(Log #211)

19- 1 - (Entire Code): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 19-1
RECOMMENDATION: The Technical Correlating Committee directs that the term "luminaire" be accepted as shown by the panel, but be followed by the existing term in parenthesis on all Proposals except those amended by Panel Action Text. This action is intended to provide consistency throughout the code. In addition, the Technical Correlating Committee directs the panel to clarify their action relative to the last line of the Panel Action. This action will be considered by the Panel as a Public Comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
Revise 604-6(a)(2) Exception No. 1 to (1) and (2) in both locations as follows:
Change "Fixture" to " Luminaire (fixture)".
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 8
VOTE ON PANEL ACTION:
AFFIRMATIVE: 8
COMMENT ON AFFIRMATIVE:
MCCULLOUGH: The panel action to accept indicates agreement with the Technical Correlating Committee direction regarding the term "luminaire" and the placement of the existing term in parenthesis in all locations. The revision shown to 604-6(a)(2) should refer to 604-6(a)(2) Exception No. 1 to (1) and (2). This is to clarify the panel action as requested by the Technical Correlating Committee. The language shown is contained in the proposed draft and reflects the panel's intent of its action on Proposal 19-1.

(Log #1229)

1- 1 - (Entire Code): Reject
SUBMITTER: Dann Strube, Lanesville, IN
COMMENT ON PROPOSAL NO: 1-1
RECOMMENDATION: The proposal should have been accepted in principle as follows:
Leave the terms fixture, lighting fixture, etc. as they are and add (luminaire) after those terms.
SUBSTANTIATION: The term luminaire is not in general use in the United States; therefore, its use is not in keeping with efforts to insure that the code is user friendly.
At the August meeting of the Kentucky Chapter IAEI meeting, I ran a quick poll (show of hands) of the 150 to 200-person audience. None said they spoke French. Very few said they knew the term luminaire. None said they felt the contractors, electricians, builders or owners in their area would understand the term. None said they like the change. Almost 100% said the change was nonsense. This alone is an indication that some efforts to make the NEC look international are not productive and only make the code less friendly.
The claim that "fixture" could be confused with a toilet is nonsense. Anyone foolish enough to make that assumption should not be reading the "electrical code."
The claim that failure to change the term is a problem for the manufacturers is also nonsense. If they want to market overseas, they can mark their products and cartons any way they want.
Point 8 in the substantiation is also defective. This item cites a FPN and FPN definition in Article 410. In fact, the international definition found in this FPN does not match the definition accepted by CMP 1 at Proposal 1-165.
The United States of America is the largest user of the NEC. As such the terms in use in our own country should be the terms of first choice in the document. The code panels have dedicated untold man-hours trying to improve the code. Do not destroy their hard work in an effort to make the document appear as if it is intended for the world at large. If the NEC is to be international, it should be marketed in English and French as the IEC documents are now marketed.
PANEL ACTION: Reject.
PANEL STATEMENT: The concern of the commenter is addressed by keeping the original term in parentheses after luminaire.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #1230)

2- 1 - (Entire Code): Reject
SUBMITTER: Dann Strube, Lanesville, IN
COMMENT ON PROPOSAL NO: 2-1
RECOMMENDATION: The proposal should have been accepted in principle as follows:
Leave the terms fixture, lighting fixture, etc. as they are and add (luminaire) after those terms.
SUBSTANTIATION: The term luminaire is not in general use in the United States; therefore, its use is not in keeping with efforts to insure that the code is user friendly.
At the August meeting of the Kentucky Chapter IAEI meeting, I ran a quick poll (show of hands) of the 150 to 200-person audience. None said they spoke French. Very few said they knew the term luminaire. None said they felt the contractors, electricians, builders or owners in their area would understand the term. None said they like the change. Almost 100% said the change was nonsense. This alone is an indication that some efforts to make the NEC look international are not productive and only make the code less friendly.
The claim that "fixture" could be confused with a toilet is nonsense. Anyone foolish enough to make that assumption should not be reading the "electrical code."
The claim that failure to change the term is a problem for the manufacturers is also nonsense. If they want to market overseas, they can mark their products and cartons any way they want.
Point 8 in the substantiation is also defective. This item cites a FPN and FPN definition in Article 410. In fact, the international definition found in this FPN does not match the definition accepted by CMP 1 at Proposal 1-165.
The United States of America is the largest user of the NEC. As such the terms in use in our own country should be the terms of first choice in the document. The code panels have dedicated untold man-hours trying to improve the code. Do not destroy their hard work in an effort to make the document appear as if it is intended for the world at large. If the NEC is to be international, it should be marketed in English and French as the IEC documents are now marketed.
PANEL ACTION: Reject.
PANEL STATEMENT: The Technical Correlating Committee has directed that the term "luminaire" be accepted as shown by the panel, but be followed by the existing term(s) in parenthesis. This action is intended to provide consistency throughout the code.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #1231)

3- 1 - (Entire Code): Reject
SUBMITTER: Dann Strube, Lanesville, IN
COMMENT ON PROPOSAL NO: 3-1
RECOMMENDATION: The proposal should have been accepted in principle as follows:
Leave the terms fixture, lighting fixture, etc. as they are and add (luminaire) after those terms.
SUBSTANTIATION: The term luminaire is not in general use in the United States; therefore, its use is not in keeping with efforts to insure that the code is user friendly.
At the August meeting of the Kentucky Chapter IAEI meeting, I ran a quick poll (show of hands) of the 150 to 200-person audience. None said they spoke French. Very few said they knew the term luminaire. None said they felt the contractors, electricians, builders or owners in their area would understand the term. None said they like the change. Almost 100% said the change was nonsense. This alone is an indication that some efforts to make the NEC look international are not productive and only make the code less friendly.
The claim that "fixture" could be confused with a toilet is nonsense. Anyone foolish enough to make that assumption should not be reading the "electrical code."
The claim that failure to change the term is a problem for the manufacturers is also nonsense. If they want to market overseas, they can mark their products and cartons any way they want.
Point 8 in the substantiation is also defective. This item cites a FPN and FPN definition in Article 410. In fact, the international definition found in this FPN does not match the definition accepted by CMP 1 at Proposal 1-165.
The United States of America is the largest user of the NEC. As such the terms in use in our own country should be the terms of first choice in the document. The code panels have dedicated untold man-hours trying to improve the code. Do not destroy their hard work in an effort to make the document appear as if it is

intended for the world at large. If the NEC is to be international, it should be marketed in English and French as the IEC documents are now marketed.
PANEL ACTION: Reject.
PANEL STATEMENT: The proposal was accepted in response to an action on definitions within Article 100 by Panel 1 and by the action of a proposal by Code-Making Panel 18 to change the term "fixture" to "luminaire."
The Technical Correlating Committee has directed that the term "luminaire" be accepted but be followed by the existing term in parenthesis. This action is intended to provide consistency throughout the code.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1232)

4- 1 - (Entire Code): Reject
SUBMITTER: Dann Strube, Lanesville, IN
COMMENT ON PROPOSAL NO: 4-1
RECOMMENDATION: The proposal should have been accepted in principle as follows:
Leave the terms fixture, lighting fixture, etc. as they are and add (luminaire) after those terms.
SUBSTANTIATION: The term luminaire is not in general use in the United States; therefore, its use is not in keeping with efforts to insure that the code is user friendly.
At the August meeting of the Kentucky Chapter IAEI meeting, I ran a quick poll (show of hands) of the 150 to 200-person audience. None said they spoke French. Very few said they knew the term luminaire. None said they felt the contractors, electricians, builders or owners in their area would understand the term. None said they like the change. Almost 100% said the change was nonsense. This alone is an indication that some efforts to make the NEC look international are not productive and only make the code less friendly.
The claim that "fixture" could be confused with a toilet is nonsense. Anyone foolish enough to make that assumption should not be reading the "electrical code."
The claim that failure to change the term is a problem for the manufacturers is also nonsense. If they want to market overseas, they can mark their products and cartons any way they want.
Point 8 in the substantiation is also defective. This item cites a FPN and FPN definition in Article 410. In fact, the international definition found in this FPN does not match the definition accepted by CMP 1 at Proposal 1-165.
The United States of America is the largest user of the NEC. As such the terms in use in our own country should be the terms of first choice in the document. The code panels have dedicated untold man-hours trying to improve the code. Do not destroy their hard work in an effort to make the document appear as if it is intended for the world at large. If the NEC is to be international, it should be marketed in English and French as the IEC documents are now marketed.
PANEL ACTION: Reject.
PANEL STATEMENT: The Technical Correling Committee has directed the term "luminaire" to be accepted and followed by the existing term in parenthesis.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1233)

5- 1 - (Entire Code): Reject
SUBMITTER: Dann Strube, Lanesville, IN
COMMENT ON PROPOSAL NO: 5-1
RECOMMENDATION: The proposal should have been accepted in principle as follows:
Leave the terms fixture, lighting fixture, etc. as they are and add (luminaire) after those terms.
SUBSTANTIATION: The term luminaire is not in general use in the United States; therefore, its use is not in keeping with efforts to insure that the code is user friendly.
At the August meeting of the Kentucky Chapter IAEI meeting, I ran a quick poll (show of hands) of the 150 to 200-person audience. None said they spoke French. Very few said they knew the term luminaire. None said they felt the contractors, electricians, builders or owners in their area would understand the term. None said they like the change. Almost 100% said the change was nonsense. This alone is an indication that some efforts to make the NEC look international are not productive and only make the code less friendly.
The claim that "fixture" could be confused with a toilet is nonsense. Anyone foolish enough to make that assumption should not be reading the "electrical code."
The claim that failure to change the term is a problem for the manufacturers is also nonsense. If they want to market overseas, they can mark their products and cartons any way they want.
Point 8 in the substantiation is also defective. This item cites a FPN and FPN definition in Article 410. In fact, the international definition found in this FPN does not match the definition accepted by CMP 1 at Proposal 1-165.
The United States of America is the largest user of the NEC. As such the terms in use in our own country should be the terms of first choice in the document. The code panels have dedicated untold man-hours trying to improve the code. Do not destroy their hard work in an effort to make the document appear as if it is intended for the world at large. If the NEC is to be international, it should be marketed in English and French as the IEC documents are now marketed.
PANEL ACTION: Reject.
PANEL STATEMENT: The action of the Technical Correlating Committee in requiring that the previous terms "fixture", "lighting fixture", etc. remain in parentheses , provides sufficient information so that no confusion will result. The term "luminaire" is the correct term for a complete lighting unit. Using the term luminaire in the NEC should correspond to its use in related product standards.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16

(Log #1234)

6- 1 - (Entire Code): Reject
SUBMITTER: Dann Strube, Lanesville, IN
COMMENT ON PROPOSAL NO: 6-1
RECOMMENDATION: The proposal should have been accepted in principle as follows:
Leave the terms fixture, lighting fixture, etc. as they are and add (luminaire) after those terms.
SUBSTANTIATION: The term luminaire is not in general use in the United States; therefore, its use is not in keeping with efforts to insure that the code is user friendly.
At the August meeting of the Kentucky Chapter IAEI meeting, I ran a quick poll (show of hands) of the 150 to 200-person audience. None said they spoke French. Very few said they knew the term luminaire. None said they felt the contractors, electricians, builders or owners in their area would understand the term. None said they like the change. Almost 100% said the change was nonsense. This alone is an indication that some efforts to make the NEC look international are not productive and only make the code less friendly.
The claim that "fixture" could be confused with a toilet is nonsense. Anyone foolish enough to make that assumption should not be reading the "electrical code."
The claim that failure to change the term is a problem for the manufacturers is also nonsense. If they want to market overseas, they can mark their products and cartons any way they want.
Point 8 in the substantiation is also defective. This item cites a FPN and FPN definition in Article 410. In fact, the international definition found in this FPN does not match the definition accepted by CMP 1 at Proposal 1-165.
The United States of America is the largest user of the NEC. As such the terms in use in our own country should be the terms of first choice in the document. The code panels have dedicated untold man-hours trying to improve the code. Do not destroy their hard work in an effort to make the document appear as if it is intended for the world at large. If the NEC is to be international, it should be marketed in English and French as the IEC documents are now marketed.
PANEL ACTION: Reject.
PANEL STATEMENT: All of the CMPs have accepted the change to "luminaire". By retaining the present term "lighting fixture(s)" in the affected sections, the usability of the document has not been negatively affected.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Ferrell

(Log #1235)

7- 1 - (Entire Code): Reject
SUBMITTER: Dann Strube, Lanesville, IN
COMMENT ON PROPOSAL NO: 7-1
RECOMMENDATION: The proposal should have been accepted in principle as follows:
Leave the terms fixture, lighting fixture, etc. as they are and add (luminaire) after those terms.
SUBSTANTIATION: The term luminaire is not in general use in the United States; therefore, its use is not in keeping with efforts to insure that the code is user friendly.
At the August meeting of the Kentucky Chapter IAEI meeting, I ran a quick poll (show of hands) of the 150 to 200-person audience. None said they spoke French. Very few said they knew the term luminaire. None said they felt the contractors, electricians, builders or owners in their area would understand the term. None said they like the change. Almost 100% said the change was nonsense. This alone is an indication that some efforts to make the NEC look international are not productive and only make the code less friendly.
The claim that "fixture" could be confused with a toilet is nonsense. Anyone foolish enough to make that assumption should not be reading the "electrical code."
The claim that failure to change the term is a problem for the manufacturers is also nonsense. If they want to market overseas, they can mark their products and cartons any way they want.
Point 8 in the substantiation is also defective. This item cites a FPN and FPN definition in Article 410. In fact, the international definition found in this FPN does not match the definition accepted by CMP 1 at Proposal 1-165.
The United States of America is the largest user of the NEC. As such the terms in use in our own country should be the terms of first choice in the document. The code panels have dedicated untold man-hours trying to improve the code. Do not destroy their hard work in an effort to make the document appear as if it is intended for the world at large. If the NEC is to be international, it should be marketed in English and French as the IEC documents are now marketed.
PANEL ACTION: Reject.
PANEL STATEMENT: The code-making panels have all accepted the change to place luminaire first. By retaining the reference to lighting fixture(s) in the affected sections, the usability of the document has not been negatively impacted.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #1236)

8- 1 - (Entire Code): Reject
SUBMITTER: Dann Strube, Lanesville, IN
COMMENT ON PROPOSAL NO: 8-1
RECOMMENDATION: The proposal should have been accepted in principle as follows:
Leave the terms fixture, lighting fixture, etc. as they are and add (luminaire) after those terms.
SUBSTANTIATION: The term luminaire is not in general use in the United States; therefore, its use is not in keeping with efforts to insure that the code is user friendly.
At the August meeting of the Kentucky Chapter IAEI meeting, I ran a quick poll (show of hands) of the 150 to 200-person audience. None said they spoke French. Very few said they knew the term luminaire. None said they felt the contractors, electricians, builders or owners in their area would understand the term. None said they like the change. Almost 100% said the change was nonsense. This alone is an indication that some efforts to make the NEC look international are not productive and only make the code less friendly.
The claim that "fixture" could be confused with a toilet is nonsense. Anyone foolish enough to make that assumption should not be reading the "electrical code."
The claim that failure to change the term is a problem for the manufacturers is also nonsense. If they want to market overseas, they can mark their products and cartons any way they want.
Point 8 in the substantiation is also defective. This item cites a FPN and FPN definition in Article 410. In fact, the international definition found in this FPN does not match the definition accepted by CMP 1 at Proposal 1-165.
The United States of America is the largest user of the NEC. As such the terms in use in our own country should be the terms of first choice in the document. The code panels have dedicated untold man-hours trying to improve the code. Do not destroy their hard work in an effort to make the document appear as if it is intended for the world at large. If the NEC is to be international, it should be marketed in English and French as the IEC documents are now marketed.
PANEL ACTION: Reject.
PANEL STATEMENT: The term "Luminaire" is becoming a commonly used term in the United States as manufacturers continue to make a single product for many countries. The terms such as "fixture" and other similar terminology will be retained in parentheses after the term "luminaire" wherever it is used.
The definition of luminaire in Article 410 was revised per proposal 18-1 to read the same as the definition added to Article 100.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #1237)

9- 1 - (Entire Code): Reject
SUBMITTER: Dann Strube, Lanesville, IN
COMMENT ON PROPOSAL NO: 9-1
RECOMMENDATION: The proposal should have been accepted in principle as follows:
Leave the terms fixture, lighting fixture, etc. as they are and add (luminaire) after those terms.
SUBSTANTIATION: The term luminaire is not in general use in the United States; therefore, its use is not in keeping with efforts to insure that the code is user friendly.
At the August meeting of the Kentucky Chapter IAEI meeting, I ran a quick poll (show of hands) of the 150 to 200-person audience. None said they spoke French. Very few said they knew the term luminaire. None said they felt the contractors, electricians, builders or owners in their area would understand the term. None said they like the change. Almost 100% said the change was nonsense. This alone is an indication that some efforts to make the NEC look international are not productive and only make the code less friendly.
The claim that "fixture" could be confused with a toilet is nonsense. Anyone foolish enough to make that assumption should not be reading the "electrical code."
The claim that failure to change the term is a problem for the manufacturers is also nonsense. If they want to market overseas, they can mark their products and cartons any way they want.
Point 8 in the substantiation is also defective. This item cites a FPN and FPN definition in Article 410. In fact, the international definition found in this FPN does not match the definition accepted by CMP 1 at Proposal 1-165.
The United States of America is the largest user of the NEC. As such the terms in use in our own country should be the terms of first choice in the document. The code panels have dedicated untold man-hours trying to improve the code. Do not destroy their hard work in an effort to make the document appear as if it is intended for the world at large. If the NEC is to be international, it should be marketed in English and French as the IEC documents are now marketed.
PANEL ACTION: Reject.
PANEL STATEMENT: Code-Making Panel 9 acknowledges the submitter's concerns, but also recognizes that broadening the applied base of the NEC beyond North America is essential. The panel agrees with the Technical Correlating Committee's position relative to the inclusion of the former terms in parentheses after the word "Luminaire".
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1238)

10- 1 - (Entire Code): Reject
SUBMITTER: Dann Strube, Lanesville, IN
COMMENT ON PROPOSAL NO: 10-1
RECOMMENDATION: The proposal should have been accepted in principle as follows:
Leave the terms fixture, lighting fixture, etc. as they are and add (luminaire) after those terms.
SUBSTANTIATION: The term luminaire is not in general use in the United States; therefore, its use is not in keeping with efforts to insure that the code is user friendly.
At the August meeting of the Kentucky Chapter IAEI meeting, I ran a quick poll (show of hands) of the 150 to 200-person audience. None said they spoke French. Very few said they knew the term luminaire. None said they felt the contractors,

electricians, builders or owners in their area would understand the term. None said they like the change. Almost 100% said the change was nonsense. This alone is an indication that some efforts to make the NEC look international are not productive and only make the code less friendly.

The claim that "fixture" could be confused with a toilet is nonsense. Anyone foolish enough to make that assumption should not be reading the "electrical code."

The claim that failure to change the term is a problem for the manufacturers is also nonsense. If they want to market overseas, they can mark their products and cartons any way they want.

Point 8 in the substantiation is also defective. This item cites a FPN and FPN definition in Article 410. In fact, the international definition found in this FPN does not match the definition accepted by CMP 1 at Proposal 1-165.

The United States of America is the largest user of the NEC. As such the terms in use in our own country should be the terms of first choice in the document. The code panels have dedicated untold man-hours trying to improve the code. Do not destroy their hard work in an effort to make the document appear as if it is intended for the world at large. If the NEC is to be international, it should be marketed in English and French as the IEC documents are now marketed.

PANEL ACTION: Reject.

PANEL STATEMENT: Code-Making Panel 10 acknowledges the submitter's concerns, but also recognizes that broadening the applied base of the NEC beyond North America is essential. The word luminaire is also used in the United States.

The panel agrees with the Technical Correlating Committee's position relative to the inclusion of the former terms in parentheses after the word "Luminaire".

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

(Log #1239)

11- 1 - (Entire Code): Reject

SUBMITTER: Dann Strube, Lanesville, IN

COMMENT ON PROPOSAL NO: 11-1

RECOMMENDATION: The proposal should have been accepted in principle as follows:

Leave the terms fixture, lighting fixture, etc. as they are and add (luminaire) after those terms.

SUBSTANTIATION: The term luminaire is not in general use in the United States; therefore, its use is not in keeping with efforts to insure that the code is user friendly.

At the August meeting of the Kentucky Chapter IAEI meeting, I ran a quick poll (show of hands) of the 150 to 200-person audience. None said they spoke French. Very few said they knew the term luminaire. None said they felt the contractors, electricians, builders or owners in their area would understand the term. None said they like the change. Almost 100% said the change was nonsense. This alone is an indication that some efforts to make the NEC look international are not productive and only make the code less friendly.

The claim that "fixture" could be confused with a toilet is nonsense. Anyone foolish enough to make that assumption should not be reading the "electrical code."

The claim that failure to change the term is a problem for the manufacturers is also nonsense. If they want to market overseas, they can mark their products and cartons any way they want.

Point 8 in the substantiation is also defective. This item cites a FPN and FPN definition in Article 410. In fact, the international definition found in this FPN does not match the definition accepted by CMP 1 at Proposal 1-165.

The United States of America is the largest user of the NEC. As such the terms in use in our own country should be the terms of first choice in the document. The code panels have dedicated untold man-hours trying to improve the code. Do not destroy their hard work in an effort to make the document appear as if it is intended for the world at large. If the NEC is to be international, it should be marketed in English and French as the IEC documents are now marketed.

PANEL ACTION: Reject.

PANEL STATEMENT: The Panel rejected proposal 11-1 because the fixtures in 670-2 are not lighting fixtures. The comment does not change this fact.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:

AFFIRMATIVE: 15

(Log #1240)

12- 1 - (Entire Code): Reject

SUBMITTER: Dann Strube, Lanesville, IN

COMMENT ON PROPOSAL NO: 12-1

RECOMMENDATION: The proposal should have been accepted in principle as follows:

Leave the terms fixture, lighting fixture, etc. as they are and add (luminaire) after those terms.

SUBSTANTIATION: The term luminaire is not in general use in the United States; therefore, its use is not in keeping with efforts to insure that the code is user friendly.

At the August meeting of the Kentucky Chapter IAEI meeting, I ran a quick poll (show of hands) of the 150 to 200-person audience. None said they spoke French. Very few said they knew the term luminaire. None said they felt the contractors, electricians, builders or owners in their area would understand the term. None said they like the change. Almost 100% said the change was nonsense. This alone is an indication that some efforts to make the NEC look international are not productive and only make the code less friendly.

The claim that "fixture" could be confused with a toilet is nonsense. Anyone foolish enough to make that assumption should not be reading the "electrical code."

The claim that failure to change the term is a problem for the manufacturers is also nonsense. If they want to market overseas, they can mark their products and cartons any way they want.

Point 8 in the substantiation is also defective. This item cites a FPN and FPN definition in Article 410. In fact, the international definition found in this FPN does not match the definition accepted by CMP 1 at Proposal 1-165.

The United States of America is the largest user of the NEC. As such the terms in use in our own country should be the terms of first choice in the document. The code panels have dedicated untold man-hours trying to improve the code. Do not destroy their hard work in an effort to make the document appear as if it is intended for the world at large. If the NEC is to be international, it should be marketed in English and French as the IEC documents are now marketed.

PANEL ACTION: Reject.

PANEL STATEMENT: The submitter of the comment has offered no new technical or definitive substantiation to support his request for the panel to revise the panel action taken on Proposal 12-1.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 9

NOT RETURNED: 2 Kelley, Laney

(Log #1241)

14- 1 - (Entire Code): Accept in Principle

SUBMITTER: Dann Strube, Lanesville, IN

COMMENT ON PROPOSAL NO: 14-1

RECOMMENDATION: The proposal should have been accepted in principle as follows:

Leave the terms fixture, lighting fixture, etc. as they are and add (luminaire) after those terms.

SUBSTANTIATION: The term luminaire is not in general use in the United States; therefore, its use is not in keeping with efforts to insure that the code is user friendly.

At the August meeting of the Kentucky Chapter IAEI meeting, I ran a quick poll (show of hands) of the 150 to 200-person audience. None said they spoke French. Very few said they knew the term luminaire. None said they felt the contractors, electricians, builders or owners in their area would understand the term. None said they like the change. Almost 100% said the change was nonsense. This alone is an indication that some efforts to make the NEC look international are not productive and only make the code less friendly.

The claim that "fixture" could be confused with a toilet is nonsense. Anyone foolish enough to make that assumption should not be reading the "electrical code."

The claim that failure to change the term is a problem for the manufacturers is also nonsense. If they want to market overseas, they can mark their products and cartons any way they want.

Point 8 in the substantiation is also defective. This item cites a FPN and FPN definition in Article 410. In fact, the international definition found in this FPN does not match the definition accepted by CMP 1 at Proposal 1-165.

The United States of America is the largest user of the NEC. As such the terms in use in our own country should be the terms of first choice in the document. The code panels have dedicated untold man-hours trying to improve the code. Do not destroy their hard work in an effort to make the document appear as if it is

intended for the world at large. If the NEC is to be international, it should be marketed in English and French as the IEC documents are now marketed.

PANEL ACTION: Accept in Principle.

Change "lighting fixture" to "luminaire (lighting fixture)". Do this for both singular and plural use of the term.

PANEL STATEMENT: While the Panel action does not eliminate the use of the term "luminaire", it does retain use of the prior term to retain continuity.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:

AFFIRMATIVE: 14

(Log #1242)

13- 1 - (Entire Code): Reject

SUBMITTER: Dann Strube, Lanesville, IN

COMMENT ON PROPOSAL NO: 13-1

RECOMMENDATION: The proposal should have been accepted in principle as follows:

Leave the terms fixture, lighting fixture, etc. as they are and add (luminaire) after those terms.

SUBSTANTIATION: The term luminaire is not in general use in the United States; therefore, its use is not in keeping with efforts to insure that the code is user friendly.

At the August meeting of the Kentucky Chapter IAEI meeting, I ran a quick poll (show of hands) of the 150 to 200-person audience. None said they spoke French. Very few said they knew the term luminaire. None said they felt the contractors, electricians, builders or owners in their area would understand the term. None said they like the change. Almost 100% said the change was nonsense. This alone is an indication that some efforts to make the NEC look international are not productive and only make the code less friendly.

The claim that "fixture" could be confused with a toilet is nonsense. Anyone foolish enough to make that assumption should not be reading the "electrical code."

The claim that failure to change the term is a problem for the manufacturers is also nonsense. If they want to market overseas, they can mark their products and cartons any way they want.

Point 8 in the substantiation is also defective. This item cites a FPN and FPN definition in Article 410. In fact, the international definition found in this FPN does not match the definition accepted by CMP 1 at Proposal 1-165.

The United States of America is the largest user of the NEC. As such the terms in use in our own country should be the terms of first choice in the document. The code panels have dedicated untold man-hours trying to improve the code. Do not destroy their hard work in an effort to make the document appear as if it is intended for the world at large. If the NEC is to be international, it should be marketed in English and French as the IEC documents are now marketed.

PANEL ACTION: Reject.

PANEL STATEMENT: The word "luminaire" is not mentioned in the materials covered by Code-Making Panel 13.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 10

NOT RETURNED: 1 Davis

(Log #1243)

15- 1 - (Entire Code): Accept in Principle

SUBMITTER: Dann Strube, Lanesville, IN

COMMENT ON PROPOSAL NO: 15-1

RECOMMENDATION: The proposal should have been accepted in principle as follows:

Leave the terms fixture, lighting fixture, etc. as they are and add (luminaire) after those terms.

SUBSTANTIATION: The term luminaire is not in general use in the United States; therefore, its use is not in keeping with efforts to insure that the code is user friendly.

At the August meeting of the Kentucky Chapter IAEI meeting, I ran a quick poll (show of hands) of the 150 to 200-person audience. None said they spoke French. Very few said they knew the term luminaire. None said they felt the contractors, electricians, builders or owners in their area would understand the term. None said they like the change. Almost 100% said the change was nonsense. This alone is an indication that some efforts to make the NEC look international are not productive and only make the code less friendly.

The claim that "fixture" could be confused with a toilet is nonsense. Anyone foolish enough to make that assumption should not be reading the "electrical code."

The claim that failure to change the term is a problem for the manufacturers is also nonsense. If they want to market overseas, they can mark their products and cartons any way they want.

Point 8 in the substantiation is also defective. This item cites a FPN and FPN definition in Article 410. In fact, the international definition found in this FPN does not match the definition accepted by CMP 1 at Proposal 1-165.

The United States of America is the largest user of the NEC. As such the terms in use in our own country should be the terms of first choice in the document. The code panels have dedicated untold man-hours trying to improve the code. Do not destroy their hard work in an effort to make the document appear as if it is intended for the world at large. If the NEC is to be international, it should be marketed in English and French as the IEC documents are now marketed.

PANEL ACTION: Accept in Principle.

Except for Sections 520-63 and 530-51, revise the text to use the word "luminaire(s)" first followed by the current code terms "fixture(s)", "lighting fixture(s)" in parenthesis. As an example, the term fixture would appear as "luminaire (fixture)".

Retain the word "fixtures" in Sections 520-63 and 530-51 as use the current text of the 1999 NEC.

PANEL STATEMENT: The revised text complies with the submitter's intent to retain the old terms while starting with the new terms. The term luminaire is in general use throughout the United States by lighting professionals.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 18

VOTE ON PANEL ACTION:

AFFIRMATIVE: 18

COMMENT ON AFFIRMATIVE:

KLEIN: 1. The term luminaire is in general use throughout the United States by all lighting certified (NCQLP) professionals.

2. Luminaire is precisely defined by The Illuminating Engineering Society of North America as: "A complete lighting unit consisting of a lamp or lamps and ballast(s) (when applicable) together with the parts designed to distribute the light, to position and protect the lamps, and to connect the lamps to the power supply."

3. The terms "fixture" and "lighting fixture" are not precisely defined.

4. Just as lamps are no longer referred to as "light bulbs", luminaires will no longer be referred to as "fixtures" in technical documentation.

(Log #1244)

16- 1 - (Entire Code): Reject

SUBMITTER: Dann Strube, Lanesville, IN

COMMENT ON PROPOSAL NO: 16-1

RECOMMENDATION: The proposal should have been accepted in principle as follows:

Leave the terms fixture, lighting fixture, etc. as they are and add (luminaire) after those terms.

SUBSTANTIATION: The term luminaire is not in general use in the United States; therefore, its use is not in keeping with efforts to insure that the code is user friendly.

At the August meeting of the Kentucky Chapter IAEI meeting, I ran a quick poll (show of hands) of the 150 to 200-person audience. None said they spoke French. Very few said they knew the term luminaire. None said they felt the contractors, electricians, builders or owners in their area would understand the term. None said they like the change. Almost 100% said the change was nonsense. This alone is an indication that some efforts to make the NEC look international are not productive and only make the code less friendly.

The claim that "fixture" could be confused with a toilet is nonsense. Anyone foolish enough to make that assumption should not be reading the "electrical code."

The claim that failure to change the term is a problem for the manufacturers is also nonsense. If they want to market overseas, they can mark their products and cartons any way they want.

Point 8 in the substantiation is also defective. This item cites a FPN and FPN definition in Article 410. In fact, the international definition found in this FPN does not match the definition accepted by CMP 1 at Proposal 1-165.

The United States of America is the largest user of the NEC. As such the terms in use in our own country should be the terms of first choice in the document. The code panels have dedicated untold man-hours trying to improve the code. Do not destroy their hard work in an effort to make the document appear as if it is

intended for the world at large. If the NEC is to be international, it should be marketed in English and French as the IEC documents are now marketed.
PANEL ACTION: Reject.
PANEL STATEMENT: The NEC should harmonize with national and international standards terminology, where possible, to avoid a multiplicity of terms for the same item.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
LANNI: I agree with the comment. This abrupt change will confuse and confound the American code user and violates the principle of "user friendly codes" which we spent a whole code cycle trying to improve.

(Log #1245)

17- 1 - (Entire Code): Accept in Principle
SUBMITTER: Dann Strube, Lanesville, IN
COMMENT ON PROPOSAL NO: 17-1
RECOMMENDATION: The proposal should have been accepted in principle as follows:
Leave the terms fixture, lighting fixture, etc. as they are and add (luminaire) after those terms.
SUBSTANTIATION: The term luminaire is not in general use in the United States; therefore, its use is not in keeping with efforts to insure that the code is user friendly.
At the August meeting of the Kentucky Chapter IAEI meeting, I ran a quick poll (show of hands) of the 150 to 200-person audience. None said they spoke French. Very few said they knew the term luminaire. None said they felt the contractors, electricians, builders or owners in their area would understand the term. None said they like the change. Almost 100% said the change was nonsense. This alone is an indication that some efforts to make the NEC look international are not productive and only make the code less friendly.
The claim that "fixture" could be confused with a toilet is nonsense. Anyone foolish enough to make that assumption should not be reading the "electrical code."
The claim that failure to change the term is a problem for the manufacturers is also nonsense. If they want to market overseas, they can mark their products and cartons any way they want.
Point 8 in the substantiation is also defective. This item cites a FPN and FPN definition in Article 410. In fact, the international definition found in this FPN does not match the definition accepted by CMP 1 at Proposal 1-165.
The United States of America is the largest user of the NEC. As such the terms in use in our own country should be the terms of first choice in the document. The code panels have dedicated untold man-hours trying to improve the code. Do not destroy their hard work in an effort to make the document appear as if it is intended for the world at large. If the NEC is to be international, it should be marketed in English and French as the IEC documents are now marketed.
PANEL ACTION: Accept in Principle.
Where the terms "fixture(s)" "lighting fixture(s)" appear, use the term "luminaire(s)" first followed by the terms "(fixture(s))" or "(lighting fixture(s))".
PANEL STATEMENT: The Technical Correlating Committee has directed that the term "luminaire" be accepted as shown by the panel, but be followed by the existing term in parenthesis. This revision meets intent of the submitter.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #1246)

18- 1 - (Entire Code): Accept in Principle
SUBMITTER: Dann Strube, Lanesville, IN
COMMENT ON PROPOSAL NO: 18-1
RECOMMENDATION: The proposal should have been accepted in principle as follows:
Leave the terms fixture, lighting fixture, etc. as they are and add (luminaire) after those terms.
SUBSTANTIATION: The term luminaire is not in general use in the United States; therefore, its use is not in keeping with efforts to insure that the code is user friendly.
At the August meeting of the Kentucky Chapter IAEI meeting, I ran a quick poll (show of hands) of the 150 to 200-person audience. None said they spoke French. Very few said they knew the term luminaire. None said they felt the contractors, electricians, builders or owners in their area would understand the term. None said they like the change. Almost 100% said the change was nonsense. This alone is an indication that some efforts to make the NEC look international are not productive and only make the code less friendly.
The claim that "fixture" could be confused with a toilet is nonsense. Anyone foolish enough to make that assumption should not be reading the "electrical code."
The claim that failure to change the term is a problem for the manufacturers is also nonsense. If they want to market overseas, they can mark their products and cartons any way they want.
Point 8 in the substantiation is also defective. This item cites a FPN and FPN definition in Article 410. In fact, the international definition found in this FPN does not match the definition accepted by CMP 1 at Proposal 1-165.
The United States of America is the largest user of the NEC. As such the terms in use in our own country should be the terms of first choice in the document. The code panels have dedicated untold man-hours trying to improve the code. Do not destroy their hard work in an effort to make the document appear as if it is intended for the world at large. If the NEC is to be international, it should be marketed in English and French as the IEC documents are now marketed.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: The committee agrees with the submitter's concern of the need for dual terms during the transition period. It also affirms the directive of the Technical Correlating Committee. See panel action on Comment 18-5.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 10
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10

(Log #1247)

19- 2 - (Entire Code): Reject
SUBMITTER: Dann Strube, Lanesville, IN
COMMENT ON PROPOSAL NO: 19-1
RECOMMENDATION: The proposal should have been accepted in principle as follows:
Leave the terms fixture, lighting fixture, etc. as they are and add (luminaire) after those terms.
SUBSTANTIATION: The term luminaire is not in general use in the United States; therefore, its use is not in keeping with efforts to insure that the code is user friendly.
At the August meeting of the Kentucky Chapter IAEI meeting, I ran a quick poll (show of hands) of the 150 to 200-person audience. None said they spoke French. Very few said they knew the term luminaire. None said they felt the contractors, electricians, builders or owners in their area would understand the term. None said they like the change. Almost 100% said the change was nonsense. This alone is an indication that some efforts to make the NEC look international are not productive and only make the code less friendly.
The claim that "fixture" could be confused with a toilet is nonsense. Anyone foolish enough to make that assumption should not be reading the "electrical code."
The claim that failure to change the term is a problem for the manufacturers is also nonsense. If they want to market overseas, they can mark their products and cartons any way they want.
Point 8 in the substantiation is also defective. This item cites a FPN and FPN definition in Article 410. In fact, the international definition found in this FPN does not match the definition accepted by CMP 1 at Proposal 1-165.
The United States of America is the largest user of the NEC. As such the terms in use in our own country should be the terms of first choice in the document. The code panels have dedicated untold man-hours trying to improve the code. Do not destroy their hard work in an effort to make the document appear as if it is intended for the world at large. If the NEC is to be international, it should be marketed in English and French as the IEC documents are now marketed.
PANEL ACTION: Reject.
PANEL STATEMENT: Refer to action on Comment 19-1.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 8
VOTE ON PANEL ACTION:
AFFIRMATIVE: 8

COMMENT ON AFFIRMATIVE:
MCCULLOUGH: The panel statement should read: Refer to action on Comment 19-1 which accepts the Technical Correlating Committee directive regarding use of the term "luminaire."

(Log #1248)

20- 1 - (Entire Code): Reject
SUBMITTER: Dann Strube, Lanesville, IN
COMMENT ON PROPOSAL NO: 20-1
RECOMMENDATION: The proposal should have been accepted in principle as follows:
Leave the terms fixture, lighting fixture, etc. as they are and add (luminaire) after those terms.
SUBSTANTIATION: The term luminaire is not in general use in the United States; therefore, its use is not in keeping with efforts to insure that the code is user friendly.
At the August meeting of the Kentucky Chapter IAEI meeting, I ran a quick poll (show of hands) of the 150 to 200-person audience. None said they spoke French. Very few said they knew the term luminaire. None said they felt the contractors, electricians, builders or owners in their area would understand the term. None said they like the change. Almost 100% said the change was nonsense. This alone is an indication that some efforts to make the NEC look international are not productive and only make the code less friendly.
The claim that "fixture" could be confused with a toilet is nonsense. Anyone foolish enough to make that assumption should not be reading the "electrical code."
The claim that failure to change the term is a problem for the manufacturers is also nonsense. If they want to market overseas, they can mark their products and cartons any way they want.
Point 8 in the substantiation is also defective. This item cites a FPN and FPN definition in Article 410. In fact, the international definition found in this FPN does not match the definition accepted by CMP 1 at Proposal 1-165.
The United States of America is the largest user of the NEC. As such the terms in use in our own country should be the terms of first choice in the document. The code panels have dedicated untold man-hours trying to improve the code. Do not destroy their hard work in an effort to make the document appear as if it is intended for the world at large. If the NEC is to be international, it should be marketed in English and French as the IEC documents are now marketed.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel action on proposal 20-1 recognizes the submitter's concern that the term "luminaire" is not widely used in the United States. The panel action recognizes and supports the action taken by Panel 1 (Proposal 1-165) on page 58 of the ROP adding the term "luminaire".
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 10
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10

(Log #1)

1- 2 - (80): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 1-3
RECOMMENDATION: The Technical Correlating Committee directs that this proposal be reviewed relative to the NFPA definition of the "Authority Having Jurisdiction" and determine if it is appropriate for this Article. In the Scope, change "shall be" to "are" to comply with the NEC Style Manual. The Technical Correlating Committee accepts the Scope as modified by this note. This action will be considered by the Panel as a Public Comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
1.) Add "materials, " after the word "equipment". Add "a" before the word "procedure".
2.) Delete the FPN following definition of "Authority Having Jurisdiction" in Section 80.2.
3.) Change "shall be" to "are" in Section 80.1 Scope.
PANEL STATEMENT: The panel has reviewed the proposed definition in accordance with the Technical Correlating Committee directive and finds that the definition is in agreement with the NFPA definition as modified in the panel action.
The FPN was removed because it is not appropriate for a specific jurisdiction that may adopt Article 80.
The panel accepts the Technical Correlating Committee directive to change "shall be" to "are" in the scope.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #601)

1- 3 - (80): Reject
SUBMITTER: John E. Propst, Equilon Enterprises, LLC
COMMENT ON PROPOSAL NO: 1-3
RECOMMENDATION: The purpose for this comment is to reject this proposal and the action of the panel in total.
SUBSTANTIATION: The only significant justification provided by the submitter for including this new section was "to provide a standardized set of administrative rules" to "allow for more consistent adoption, use, and enforcement of the NEC". However, because of the broad application of the NEC to almost all aspects of electrical installations from single family residences up to major industrial facilities that include sophisticated computer controls, cogeneration, transmission, and distribution it is not practical to consider the application of a single set of administrative rules to all applications. While it is reasonable to consider the review of construction plans for typical residential and small commercial applications, it is highly unlikely that these rules could handle the design review of a multi-million or multi-billion dollar project designed by major engineering firms oftentimes located in other parts of the world without adding unnecessary cost burden and time delays. There are many requirements throughout the NEC that allows specific exceptions to industrial applications. This is often done with the recognition that the engineering and maintenance requirements and practices in industrial facilities goes beyond the normal practices of nonindustrial facilities. This same logic would also suggest that the rules that apply to industrial facilities must also deviate from those being applied to residential, commercial, and similar establishments.
Within the scope of the proposed article, the investigation of fires within industrial facilities is often a very rigorous process involving the expertise of many forensic experts. It is not unusual for an investigation to proceed for a period of time until the root cause can be identified. The additional involvement of personnel defined by this rule would only add unnecessary burden and delay without clearly defining the benefits. As mentioned above, the requirements for design review for major industrial installations is beyond the expected expertise of most electrical inspectors. The designation of the "authority having jurisdiction" only adds confusion to what is already a topic muddled by the differences in definitions between documents such as OSHA 1910.399, the NEC and the NEC Handbook.
Within the article, there are many examples of confusing language. For example, in 80.13(2) the article describes disconnecting power to a premises from its source of electric supply. While this may be a clearly defined point for a typical residence, it is not nearly as well defined for a facility receiving power at 230 kV with onsite generation, which is much more typical of industrial installations.
Other areas of confusing language is where there are references to existing laws (80.15 (H)(2), 80.17(A) as examples). If the desire is to achieve a standardized set of rules, then there should not be allowances for deviations set by other laws.
The requirements listed in 80.27 for inspector qualification is most likely very appropriate for personnel responsible for the inspection of typical residential and commercial installations. However, it has been our experience that most nationally recognized inspector certification programs do to address the specific requirements needed for industrial applications that might include high voltage applications, applications in classified locations, complex and integrated control, alarm, and protection schemes, and similar applications. Because of this, many industrial locations have found it necessary to provide their own custom training programs for their crafts, inspection, and engineering personnel. For these reasons, proposed Article 80 should not be included in the NEC.
PANEL ACTION: Reject.
PANEL STATEMENT: Article 80 provides a set of model administrative rules that can be beneficial to an inspection jurisdiction in the adoption of electrical safety rules and the enforcement of those rules. The information included in Article 80 is not part of the Code unless adopted and is a resource from which to draw where needed. A jurisdiction sharing the commentor's concerns may not elect to adopt Article 80.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #614)

1- 4 - (80): Reject
SUBMITTER: Steven C. Johnson, Time Warner Cable
COMMENT ON PROPOSAL NO: 1-3
RECOMMENDATION: Reject the proposal to add a new Article 80.
SUBSTANTIATION: Section 90-1(c) intention states: "This code is not intended as a design specification nor an instruction manual for untrained persons." Is not this proposed Article 80 a design specification for a local statute dealing with electrical installations? This might be appropriate for an example statute to be made available to authorities having jurisdiction but is beyond the scope of the code.
PANEL ACTION: Reject.
PANEL STATEMENT: Article 80 is information only in the NEC and needs to be specifically adopted by a jurisdiction for it to be applicable. As such, it is not a part of the NEC and not subject to the scope of the NEC.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #897)

1- 5 - (80): Reject
SUBMITTER: John Stricklin, Mtn. Home, ID
COMMENT ON PROPOSAL NO: 1-3
RECOMMENDATION: No new Article 80. Do not accept this proposal.
SUBSTANTIATION: This article contains legal parameters that do not have anything to do with the design of electrical installations. A lot of jurisdictions have an existing law that states, they have to adopt the current addition of the National Electrical Code. This leaves no room for Article 80 in the 2002 National Electrical Code because; Article 80 could conflict with their existing laws. With Article 80 in the 2002 National Electrical Code, could make some jurisdictions look at changing their laws and with politics the way they are today, could have the inspection program eliminated.
PANEL ACTION: Reject.
PANEL STATEMENT: Article 80 is not a part of the Code unless so adopted by an appropriate jurisdiction. The authority adopting the Code will have to specifically adopt Article 80 before it becomes law. Section 80-5 states "Article 80 shall not apply unless specifically adopted by the local jurisdiction adopting the National Electrical Code." The panel does not agree that approval of Article 80 could cause inspection programs to be eliminated. A jurisdiction sharing the commentor's concerns may not elect to adopt Article 80.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #917)

1- 6 - (80): Reject
SUBMITTER: Joe Tedesco, NTT Inc.
COMMENT ON PROPOSAL NO: 1-3
RECOMMENDATION: Move proposed new Article 80 into an annex.
SUBSTANTIATION: Since this article is not considered as part of the code, it should be in an annex with the rest of the non-code items.
PANEL ACTION: Reject.
PANEL STATEMENT: Article 80 becomes an enforceable part of the Code if adopted by a local jurisdiction. This makes it different from an annex and the panel believes its current location at the beginning of the Code is appropriate.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
TROGLIA: I believe that Article 80 should be relocated to the Annex. For those jurisdictions not adopting Article 80, it will be confusing and not user friendly to have such a bulk of nonrelevant material in the front of the book. Such relocation should have minimal impact on those jurisdictions adopting Article 80.

(Log #1621)

1- 7 - (80): Accept in Part
SUBMITTER: Gilbert L. Thompson, MEIA Codes and Standards
COMMENT ON PROPOSAL NO: 1-3
RECOMMENDATION: We would like to go on record as supporting this proposal. The NEC Task group on administrative rules did a great service to the electrical industry by developing this proposal for consideration by localities that have not already passed legislation to accomplish its purpose. However, we think one important aspect was overlooked in its formation. Where are the qualifications or requirements for the installers who provide electrical services?
SUBSTANTIATION: In order to provide electrical services for the public, most jurisdictions require the work to be installed by a duly insured or bonded, actively certified, licensed person who is qualified for the class or type of work to be done. Also, some areas allow only the resident owner to apply for their own permit if they pass a test designed to show that they are familiar with the latest NEC code rules. We think the task force should consider this omission and come up with language and a section that would qualify the installer of the installation in a similar manner that qualified the inspector in section 80-27.
PANEL ACTION: Accept in Part.
PANEL STATEMENT: The panel accepts the commentor's expressed support of the proposal in the first two sentences only. However, the commentor has not provided specific text for the proposed additional requirements in accordance with Section 4-4.5(c) of the Regulations Covering Committee Projects.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #525)

1- 8 - (80-13(g)): Accept in Principle
SUBMITTER: Robert B. Alexander, Fluor Daniel
COMMENT ON PROPOSAL NO: 1-3
RECOMMENDATION: Revise last sentence to read:
As used in this section, "emergency" means circumstances that the authority having jurisdiction knows, or has reason to believe, exist and that reasonably can constitute immediate danger to life or ~~and~~ property.
SUBSTANTIATION: Editorial, the current wording requires both life and property to be in jeopardy. The proposed wording allows either to be the basis for examination. At the Panel's discretion they may also wish to add a reference to "bodily injury."
PANEL ACTION: Accept in Principle.
Revise the last sentence of Section 80.13(7) of the 2001 NEC ROP draft to read as follows:
As used in this section, emergency means circumstances that the authority having jurisdiction knows, or has reason to believe, exist and that reasonably can constitute immediate danger to ~~life~~ persons or ~~and~~ property.
PANEL STATEMENT: The panel believes this editorial revision accomplishes the submitter's intent.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #2251)

1- 9 - (80-15(b)(4)): Accept
SUBMITTER: Guy R. Franks, SBC
COMMENT ON PROPOSAL NO: 1-3
RECOMMENDATION: Add a new item (h) as follows:
(h) A representative of a telecommunications utility operating in the jurisdiction.
SUBSTANTIATION: With the telecommunications industry represented on the electrical board, this board will have representation from all of the entities and users subject to the NEC. Adding telecommunications to the electrical board will result in an electrical board that has a broader and balanced perspective.

PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #882)

1- 10 - (80-19(d)): Reject
SUBMITTER: Michael V. Glenn, Longview Fibre Co.
COMMENT ON PROPOSAL NO: 1-3
RECOMMENDATION: Revise 80-19(d) to read as follows:
(d) Annual Permits. In lieu of an individual permit for each installation or alteration, an annual permit shall, upon application, therefore, be issued to any person, firm or corporation regularly employing one or more employees for the installation, alteration, and maintenance of electric equipment in or on buildings or premises owned or occupied by the applicant for the permit. ~~Upon application, an electrical contractor as agent for the owner or tenant shall be issued an annual permit.~~ It shall be permissible, upon application for an annual permit, for an electrical contractor to act as agent for the owner or tenant. The applicant shall keep records of all work done and such records shall be transmitted periodically to the electrical inspector.
SUBSTANTIATION: Our industrial facility employees, approximately 90 full time electricians that do maintenance type of electrical work. The State of Washington's Electrical Inspection Department presently utilizes annual permits of which we manage our own records and work with the Inspection Department for the required inspections. We would not want nor would we use an electrical contractor to act as our agent for our electricians and inspections. There are many industrial facilities throughout the country that have their own electricians and electrical staff who would not allow a contractor to serve as their agent. The proposed change would allow any person, firm, or corporation the option of using an electrical contractor as an agent or to serve as their own agent. This change keeps the intent of an annual permit the same and provides more flexibility for a wider variety of circumstances.
PANEL ACTION: Reject.
PANEL STATEMENT: The present language specifically permits an annual permit to be issued to any "person, firm or corporation" satisfying certain conditions. While an electrical contractor is permitted to act as an agent for an owner or tenant, nothing requires that applicants for annual permits be electrical contractors.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #526)

1- 11 - (80-29): Accept
SUBMITTER: Robert B. Alexander, Fluor Daniel
COMMENT ON PROPOSAL NO: 1-3
RECOMMENDATION: Revise section to read:
80.29 Liability for Damages. Article 80 shall not be construed to affect the responsibility or liability of any party owning, operating, designing, controlling, or installing any electric equipment for damages to persons or property caused by a defect therein, nor shall the ____ nor any of its employees be held as assuming any such liability by reason of the inspection, reinspection, or other examination authorized.
SUBSTANTIATION: Editorial, the current wording actually lets everyone "off the hook." That is, compliance with Article 80 must affect "the responsibility or liability" of those delimited. Since Section 80-1(4) includes "design" in the scope of the article, omitting it from "list" in 80-29 could be interpreted as absolving the designer from responsibility.
PANEL ACTION: Accept.
Editorially revise the comment to read as follows:
80.29 Liability for Damages. Article 80 shall not be construed to affect the responsibility or liability of any party owning, designing, operating, controlling, or installing any electric equipment for damages to
persons or property caused by any defect therein, nor shall the _____ nor any of its employees be held as assuming any such liability by reason of the inspection, reinspection, or other examination authorized.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

ARTICLE 90 — INTRODUCTION

(Log #343)

1- 12 - (90-1(c)): Accept
SUBMITTER: William T. Fiske, I T S North America
COMMENT ON PROPOSAL NO: 1-5
RECOMMENDATION: Reject the proposal.
SUBSTANTIATION: Submitter's statement in substantiation, "...many rules are included in the Code that are design in nature...," is true; however the presence of some design criteria in the Code does not make it a design manual. The NEC merely sets minimum criteria, and as stated in 90-1(b), application of NEC rules does not necessarily result in good electrical system design. In addition, submitter provided no substantiation for deleting reference to, "untrained persons".
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
COX: I disagree with the panel action to accept this comment. I do agree with the submitter that the presence of some design criteria in the code does not make it a design manual. The original language and the present language supports that and refers to the "Code" as the complete document. This provision has never prohibited a safety rule that includes design criteria from being adopted into the code. However, it is broadly interpreted that one can use 90.1(C) to do just that. In the 2001 NEC ROP, 90.1(C) is used by Code Making Panels over 25 times as all or part of their reason for rejecting a code proposal.
The term "untrained persons" is used only once in the NEC and is undefined in the context of the code. Without a definition of "untrained" and a description of the area of expertise or skill of training implied, this provision is unenforceable as to applying a safety rule and will be interpreted as differently as there are opinions as to what an "untrained" person is. Section 90.1(C) has no bearing on the application or enforcement of the code. The common interpretation of this rule appears to be that the code is not intended to be used by people who are untrained. Section 90.1(C) in no way prohibits anyone from using the code, whether or not they are trained. In view of the code, what does "untrained" mean? Is a trained persons required to be an electrical engineer, electrician, or electronic technician? The simple statement that the code is not intended as an instruction manual for untrained person does not have any bearing on the application or enforcement of the code. Those who are familiar with the code understand that a person cannot simply study the code to become an engineer, an electrician, or a technician. More fundamental training is necessary before a person understands electrical theory and practice. Section 90.1(C) has no role in the present NEC. The wording in 90-1(A) and (B) address the type of material that can be adopted as part of the code and it focuses on safety. This comment should be rejected. See my explanation of negative vote on Comment 1-21.

(Log #448)

1- 13 - (90-1(c)): Reject
SUBMITTER: Joseph A. Tedesco, J A Tedesco Associates, Inc
COMMENT ON PROPOSAL NO: 1-5
RECOMMENDATION: Revise the proposal to "reject" and put back the following to replace section 90-1(c). "Intention: This code is intended to be used by 'Qualified Persons'."
SUBSTANTIATION: Deleting the section makes no sense, and replacing the rule without any real concern for safety will not be appreciated by the electrical industry! Besides, the Code-Making Panel's revised definition of a qualified person makes this a necessary change.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel rejects the added new language. The existing text is clear, concise and correct. See panel action on Comment 1-12.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
COMMENT ON AFFIRMATIVE:
COX: I agree with the panel action to reject this comment but disagree with the panel statement. The submitter introduces a new concept that has not been considered by the panel or the public. To add a new restriction that would essentially limit the use of the code to people who are qualified is a drastic change from what is presently in the code. There is a significant difference between

"This code is not intended as a design specification nor an instruction manual for untrained persons" and "This code is intended to be used by qualified persons."

I disagree with the panel that the wording in 90.1(C) is clear, concise and correct. It is very clear that there are many different interpretations of this wording. That fact is evident in the comments submitted regarding Proposal 1-5 and by Code Making Panel actions shown in the 2001 NEC ROP and previous editions of the ROP and ROC. It is clear that people understand this wording to mean different things. See my explanation of negative vote on Comment 1-21.

(Log #473)

1- 14 - (90-1(c)): Accept
SUBMITTER: William T. Fiske, Intertek Testing Services
COMMENT ON PROPOSAL NO: 1-5
RECOMMENDATION: Reject the proposal.
SUBSTANTIATION: Submitter's statement in substantiation, "... many rules are included in the Code that are design in nature...," is true; however the presence of some design criteria in the Code does not make it a design manual. The NEC merely sets minimum criteria, and as stated in 90-1(b), application of NEC rules does not necessarily result in good electrical system design. In addition, submitter provided no substantiation for deleting reference to, "untrained persons".
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
COX: I disagree with the panel action to accept this comment. This comment should be rejected. See my explanation of negative vote on Comments 1-12 and 1-21.

(Log #593)

1- 15 - (90-1(c)): Accept
SUBMITTER: Arthur J. Carlson, Pocatello, ID
COMMENT ON PROPOSAL NO: 1-5
RECOMMENDATION: (c) Intention. This code is not intended as a design specification nor an instruction manual for untrained persons.
SUBSTANTIATION: Proposal 1-5 should be rejected. To delete Section 90-1(c) would open the door to make the NEC even more non-user friendly. I am certain that in a few code cycles; the NEC would read like an engineers handbook.
PANEL ACTION: Accept.
PANEL STATEMENT: The panel concludes that the submitter's recommendation is to reject Proposal 1-5.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
COX: I disagree with the panel action to accept this comment. The purpose of the code is stated in 90-1(a) as "... the practical safeguarding of persons and property from hazards arising from the use of electricity." Proposals to change the NEC should fall within those parameters. The existing rules do not restrict the level of technical difficulty NEC provisions may contain. As electrical and electronic technology advances and become more complex, the code will have to reflect those changes. There is nothing in existing 90.1(C) that prohibits including complex engineering data or procedures in the code as long as they are for "the practical safeguarding of persons and property from hazards arising from the use of electricity." This comment should be rejected. See my explanation of negative vote on Comments 1-12 and 1-21.

(Log #609)

1- 16 - (90-1(c)): Accept
SUBMITTER: Glenn W. Zieseniss, Crown Point, IN
COMMENT ON PROPOSAL NO: 1-5
RECOMMENDATION: This proposal should be "reject".
SUBSTANTIATION: I agree with Mr. Minck's comment.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
COX: I disagree with the panel action to accept this public comment. The submitter relies on information in a statement associated with a negative vote on Proposal 1-5. That negative statement includes a reference to this section as being "historic" and that it provides clarity involving those persons attempting to the use the rules of the NEC. It further states: "The clarity provided for users of the code in this section far outweigh any negative ramifications involving misdirected opposition to any specific proposal." In over 30 years of observing the code making process, the application of the design clause of 90.1(C) has been used almost exclusively to oppose the acceptance of a rule within the code, even though it involved safety. One only has to check the 2001 ROP and earlier ROPs and ROCs to verify this. The wording originally adopted for the 1937 NEC did not support its use to oppose individual proposed changes in the code and neither does the present wording. The 1937 wording was: "This code is to be regarded neither as a design specification nor an instruction manual for untrained persons." That wording cautions people that they should not think of the code as a design specification. It is interesting to note that the reference is to the code as the complete document and not to individual rules. As an emphasis on the acceptability of design as part of the NEC, the 1937 code added a title to Chapter 2 that read: "Wiring Design and Protection." Since provisions in Chapter 2 are predominately design, it can be readily pointed out that the authors of the design provision in the 1937 code did not have any intent of applying the rule to parts of the code or to proposed changes.

The wording indicating that the code is not intended as a design specification may have had some validity for the 1937 NEC and several issues following it. The 1937 code included a statement in the same paragraph as the design specification provision that read: "The requirements of this code constitute a minimum standard." With the statement that the code is a "minimum standard", it may have been considered necessary to the code developers that another statement be included to clarify that even though the code was a minimum standard, it should not be considered as a design specification to prohibit designers from using anything other than the minimum set of rules. The last sentence of the paragraph supports this position because it emphasizes that one may have to do more than the Code requires to have good service. The paragraph in question in the 1937 code reads: "The requirements of this code constitute a minimum standard. Compliance therewith and proper maintenance will result in an installation reasonably free from hazard but not necessarily efficient or convenient. This code is to be regarded neither as a design specification nor an instruction manual for untrained persons. Good service and satisfactory results will often require larger sizes of wire, more branch circuits, and better types of equipment than the minimum which is here specified." The wording regarding "minimum standard" was deleted during the 1971 code revision cycle.

The negative statement also includes: "The present wording provides all Code Making Panels with a much needed and desired reference in dealing with design proposals to the NEC." This is a significant point in this issue. Section 90.1(C) is not a basis for rejecting a proposal. This section did not prohibit the adoption of safety rules with design specifications in the 1937 code and still does not today, even with the revised wording. Regardless of how many rules in the code includes design criteria, it is still a safety code and not a design specification. In order for the NEC to be considered as a design specification, Section 90-1(A) and (B) will have to be changed to identify the NEC for that purpose or other steps taken that eliminated the present purpose of the "practical safeguarding of persons and property from the hazards arising from the use of electricity." Code proposals and public comments should be considered on their merits as to whether or not they are applicable for the NEC. Section 90.1(C) has no role in that consideration. It applies only to the code as a whole and the intent of the total document.

The negative statement references the intent of the code as an instruction manual for untrained persons, and includes the wording: "All NEC Code Making Panels depend on this second declaration in 90.1(C) to make clear that the many technical terms and technical requirements incorporated into the code's language are not directed at persons not trained in the ability to understand such language and provisions." Section 90.1(C) does not prohibit an untrained person from using the Code nor does it identify the type of training needed or the level of knowledge and experience to be achieved before one is considered as "trained". Specific sections in the Code include rules covering "qualified" persons, but

90.1(C) does not affect how those sections are applied and those rules have no bearing on the application of 90.1(C). This comment should be rejected.

(Log #898)

1- 17 - (90-1(c)): Accept
SUBMITTER: John Stricklin, Mtn. Home, ID
COMMENT ON PROPOSAL NO: 1-5
RECOMMENDATION: Leave text as 1999 NEC. Do not accept this proposal.
SUBSTANTIATION: The 1940 National Electrical Code states, as well as an 1897 electrical code edition, "It is recommended that architects when drawing plans make provisions for ample electrical etc.", an INTENT of having only persons trained in electrical knowledge, design electrical installations. Let's not leave it up to untrained persons, to draw and install electrical designs. How would you like to have a shoe clerk from the local department store design the electrical installation in your house?
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
COX: I disagree with the panel action on this comment. The present wording in 90.1(C) does not prohibit an untrained person from either designing a system or using the code. While the submitter has a valid point in emphasizing that properly trained persons should design and install electrical systems, this section only addresses the intent of the code as an instruction manual for untrained persons. While several sections in the code include the term "qualified persons". Those sections generally permit a variation of a general rule where the equipment is either accessible to qualified persons or is serviced by them. It does not address the level of training and experience a designer, installer, or inspector is required to have nor does it define a "trained person". This comment should be rejected.

(Log #1007)

1- 18 - (90-1(c)): Reject
SUBMITTER: Michael P. O'Quinn, MOGO Enterprises, Inc.
COMMENT ON PROPOSAL NO: 1-5
RECOMMENDATION: Revise as follows:
"This Code is not intended as a design specification nor an instruction manual for ~~untrained~~ unqualified persons."
SUBSTANTIATION: Even though 90-1(a) declares the intent of the Code as the "practical safeguarding of persons and property ..." maintaining the statement in 90-1(c) that the Code is "...not intended as a design specification..." clarifies that the direction of the Code is towards safety and not design.
For example, past editions of the Code have dealt with the issue of harmonics by supplying FPN (fine print notes) warning the installer of possible dangers. This is because the Code is primarily concerned with safety. If the Code was a "design specification", an in-depth description of corrections would have been supplied.
The Code is also not intended to be used by persons untrained in the terminology or theory of electrical systems: the Code expects a level of expertise for understanding. Because of initial acceptance of ROP 1-178, a new definition of "qualified person", the changing of the term "untrained" to "unqualified" explains the intended audience of the Code. For example, an unqualified person has no understanding of Section 110-12, requiring "...a neat and workmanlike..." installation.
It is important to note that the Code is not designed nor intended to be a textbook.
PANEL ACTION: Reject.
PANEL STATEMENT: It is not the intent of the panel to restrict the use of this Code to qualified persons as defined in Article 100.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #1548)

1- 19 - (90-1(c)): Accept
SUBMITTER: Ravindra H. Ganatra, Alcan Cable
COMMENT ON PROPOSAL NO: 1-5
RECOMMENDATION: The panel should reject this proposal.
SUBSTANTIATION: The Code is a legislated document. As such, it is necessary to identify "what is not intended to accomplish". Typically, in the Code the permissive possibilities are not enumerated in an exhaustive list while the prohibitive possibilities are clearly identified. For a perceived misuse of existing 90.1(c) by the Panels, as suggested by the Submitter, it is not necessary to eliminate the rule that serves a purpose for the adoption and implementation of the Code. Lack of this clarification could prevent listings or approvals of products and installations that are in compliance with the Code and applicable product standards but may not be enumerated in a specific permissive list in the Code.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
COX: I disagree with the panel action to accept this comment. It is not necessary to identify what the code is not intended to accomplish nor the reference to this provision serves a purpose for the adoption and implementation of the code. There are numerous things the code is not intended to either be or to accomplish other than a design specification or an instruction manual for untrained persons. It is not clear how the deletion of 90.1(C) could prevent listings or approvals of products and installations. Section 90.1(C) has no bearing on how the code is either interpreted or applied or how products are evaluated. This comment should be rejected.

(Log #1622)

1- 20 - (90-1(c)): Accept in Part
SUBMITTER: Gilbert L. Thompson, MEIA Codes and Standards
COMMENT ON PROPOSAL NO: 1-5
RECOMMENDATION: We think this proposal should be rejected. We agreed with Mr. Dini and especially with the remarks of Mr. Minick in the negative voting. Change 90-1(c) to read like the 1937 NEC which said "the code is to be regarded neither as a design specification nor as an instruction manual for untrained persons". This wording would answer both the affirmative and negative panel votes.
SUBSTANTIATION: A change back to the old language would let proposals and installations methods be submitted for safety reasons and then be judged on their own merit since the stated intention would be clear that the code is not a design specification manual. Also, we feel that everyone "in the trade" knows that the NEC is not an instruction manual for untrained persons. However, when lawyers, judges, builders and other "outside" persons read sections of the code and suddenly become experts, it helps to refer them to this section of the code especially since proposals 1-6 and 1-7 (90-1(d) (new) have been approved if accepted.
PANEL ACTION: Accept in Part.
PANEL STATEMENT: The panel accepts the recommendation to reject the proposal. The panel concludes the present wording of the 1999 NEC is clear, concise and correct and therefore rejects the proposed wording change.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
COX: I disagree with the panel action to accept this comment in part. The present wording is definitely not understood the same by users of the code. The 1937 wording recommended by the submitter is more appropriate than the present wording. The 1937 wording focuses only on how people are to regard the code whereas the present language redirects it to what the code is intended to do or be. There is a significant difference between those two versions. While the proposed change does have a different meaning, there is no assurance that the 1937 language will solve the problem stated in the substantiation for Proposal 1-5. This comment should be rejected. See my Explanation of negative vote on Comments 1-16 and 1-21.

(Log #2002)

1- 21 - (90-1(c)): Accept
SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc.
COMMENT ON PROPOSAL NO: 1-5
RECOMMENDATION: The proposal should be rejected.
SUBSTANTIATION: This section says, in elegant simplicity, that the Code "is not intended as a design specification nor an instruction manual for untrained persons." This is one of the bedrock principles that provide the Code's public legitimacy. Usually we ask both proposal submitters and code making panels to cite a safety problem before changing the Code. This proposal virtually proclaims the opposite. Either the provisions in the NEC are solely founded in safety, or its provisions are something akin to a collective bargaining agreement where the industry seizes whatever economic advantage it can.

The proposal submitter asserts that: "There have been occasions where the wording in Section 90-1(c) has been used to oppose the addition of Code rules because they included requirements involving design criteria even though the objective of those rules was safety." Many rules are included in the Code that are design in nature but still fall within the "practical safeguarding of persons and property from hazards arising from the use of electricity."

This substantiation does not bear close examination. Some questions of electrical layout are indeed fair game for regulation as safety-related. As such they are utterly unaffected by this provision since the present Code wording (quoted accurately in the substantiation) already say the Code covers these topics. The real target of the proposal is those proposals questionably related to safety. Removing this subsection makes it that much easier to get non-safety issues slipped into the Code, and then to masquerade them behind the rubric of safety-related design. I don't doubt the sincerity of the proposal submitter, who certainly doesn't intend such an outcome, but that will be the result over time.

For 63 years (since the 1937 NEC) this provision has stated, without significant change, that the NEC is not intended as a design specification. As the proposal submitter noted, some of us, including this author, routinely subject code making panels to withering public criticism when they step off the reservation. We do it for good reason. It is difficult enough to produce a Code that is technically correct and coherent without going beyond the parameters of fire, electrocution, and explosion hazards caused by the use of electricity, and this rule has been a meaningful deterrent to Code Making Panels seeking to expand their role. Electricity is electricity. What compelling safety issue arises at this time, and requires this solution, that wasn't equally the case in 1937 and all the years since?

Properly enforced, the present language represents the moral basis under which the Code retains its public legitimacy. Codes and standards are under constant scrutiny, as indeed they should be, for hidden benefits that inure to the benefit of the special interests that inevitably draw them up. Nothing in our system of government enthrones the National Electrical Code Committee. The building officials or other public authorities will view any shift in the direction toward design inclusion in the NEC as proof that the electrical industry cannot be trusted with the Code. However well-intentioned, this proposal will only confirm their worst suspicions.

Key to this discussion is how to properly apply the word "design." We need to look at the term not as it could be defined in a dictionary, but as it has been used for generations of Code practice. If design were simply to mean electrical layout, then almost the entire Code would be design, since the NEC by its very nature is and must be prescriptive. Therefore, such a definition makes the term meaningless in this discussion. On the contrary, design in the Code sense means layout that serves an engineering objective relative to the utility of the installation, over and above minimum safety. That domain is clearly stated as beyond the reach of the Code in Section 90-1(b). Design in this context is the engineering that makes the completed installation "efficient, convenient, [and] adequate for good service [and] future expansion of electrical use."

Any revisions to this section should await genuine substantiation based on a real safety problem. In the meantime, both the technical merit and the moral authority of the Code are strengthened by a routine and rigorous application of the existing text. To monkey with provisions in this, the very first section in the Code, provisions that stood unchanged and unchallenged over sixty years, will inevitably further encourage the building officials in their forthcoming efforts to persuade public officials to adopt their version of a competing electrical code.

Three years ago Code-Making Panel 1 started down this route, initially accepting a similarly motivated, albeit slightly less radical, proposal. During the Public Comment period, Code-Making Panel 1 grumbled but reversed its position. That's what makes this action even more inexplicable, although there are many new members of Code-Making Panel 1 this time out. The outcome should be the same.
PANEL ACTION: Accept.
PANEL STATEMENT: The panel does not necessarily agree with all of the submitters substantiation.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NEGATIVE: 1
EXPLANATION OF NEGATIVE:

COX: I disagree with the panel action to accept this comment. Many rules in the NEC include design criteria. Where this section is used to prohibit new products or installation provisions that could result in safe installations, it does constitute a safety issue. When the wording upon which the 90.1(C) text involving design was adopted in the 1937 NEC, Chapter 2 of that same edition was entitled: "Wiring Design and Protection". That action logically associates design with the code where the design provision is within the scope of "the practical safeguarding of persons and property". If the text in 90.1(C) is interpreted as prohibiting rules that contain design from being included in the code, that includes all types of design. The removal of the text in 90.1(C) eliminates misunderstanding as to whether or not design criteria is permitted in the code and relies on the wording in 90-1(A) and (B) to limit any design provision to that which relates to safety. The design provision in 90.1(C) had more impact on the code until the wording: "The provisions of this code constitute a minimum standard" was deleted in the 1971 NEC. While that wording was in the code, the original text involving design could have been used to protect designers from being forced to use the "minimum standard" rules when they intended to design an even safer system than the code required.

The submitter of this comment references the proper enforcement. It is not clear how an enforcing agency can enforce 90.1(C). Many jurisdictions have licensing, certification, and registration laws for people who perform electrical work within their jurisdiction. Those laws are used to ensure that qualified people perform electrical work, but 90.1(C) plays no part in that administration. Using the code to train people is generally supported by inspection jurisdictions. It would be highly unlikely that a jurisdiction that adopts the NEC as its electrical code would prohibit those who it considered as untrained from being taught from the code. In the same fashion, jurisdictions generally expect electrical installations to be designed according to the NEC even though the NEC is not to be considered as a design specification. Nothing in the wording of 90.1(C) prohibits design requirements from being included in the code. Nothing in the wording in 90.1(C) prohibits an untrained person from using the code. This comment should be rejected.

If Code Making Panel 1 concludes that 90.1(C) should remain in the code, it should clarify exactly what the provision means and how it applies. The panel should either make it clear that 90.1(C) permits the adoption of safety associated design criteria in the code or it should take the position that it does provide grounds for rejecting such proposed rules. The present wording is both misunderstood and misapplied. Proposal 1-5 should be accepted.

(Log #2222)

1- 22 - (90-1(c)): Accept
SUBMITTER: Robert H. Keis, Dover, DE
COMMENT ON PROPOSAL NO: 1-5
RECOMMENDATION: This proposal should be rejected.
SUBSTANTIATION: The proposer's statement that there is no need to identify what the code is not intended to accomplish is incorrect. Hundreds of times in 30 years of inspection I have been asked by electricians and engineers alike why the code doesn't tell them how to do their job. The code tells them what is required, but not how to accomplish the requirement. This also applies to why the code is not an instruction manual for untrained persons. There are many "intents" in the code, and code training is necessary to use the code properly. Even as I read this ROP I find statements such as "the panel's intent is...".

Please give some consideration to the negative votes by some of the panel members. Even Panel 2 used this section for a reference on Proposal 2-267 (Log #2892).

We need this section in the NEC.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13

VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
COX: I disagree with the panel action to accept this comment. The existing language in 90.1(C) does not prohibit the NEC from containing installation information to aid the designer or electrician in his or her job as long as it falls within the purpose of the code as described in 90-1(A), "...the practical safeguarding of persons and property from hazards arising from the use of electricity." While installation information of this type is usually found in other documents and not needed in the NEC, neither 90.1(A), (B), or (C) prohibits it from being included in the code. This comment should be rejected. See my explanation of negative vote on Comment 12-21.

(Log #1642)

1- 23 - (90-1(d)): Reject
SUBMITTER: Andy Scott, National Cable Television Association
COMMENT ON PROPOSAL NO: 1-8
RECOMMENDATION: Accept Proposal 1-8.
SUBSTANTIATION: NCTA, on behalf of the cable television industry, strongly urges Panel 1 to accept this proposal. The code currently contains no statement regarding its retroactivity, leaving the interpretation of this important matter to users and enforcers of the code. This has led to confusion regarding the application of new requirements, non-uniform enforcement by authorities having jurisdiction, and local unauthorized interpretations regarding retroactivity. This proposal attempts to provide guidance to both users and enforcers of the code regarding its application situations where existing facilities, equipment, structures, or installations are being modified, but much of the existing installation remains untouched.
PANEL ACTION: Reject.
PANEL STATEMENT: No additional technical substantiation has been provided for this proposed change. The panel reaffirms its original voting statement on Proposal 1-8. See also Proposal 1-3 for further information on retroactivity.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #2178)

1- 24 - (90-1(d)): Accept
SUBMITTER: Donald R. Cook, Shelby County Building Inspections
COMMENT ON PROPOSAL NO: 1-8
RECOMMENDATION: I agree with the panel action to reject the proposal.
SUBSTANTIATION: This wording would make the authority having jurisdiction's job more difficult in areas where the NEC was first adopted and enforced in recent years. Existing facilities where no enforcement of minimum standards sometimes need significant changes. The authority having jurisdiction must make judgment decisions and 90-4 currently gives the AHJ authority to enforce minimum requirements for safe facilities. This wording would complicate the already difficult task. Continue to reject the proposal.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #2003)

1- 25 - (90-1(d), FPN): Accept
SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc.
COMMENT ON PROPOSAL NO: 1-6
RECOMMENDATION: In the FPN, change "above" to "these".
SUBSTANTIATION: Corrects a violation of Section 3.3.4 of the Style Manual.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #CC100)

1- 26a - (90-2): Accept
SUBMITTER: CMP 1
COMMENT ON PROPOSAL NO: 1-10
RECOMMENDATION: Revise the wording previously accepted in Proposal 1-10 as follows:
90-2(a) Covered. This Code covers the installation of electric conductors, electric equipment, signaling and communications conductors and equipment, and fiber optic cables and raceways for the following:
1. Public and private premises including buildings, structures, mobile homes, recreational vehicles, and floating buildings.
2. Yards, lots, parking lots, carnivals, and industrial substations.
3. Installations of conductors and equipment that connect to the supply of electricity.
4. Installations used by the electric utility, such as office buildings, warehouses, garages, machine shops, and recreational buildings that are not an integral part of a generating plant, substation, or control center.
FPN: For additional information concerning such installations in an industrial or multibuilding complex, see the National Electrical Safety Code, ANSI C2-1997.
90-2(b)(5). Installations under the exclusive control of an electric utility where such installations
1. consist of ~~wiring for~~ service drops or service laterals, and associated metering; or
2. are located in legally established easements, ~~or~~ right-of-ways, or by other agreements either designated by or recognized by public service commissions, utility commissions or other regulatory agencies having jurisdiction for such installations; or
3. are on property owned or leased by the electric utility for the purpose of communications, metering, generation, control, transformation, transmission, or distribution of electric energy.
SUBSTANTIATION: The panel concludes that the amended wording adds more clarity as to the installations covered and not covered as stipulated in Section 90-2. The term "associated metering" was added to clarify that metering equipment associated with service drops and laterals is not covered by the Code. The wording added to identify access by easements, right-of-ways or by other agreements associated with the authority of public service commissions, utility commissions, or other regulatory agencies having jurisdiction is to clarify that those agencies generally have authority over those types of installations and establish the rules under which they are governed.
It is not the intent of Code-Making Panel 1 to exclude the NEC as a controlling installation document fully capable of being utilized for electrical installations in most cases. Section 90-2(b) likewise does not contain areas where portions of the NEC could not be used, but rather this section lists specific areas whereby the nature of the installation requires specialized rules or where the use of other controlling installation rules, standards, and guidelines have been specifically developed for these uses and industries. Among these industries is the electrical utility industry, which utilizes the NESC as its primary guideline in the generation, transmission, distribution, and metering of electrical energy. The utility industry's right to produce and distribute electrical energy using NESC rules or whether this industry should be prohibited or excluded from installing any type of lighting has never been an NEC issue.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
IVORY: I support the proposal and comments as suggest in Comment 1-27-902. The proposed text does not add clarity, is not easily enforceable, and certainly a step in the wrong direction. However, I support the original language from the 1998 ROP, Proposal 1-13 and Comment 1-18a which now appears as the new Proposal 1-10 in the 2001 NEC ROP. This original language is a step in the right direction, and is easily understood and enforceable. Also, the original language clarifies the issue of parking lot lighting, which is the heart of the problem.
COMMENT ON AFFIRMATIVE:
TROGLIA: I am voting affirmative on the panel recommendation on this comment as I feel the panel has adequately addressed the concerns expressed in my negative vote on Proposal 1-10. I believe the substantiation developed for this comment will be of help in understanding the appropriate application of the NEC and NESC requirements. However, I remain convinced that the NEC and NESC defined "Service Point" as proposed in Proposal 1-11 would better define the demarcation between facilities covered by the two

codes and its use would codify what is essentially present practice in most jurisdictions.

(Log #1623)

1- 26 - (90-2): Accept in Principle
SUBMITTER: Gilbert L. Thompson, MEIA Codes and Standards
COMMENT ON PROPOSAL NO: 1-10
RECOMMENDATION: This proposal should be accepted as revised and submitted by code-making panel 1.
SUBSTANTIATION: The code making panel's comments should help to clarify their intent that only wiring under the exclusive control of an electric utility for the purpose of communications, metering, generation, control, transformation, transmission, or distribution of electrical energy is not covered by the NEC. This should help answer 72 other proposals on this subject and provide the guidance necessary when deregulation of electrical energy takes place nationwide.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: The revised wording provides a better understanding of the installations covered and not covered and focuses on those agencies primarily responsible for making the necessary determination of how the rules are applied on a local level.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #1887)

1- 27 - (90-2): Reject
SUBMITTER: Michael I. Callanan, International Brotherhood of Electrical Workers
COMMENT ON PROPOSAL NO: 1-10
RECOMMENDATION: Reject this proposal.
SUBSTANTIATION: The IBEW can not support this change. The proposed text does not add clarity, is not easily enforceable, and certainly a step in the wrong direction. However, the IBEW does support the original language from the 1998 ROP, Proposal 1-13 and Comment 1-18a which now appears as the new proposal 1-10 in the 2001 NEC ROP. This original language is a step in the right direction, and is easily understood and enforceable. Also, the original language clarifies the issue of parking lot lighting, which is the heart of the problem.

This comment represents the official position of the International Brotherhood of Electrical Workers Codes & Standards Committee.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel concludes that the revised wording in Comment 1-26a is more appropriate and that the original wording in Proposal 1-10 could be interpreted as excluding some transmission and distribution lines from crossing private property even though they are clearly in a utility easement or right-of-way. CMP 1 reaffirms that parking lot lighting is covered by the NEC as described in Section 90-2(a).
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
COMMENT ON AFFIRMATIVE:
IVORY: See my explanation of negative vote on Comment 1-26a.

(Log #2004)

1- 28 - (90-2): Reject
SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc.
COMMENT ON PROPOSAL NO: 1-11
RECOMMENDATION: Accept the proposal in principle. Meld the substance of the proposal with the editorial structure of Proposal 1-10, as follows:

Amend 90-2 as follows:

90.2. Scope. The Code covers the installation of electric conductors, electric equipment, signalling and communications conductors and equipment, and fiber optic cables and raceways as covered in 90-2(a) subject to the exclusions in 90.2(b).

(A) Covered. This code covers the following:
(1) Buildings and Structures. Premises wiring in or on buildings and structures, both public and private, including mobile and manufactured homes, recreational vehicles, and floating buildings.
(2) Outside Wiring. Premises wiring in yards, lots, parking lots, carnivals, industrial substations, and other outside conductors and equipment.
FPN: For additional information concerning such installations in an industrial or multibuilding complex, see the National Electrical Safety Code, ANSI C2-1997.
(3) Connected to Electric Supply. Conductors and equipment that connect to the supply of electricity.
(4) Electric Utility Business and Accessory Uses. Installations used by an electric utility, such as office buildings, warehouses, garages, machine shops, and recreational buildings, which are not an integral part of a generating plant, substation, or control center.

(B) Not Covered. This Code does not cover the following:
(1) Self-Propelled Vehicles. [no change to existing text; FPN remains]
(2) Mines [no change to existing text]
(3) Railways. [no change to existing text]
(4) Communications [no change to existing text]
(5) Public Access Restricted. Installations on the supply side of the service point, and used for the purpose of communications, metering, generation, control, transformation, transmission, distribution, or utilization of electric energy provided both of the following conditions are met:
(a) Control. The installation is exclusively operated, maintained, and controlled on a continuing basis by electric utilities, or by entities recognized by the jurisdiction as having substantially equivalent organizational permanence, engineering supervision, and workforce training.
(b) Location. The installation is located in buildings or in outdoor locations owned or leased by the electric utility or equivalent entity and used exclusively for such purposes, or on or along public highways, street, roads, etc., or outdoors on private property by publicly recorded rights.

(C) Special Permission. [no change to existing text].
SUBSTANTIATION: This comment is more modest editorially than the original proposal, building on Code-Making Panel 1's work under Proposal 1-10. It includes constructive editorial changes that provide paragraph titles and also appropriate parent language in 90-2 that frames the relationship between the first two subsections following. The most important substantive change from the present NEC is contained in the revisions to Section 90-2(b)(5). Much of this substantiation unavoidably reiterates that submitted with the original proposal. It needs to be reconsidered in light of the Style Manual command that the NEC must be in a form suitable for mandatory adoption by the various jurisdictions. Every jurisdiction effectively defines, through some regulatory process, the service point. If that were not the case, there would be endless controversy and lawsuits over licensure, qualifications, insurance coverage, OSHA regulations, and a dozen other areas I haven't bothered to list. Its location may occasion controversy, but its existence is incontrovertible.

The most jurisdictional-friendly way to assure NEC adoption without amendment of Article 90, therefore, is to write it in a way that directly interfaces with the service point concept. Unfortunately, the substantive action on Proposal 1-10 guarantees that every single adopting jurisdiction will need at least one NEC amendment, unless they are willing to force the electric utilities out of existing tariffs and work practices that have continued under the NESC since its inception, albeit at variance from the NEC. There being no loss experience to support such an action, it simply will not occur. When a panel action guarantees that no known jurisdiction can adopt or enforce such a key provision without major amendment, either by direct action or in effect by ignoring its terms, that action fails Section 1.3 of the Style Manual.

As proposed in this comment, Section 90.2(B)(5) holds the key to finally end approximately seventy years of conflict and overlapping jurisdictional boundaries between the NESC and the NEC. Unless we focus on these concepts we miss the premises that underlies the NESC. If we look at NESC requirements outside this context, we inevitably see a free lunch for utilities and an unacceptable diminution of safety. Such a view is unfair, and intellectually dishonest. The NESC trades off reductions in installation requirements for increases in supervision by virtue of its intended audience.

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

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

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

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

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

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

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

A companion comment on Proposal 1-185 redefines service point accordingly. ("The point of connection between the premises wiring and the facilities of a serving entity recognized by the jurisdiction as having substantially equivalent organizational permanence, engineering supervision, and workforce training.") This comment also incorporates the suggestion in the affirmative comment in the voting, although with greater economy of wording ("publicly recorded rights") to assure appropriate formality (through recordings in county deed registries, etc.) in dealing with easements.

The service point redefinition (see companion comment) allows the reapplication of Article 230 to the interior of these industrial facilities (Code-Making Panel 1 already deleted the phrase "of utility conductors" from the premises wiring definition, per Proposal 1-176). The result would be a Code that tells it as it is. There are large industrial campuses using the NESC for major elements of their outdoor distribution systems. The NEC would otherwise claim these under Article 225. I am a well-bruised but still standing veteran of the battle to include manholes in the NEC, and that effort only succeeded after my panel allowed the DuPonts of the world to continue using the NESC for their outdoor distributions. I frequently represent electrical viewpoints to legislative leaders and committees. Anyone who thinks they're going to fiddle with Section 90-2 and end up forcing these major employers to revamp their campuses so as to become the sole province of conventional electrical trade licensure needs to meet some of the people I deal with in this process.

To accept this proposal would demonstrate to political authorities a level of sophistication and maturity unusual in a self-regulated industry. It is squarely rooted in safety and not market share. It removes from our table all competitive issues, because the NEC only gets mud on its face when it tries to influence them. The NEC Committee must face up to the fact that just because some area of electrical work is covered by the NEC, it does not follow that conventional electricians will wire it. The plethora of allowances for homeowner wiring should prove that point beyond any doubt.

There's no question that some utilities have abused their rate base revenue to compete with electrical contractors. However, in terms of electrical distribution, their activities constitute a natural monopoly, and natural monopolies are always subject to state regulation. That's where those battles must be fought. If a utility uses its rate base to unfairly compete with electrical contractors in the performance of premises wiring, such practices are morally reprehensible and deserve to be prohibited by regulatory authorities as contrary to sound public policy. However, what is sauce for the goose is sauce for the gander. The NEC can claim public area and roadway lighting for years to come, but the identity of those performing this work, and the standards to which they work, will be decided by the same authorities we would ask to prohibit unfair utility competition in premises wiring.

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

The present Section 90-2 isn't great, but it has just enough ambiguity that it does not require local amendment to accommodate historic utility practice. As such, it should not be changed without far more careful consideration of how the NEC interfaces with regulatory structures in place for generations in the United States and other countries which we hope will adopt this Code. The only point of common reference, connecting all these disparate applications throughout a global economy, is the service point concept. If Code-Making Panel 1 is unwilling to embrace it, then it should leave well enough alone.

PANEL ACTION: Reject.

PANEL STATEMENT: The panel does not fundamentally agree with the submitter's substantiation. The term "service point" as pointed out by the submitter in the substantiation has been and continues to be a moving target. The issues involved in what can and what cannot be covered by the NEC is not a who has a right to do the work issue involving utilities, contractors, or other such entities. That issue is a local, regional, or state issue involving qualifications of an installer. This issue is really one of if the NEC is an adequate prescriptive code by which electrical installations, including street lighting and site lighting, may be safely accomplished. The panel is of the opinion that the NEC is adequate for all such purposes. The issues involved here also do not include any assumptions that following NEC requirements is safer than following NESC requirements as installations under either code that are carried out within the context of the overall rules and installations guidelines of each code are expected to produce a safe installation and this would specifically include, in this case, street or site lighting installations.

It is not the intent of Code-Making Panel 1 to exclude the NEC as a controlling installation document fully capable of being utilized for electrical installations in most cases. Section 90-2(b) likewise does not contain areas where portions of the NEC could not be used, but rather this section lists specific areas whereby the nature of the installation requires specialized rules or where the use of other controlling installation rules, standards, and guidelines have been specifically developed for these uses and industries. Among these industries is the electrical utility industry, which utilizes the NESC as its primary guideline in the generation, transmission, distribution, and metering of electrical energy. The utility industry's right to produce and distribute electrical energy using NESC rules or whether this industry should be prohibited or excluded from installing any type of lighting has never been an NEC issue. See Comment 1-26a.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13

VOTE ON PANEL ACTION:

AFFIRMATIVE: 13

COMMENT ON AFFIRMATIVE:

TROGLIA: I agree with Proposal 1-11, however, I believe the panel recommendation and substantiation on Comment 1-26a adequately addresses the issue. See my comment on vote on Comment 1-26a.

(Log #1141)

1- 29 - (90-2(a)): Accept in Principle

SUBMITTER: James E. Brunssen, Telcordia Technologies, Inc.

COMMENT ON PROPOSAL NO: 1-81

RECOMMENDATION: This comment is intended to affirm the panel action on Proposal 1-81, and the corresponding panel action on Proposal 1-10. In addition, the panel is encouraged to make no further revisions to 90-2(a) that might detract from the intent of Technical Correlating Committee Task Group Proposal 1-81.

SUBSTANTIATION: A Technical Correlating Committee Task Group was formed to address concerns expressed in the previous code cycle that because of the independence of Chapter 8 from the

other sections of the NEC, there exists a perception that installations of communications conductors and equipment are not subject to electrical inspection by the Authority Having Jurisdiction. This misperception, addressed by the Technical Correlating Committee Task Group in Proposal 1-81 and Accepted in Principle by Panel 1, has been adequately addressed by the panel action on Proposal 1-10 and proposed rewrite of 90-2(a) to address both the Technical Correlating Committee Task Group concerns and the "parking lot lighting issue". Care should be exercised by the panel in responding to public comments that the intent of the Technical Correlating Committee Task Group as contained in Proposal 1-81 is not lost in any subsequent revisions to 90-2(a). That intent is to convey to the NEC user that although Chapter 8 is independent of the rest of the NEC, installations of communications conductors and equipment are covered by the NEC and are subject to electrical inspection (with the exception of situations identified in 90-2(b)).
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: The panel understands the submitter to be recommending that CMP-1 reaffirm its action to add a new 90-2(a)(6). This action is in addition to that taken on Comment 1-26a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #1142)

1- 30 - (90-2(a)): Accept in Principle
SUBMITTER: James E. Brunssen, Telcordia Technologies, Inc.
COMMENT ON PROPOSAL NO: 1-10
RECOMMENDATION: This comment is intended to affirm the panel action on Proposal 1-10, and the corresponding panel action on Proposal 1-81. In addition, the panel is encouraged to make no further revisions to 90-2(a) that might detract from the intent of TCC task group Proposal 1-81.
SUBSTANTIATION: A Technical Correlating Committee Task Group was formed to address concerns expressed in the previous code cycle that because of the independence of Chapter 8 from the other sections of the NEC, there exists a perception that installations of communications conductors and equipment are not subject to electrical inspection by the Authority Having Jurisdiction. This misperception, addressed by the Technical Correlating Committee Task Group in Proposal 1-81 and Accepted in Principle by Panel 1, has been adequately addressed by the panel action on Proposal 1-10 and proposed rewrite of 90-2(a) to address both the Technical Correlating Committee Task Group concerns and the "parking lot lighting issue". Care should be exercised by the panel in responding to public comments that the intent of the Technical Correlating Committee Task Group as contained in Proposal 1-81 is not lost in any subsequent revisions to 90-2(a). That intent is to convey to the NEC user that although Chapter 8 is independent of the rest of the NEC, installations of communications conductors and equipment are covered by the NEC and are subject to electrical inspection (with the exception of situations identified in 90-2(b)).
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: The panel understands the submitter to be recommending that CMP-1 reaffirm its action to add a new 90-2(a)(6). This action is in addition to that taken on Comment 1-26a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #1348)

1- 31 - (90-2(a) &(b)): Reject
SUBMITTER: David P. Brown, Baltimore Gas and Electric Co/EEI
COMMENT ON PROPOSAL NO: 1-10
RECOMMENDATION: This proposal should be rejected and proposal 1-11 should be accepted
SUBSTANTIATION: The Panel's interpretation of the revised text of Section 90-2(b)(5) is in conflict with the scope of the National Electrical Safety Code (NESC). The NESC has always covered installations of electric utilities that are under their exclusive control and on the supply side of the service point of a premises wiring system. This includes lighting installations directly connected to their distribution systems. Utility regulatory commissions, under statutory authority, generally adopt and enforce the requirements of the NESC as they apply to utility installations within their jurisdiction. These commissions recognize street and parking lot lighting covered by the NESC as utility functions. They generally do not have regulatory authority over utility installations that are a part of a premises wiring system. These installations are generally covered by the requirements of the National Electrical Code (NEC) and are enforced by the Authority Having Jurisdiction (AHJ) referenced therein. The AHJ cannot enforce the proposed 2002 NEC as interpreted by the Panel without usurping the statutory authority of the utility regulatory commission. This conflict will have to be resolved in each and every jurisdiction adopting the 2002 NEC. This does not facilitate the NFPA stated objective of developing a code that is uniformly and readily adoptable by the jurisdiction without change. It also creates a conflict between documents both recognized as ANSI standards contrary to ANSI requirement for no conflict within its adopted standards. Acceptance of proposal 1-11 resolves the conflict between the documents by clearly establishing the defined Service Point as the point of NEC/NESC interface and facilitates the adoption of both documents without change.

The Panel's interpretation of the revised text indicates that a parking lot light on an existing utility pole that supports other distribution facilities is not covered by the NEC, however an extension from that pole to another pole and light on the lot under the exclusive control of the utility would be covered. This makes absolutely no sense and is without justification.

In addition, the Panel has presented no evidence that the existence of a recorded easement has any bearing on the safety of the installation. In our opinion, the NEC was never intended to dictate land use requirements. An easement is a mandated land use requirement. No justification has been presented for a requirement that a utility installation on private property, made solely for the supply of service to that property, needs to be covered by an easement to be considered as not covered by the NEC. An easement for utility facilities on private property assures the utility can meet its obligation to supply all of its customers served through those facilities. No such assurance is generally needed from a property owner for facilities installed on and serving only that property. Also the proposed text would require an easement for a residential electrical meter that has always been considered as not covered by the NEC.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel Comment 1-26a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
COMMENT ON AFFIRMATIVE:
TROGLIA: I agree with Proposal 1-11, however, I believe the panel recommendation and substantiation on Comment 1-26a adequately addresses the issue. See my comment on vote on Comment 1-26a.

(Log #1349)

1- 32 - (90-2(a)& (b)): Reject
SUBMITTER: David P. Brown, Baltimore Gas and Electric Co/EEI
COMMENT ON PROPOSAL NO: 1-11
RECOMMENDATION: This proposal should be accepted as submitted and Proposal 1-10 should be rejected.
SUBSTANTIATION: It is clear and reconciles the scopes of the NEC and NESC, facilitates their uniform adoption and enforcement without change, and eliminates the conflict created by the Panel's interpretation of proposal 1-10. By establishing the NEC defined Service Point as the NEC/NESC interface, what is essentially present practice in most jurisdictions would be codified. See my comment on proposal 1-10.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel does not agree that a conflict is created between the NEC and NESC by Proposal 1-10 or the revised language in Comment 1-26a. Also, see panel action and statement on Comment 1-28.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
COMMENT ON AFFIRMATIVE:
TROGLIA: I agree with Proposal 1-11, however, I believe the panel recommendation and substantiation on Comment 1-26a adequately addresses the issue. See my comment on vote on Comment 1-26a.

(Log #1607)

1- 33 - (90-2(a)(2) and 90-2(b)(5)): Reject
SUBMITTER: Robert Molde, Xeel Energy
COMMENT ON PROPOSAL NO: 1-10
RECOMMENDATION: This proposal should be rejected.
SUBSTANTIATION: In 90-2(a)(2), the reference to yards, lots, and parking lots will still cause confusion where such lighting is provided from utility poles having other distribution or transmission lines on the pole. This also would do away with utility provided and maintained area (security) lights to farm yards in rural areas. Such farm yard security lighting has been provided for decades and has proven to be a safe, practical, and economical installation.

In 90-2(b)(5), the right for the utility to provide a service drop or lateral by easement should not be the only option. The right to be there by other established rights should be available as is now permitted.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel Comment 1-26a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
COMMENT ON AFFIRMATIVE:
TROGLIA: See my comment on vote on Comment 1-26a.

(Log #783)

1- 34 - (90-2(a)(4)): Reject
SUBMITTER: Carlos J. Diaz, MidWest Generation EME, LLC
COMMENT ON PROPOSAL NO: 1-10
RECOMMENDATION: Section 90.2(A)(4) - Revise existing wording "Installations used by the electric utility such as..." to read as follows:

"Installations used by the electric utility or commercial power generator, such as ...".
SUBSTANTIATION: As the power industry continues to evolve under deregulation, many facilities once under the term "electric utility" are being reclassified as "commercial power generators" such as Independent Power Producers (IPPs), Merchant Plants, etc. These facilities have not altered their core function of producing power. They continue to produce power under the same operating conditions and with the same equipment as before. This comment does not change the meaning or intent of this section. This comment merely clarifies the applicability of the NEC to commercial power generators, as well as, supports the NEC in being as current as possible with the changing power industry nomenclature.
PANEL ACTION: Reject.
PANEL STATEMENT: Only utilities or other regulated entities covered by the NESC are not covered by the NEC.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #884)

1- 35 - (90-2(a)(4)): Reject
SUBMITTER: Carlos J. Diaz, MidWest Generation EME, LLC
COMMENT ON PROPOSAL NO: 1-10
RECOMMENDATION: Section 90.2(A)(4) - Revise existing wording:

"Installations used by the electric utility such as ..." to read as follows:

"Installations used by the electric utility or commercial power generator, such as ....".
SUBSTANTIATION: As the power industry continues to evolve under deregulation, many facilities once under the term "electric utility" are being reclassified as "commercial power generators" such as Independent Power Producers (IPPs) Merchant Plants, etc. These facilities have not altered their core function of producing power. They continue to produce power under the same operating conditions and with the same equipment as before. This comment does not change the meaning or intent of this section. This comment merely clarifies the applicability of the NEC to commercial power generators, as well as, supports the NEC in being as current as possible with the changing power industry nomenclature.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Comment 1-34.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #2136)

1- 36 - (90-2(b)): Reject
SUBMITTER: David F. McIntyre, Niagara Mohawk Paper Corporation
COMMENT ON PROPOSAL NO: 1-10
RECOMMENDATION: We recommend the rejection of this proposal.
SUBSTANTIATION: The Mid-Atlantic Utilities Outdoor Lighting Council is opposed to the proposed change to 90-2(b). The Council is aware of Edison Electric Institute's position on this proposal and fully supports their action on Proposal 1-10.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and substantiation on Comment 1-26a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
COMMENT ON AFFIRMATIVE:
TROGLIA: See my comment on vote on Comment 1-26a.

(Log #620)

1- 37 - (90-2(b)(1)): Reject
SUBMITTER: Edward T. Cousins, Conoco Inc.
COMMENT ON PROPOSAL NO:
RECOMMENDATION: Revise as follows:

90-2(b)(1) Installations in ships, watercraft other than floating buildings, railway rolling stock, aircraft, or automotive vehicles ~~(other than mobile homes and recreational vehicles).~~
SUBSTANTIATION: The problem with the phase shown in strike - through legislative format in number 3 - above is that it: (1) is redundant, unnecessary wording since mobile homes and recreational vehicles are clearly stipulated in 90-2. (1) "Installations of electric conductors and equipment within or on public and private buildings or other structures, including mobile homes, recreational vehicles, and floating buildings"; (2) The sentence 90.2(b)(1) includes a double negative when the reader attempts to read and understand the component parts of the referenced. Section/paragraph, for example: "This code does not cover installations in ships." is quite clear and unambiguous." This code does not cover aircraft" is quite clear and unambiguous." This code does not cover automotive vehicles other than mobile homes and recreational vehicles." This sentence is awkward and unclear and may be misconstrued or interpreted by the reader as being contradictory to 90-2(a)(1). Thirdly, the phrase "automotive vehicles other than mobile homes and recreational vehicles" implies that mobile homes are a subset of automotive vehicles. While some so called "mobile homes" may have drive engines and manual guidance mechanisms most "mobile homes" are towed structures more closely linked to trailers and are often referred to as "trailer homes". The result therefore considering reasons 2 and 3 above would be lack of clarity and possible misunderstanding of the subject section/paragraph 90-2(b)(1).
PANEL ACTION: Reject.
PANEL STATEMENT: It is the understanding that the submitter is referencing Proposal 1-11. See Comment 1-26a and panel statement on Comment 1-28.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #342)

1- 38 - (90-2(b)(5)): Accept in Principle
SUBMITTER: William T. Fiske, I T S North America
COMMENT ON PROPOSAL NO: 1-10
RECOMMENDATION: As suggested by Mr. Cox in affirmative vote revise text to read as follows:

"...located in legally established easements, or right-of-ways <u>either designated by or recognized by Public Service Commissions, Utility Commissions or other regulatory agency having jurisdiction for such installations;</u> or on property owned...".
SUBSTANTIATION: As indicated by Mr. Cox, added explanation of rights of way and easements is needed to clarify the scope of the National Electrical Code.

PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel Comment 1-26a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #472)

1- 39 - (90-2(b)(5)): Accept in Principle
SUBMITTER: William T. Fiske, Intertek Testing Services
COMMENT ON PROPOSAL NO: 1-10
RECOMMENDATION: As suggested by Mr. Cox in affirmative vote, "... located in legally established easements, or right-of-ways either designated by or recognized by Public Service Commissions, Utility Commissions or other regulator agency having jurisdiction for such installations; or on property owned...".
SUBSTANTIATION: As indicated by Mr. Cox, added explanation of rights of way and easements is needed to clarify to scope of the National Electrical Code.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel Comment 1-26a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #782)

1- 40 - (90-2(b)(5)): Reject
SUBMITTER: Carlos J. Diaz, MidWest Generation EME, LLC
COMMENT ON PROPOSAL NO: 1-10
RECOMMENDATION: Section 90.2(B)(5) - Revise existing wording "leased by the electrical utility for..." to read as follows:
"leased by the electric utility or commercial power generator for...".
SUBSTANTIATION: As the power industry continues to evolve under deregulation, many facilities once under the term "electric utility" are being reclassified as "commercial power generators" such as Independent Power Producers (IPPs), Merchant Plants, etc. These facilities have not altered their core function of producing power. They continue to produce power under the same operating conditions and with the same equipment as before. This comment does not change the meaning or intent of this section. This comment merely clarifies the applicability of the NEC to commercial power generators, as well as, supports the NEC in being as current as possible with the changing power industry nomenclature.
PANEL ACTION: Reject.
PANEL STATEMENT: Only utilities or other regulated entities covered by the NESC are not covered by the NEC.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #784)

1- 41 - (90-2(b)(5)): Reject
SUBMITTER: Carlos J. Diaz, MidWest Generation EME, LLC
COMMENT ON PROPOSAL NO: 1-10
RECOMMENDATION: Section 90.2(B)5 - Revise existing wording "Installations under the exclusive control of an electric utility where..." to read as follows:
"Installations under the exclusive control of an electric utility or commercial power generator where...".
SUBSTANTIATION: As the power industry continues to evolve under deregulation, many facilities once under the term "electric utility" are being reclassified as "commercial power generators" such as Independent Power Producers (IPPs), Merchant Plants, etc. These facilities have not altered their core function of producing power. They continue to produce power under the same operating conditions and with the same equipment as before. This comment does not change the meaning or intent of this section. This comment merely clarifies the applicability of the NEC to commercial power generators, as well as, supports the NEC in being as current as possible with the changing power industry nomenclature.
PANEL ACTION: Reject.
PANEL STATEMENT: Only utilities or other regulated entities covered by the NESC are not covered by the NEC.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #885)

1- 42 - (90-2(b)(5)): Reject
SUBMITTER: Carlos J. Diaz, MidWest Generation EME, LLC
COMMENT ON PROPOSAL NO: 1-10
RECOMMENDATION: Revise existing wording "Installations under the exclusive control of an electric utility where .." to read as follows:
"Installations under the exclusive control of an electric utility or commercial power generator where...".
SUBSTANTIATION: As the power industry continues to evolve under deregulation, many facilities once under the term "electric utility" are being reclassified as "commercial power generators" such as "Independent Power Producers (IPPs), Merchant Plant, etc. These facilities have not altered their core function of producing power. They continue to produce power under the same operating conditions and with the same equipment as before. This comment does not change the meaning or intent of this section. This comment merely clarifies the applicability of the NEC to commercial power generators, as well as, supports the NEC in being as current as possible with the changing power industry nomenclature.
PANEL ACTION: Reject.
PANEL STATEMENT: Only utilities or other regulated entities covered by the NESC are not covered by the NEC.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #886)

1- 43 - (90-2(b)(5)): Reject
SUBMITTER: Carlos J. Diaz, MidWest Generation EME, LLC
COMMENT ON PROPOSAL NO: 1-10
RECOMMENDATION: Revise existing wording "leased by the electric utility for ..." to read as follows:
"leased by the electric utility or commercial power generator for...".
SUBSTANTIATION: As the power industry continues to evolve under deregulation, many facilities once under the term "electric utility" are being reclassified as "commercial power generators" such as Independent Power Producers (IPPs), Merchant Plants, etc. These facilities have not altered their core function of producing power. They continue to produce power under the same operating conditions and with the same equipment as before. This comment does not change the meaning or intent of this section. This comment merely clarifies the applicability of the NEC to commercial power generators, as well as, supports the NEC in being as current as possible with the changing power industry nomenclature.
PANEL ACTION: Reject.
PANEL STATEMENT: Only utilities or other regulated entities covered by the NESC are not covered by the NEC.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #1760)

1- 44 - (90-7, FPN): Accept
SUBMITTER: Jim Pauley, Square D Company
COMMENT ON PROPOSAL NO: 1-95
RECOMMENDATION: The panel should continue to accept the proposal.
SUBSTANTIATION: The proposal and its companion (1-315) are a badly needed next step to tie the components of the US Safety System together. See my additional comment on Proposal 1-315.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #1227)

1- 45 - (90-7, FPN No. 3): Reject
SUBMITTER: Dann Strube, Lanesville, IN
COMMENT ON PROPOSAL NO: 1-95
RECOMMENDATION: The proposal should have been rejected.
SUBSTANTIATION: This is a companion to my comment on Proposal 1-315.
A list of related UL standards is of no real use for several reasons.

1. The list is not a full list of all UL standards used to evaluate products.
2. Many other standards are used in code enforcement, i.e., NEMA, IEC, ANSI, etc.
3. With no cross-reference from Annex A to specific code sections, the list in Annex A is no less than wasted paper filling the code with useless pages.
4. To satisfy the intent of Annex A we must include the UL White Book, UL Catalog, ANSI catalog and who knows what else.
5. The users of the NEC should be expected to understand that Section 110-3(b) requires or at least implies that compliance with other standards and instruction is required.

PANEL ACTION: Reject.
PANEL STATEMENT: The information included in the proposed annex will be helpful to users of the Code. The submitter does not provide information on standards stated as not being included in the annex, but his concern may be addressed in Comment 1-182. While many standards are used in code enforcement, the proposed list of product safety standards is more frequently used by designers, installers, and inspectors. The panel disagrees with the submitter that the inclusion of this material is a waste of space and that the information stated in item (4) of his substantiation must also be included to meet the intent of the annex. The panel agrees that users of the NEC should understand that Section 110-3(b) is associated with conformance with product safety standards, but concludes that the informational list of product safety standards in the annex is valuable to those individuals.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #1392)

1- 46 - (90-7, FPN No. 3): Reject
SUBMITTER: Kari Barrett, American Chemistry Council
COMMENT ON PROPOSAL NO: 1-95
RECOMMENDATION: Delete FPN No. 3.
SUBSTANTIATION: This is a companion comment to proposal 1-315 which recommended rejection of the addition of Annex A.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Comment 1-45.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

ARTICLE 100 — DEFINITIONS

(Log #2173)

1- 47 - (100): Accept
SUBMITTER: Donald R. Cook, Shelby County Building Inspections
COMMENT ON PROPOSAL NO: 1-313
RECOMMENDATION: Code-Making Panel 14 supports the Code-Making Panel 1 action to reject the proposal to relocate the definition of "Dust-ignition proof" to Article 100 and recommends the definition be relocated in Section 500-2 of the proposed rewrite of Article 500.
SUBSTANTIATION: This term is used in Chapter 5 and the new proposed Section 500-2 applies to all sections where the term is used. The scope of Article 100 permits, but does not require definitions used in more than one Article to be located in Article 100. See panel action on Proposal 14-2a in May 2001 ROP. This comment was developed from input provided by several members of Code-Making Panel 14. The panel was not balloted.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #2190)

1- 48 - (100): Accept in Principle in Part
SUBMITTER: Mark Goodman, BP (ARCO)
COMMENT ON PROPOSAL NO: 14-4a
RECOMMENDATION: This comment is being submitted to Panel 1 in accordance with Technical Correlating Committee direction for Panel 1 consideration of Proposal and panel action for 14-4a. As an alternate to the inclusion of the definition and fine print note for the term "Identified" in Article 500, this comment recommends that the Article 100 definition of Identified be maintained with a modification of the wording of the FPN as follows:

"FPN: The determination of the suitability of equipment for a specific purpose, environment, or application can be made by several means such as:
1. equipment listing or labeling
2. evidence of equipment evaluation from a qualified testing laboratory or inspection agency concerned with product evaluation, or
3. Other evidence acceptable to the authority having jurisdiction such as a manufacturer's self-evaluation or an owner's engineering judgment.
(See definitions of Labeled and Listed)"

SUBSTANTIATION: The fine print note has been modified to provide additional guidance for several of the methods commonly used to determine suitability of equipment in both classified and unclassified locations. The fine print note is necessary to provide clarity and distinguish the differences between the defined terms "Approved", "Listed", and "Identified" as used throughout the code.
PANEL ACTION: Accept in Principle in Part.
The panel accepts in principle the FPN up to and including item No. 2.
The panel rejects item No. 3.
PANEL STATEMENT: The panel rejects item No. 3 since it is already covered in 90.4. See action and statement on Comment 1-177.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #925)

1- 49 - (100-Ampacity): Reject
SUBMITTER: John E. Conley, Stratford, CT
COMMENT ON PROPOSAL NO: 1-101
RECOMMENDATION: Accept the proposal.
SUBSTANTIATION: These comments apply, individually, and collectively, to the following proposed actions published in the ROP for the 2002 NEC.
1-101 (100-Ampacity)
6-92 (310-15(c))
6-120 (310-60(d))
6-126 (Table 310-67)
6-127 (Table 310-68)
6-128 (Table 310-69)
6-129 (Table 310-70)
6-130 (Table 310-71)
6-131 (Table 310-72)
6-132 (Table 310-73)
6-133 (Table 310-74)
6-134 (Table 310-75)
6-135 (Table 310-76)
6-136 (Table 310-77)
6-137 (Table 310-78)
6-138 (Table 310-79)
6-139 (Table 310-80)
6-140 (Table 310-81)
6-141 (Table 310-82)
6-142 (Table 310-83)
6-143 (Table 310-84)
6-144 (Table 310-85)
6-145 (Table 310-86)
6-223 (B-310-15(b)(1))
6-226 (Table B-310-1)
6-228 (B-310-15(b)(2))
6-231 (Table B-310-3)
6-232 (Table B-310-5)
6-233 (Table B-310-6)
6-234 (Table B-310-7)
6-235 (Table B-310-8)
6-236 (Table B-310-9)
6-237 (Table B-310-10)
All of these proposals should be accepted.
Individual panel comments seem to fall into three major categories: (1) 'Scientific ampacity' does not appear in the NEC; (2) The present definition is entirely satisfactory; (3) All NEC ampacities are scientific
My comments:
(1) These proposals were inspired by the panel's rejection, three years ago, for this very reason. Proposal 1-101 deals with the

definition; the others deal with introducing the term into the text where appropriate.

(2) The present definition is great; very carefully crafted. It is not wrong, but it is inadequate. It applies only for those ampacities based strictly on thermal considerations, such as those in the tables listed above. Other ampacities are based on a multiplicity of factors (see section 310-15(b) FPN) beyond the scope of the existing definition. An objective observer would certainly conclude that the present definition is not entirely satisfactory.

(3) This is a very interesting observation. It can be reasonably stated that everything in the Code is scientific, but that obscures the point that a tremendous amount of judgment often modifies pure science. That is as it should be. In this case, what I have called scientific ampacities are pure science. They are calculated using only recognized scientific principles; nothing judgmental. They spring from the field of technology and computers. Other ampacities come from the field of wisdom, and cannot be calculated scientifically.

PANEL ACTION: Reject.

PANEL STATEMENT: No technical substantiation for the change has been provided. In addition, submitter(s) substantiation item (3) would be correct only if bare wires were used. As long as different electrical insulation materials and thicknesses have different heat transfer characteristics, the scientific ampacity defined by the submitter would be different for every type of conductor.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13

VOTE ON PANEL ACTION:

AFFIRMATIVE: 13

(Log #2)

1- 50 - (100-Authority Having Jurisdiction): Accept

SUBMITTER: Technical Correlating Committee National Electrical Code

COMMENT ON PROPOSAL NO: 1-103

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

SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13

VOTE ON PANEL ACTION:

AFFIRMATIVE: 13

(Log #1129)

1- 51 - (100-Bonding Jumper, Main): Accept

SUBMITTER: Paul Dobrowsky, Holley, NY

COMMENT ON PROPOSAL NO: 1-107

RECOMMENDATION: Code-Making Panel 1 should continue to reject this proposal. This is consistent with the action taken by Code-Making Panel 5 on Proposal 5-99.

SUBSTANTIATION: The term "main bonding jumper" is presently used in other sections of Article 250 related to Services. The term "bonding jumper" is presently used for feeders and branch circuits.

This comment was developed and reviewed by a task group consisting of Paul Dobrowsky (CMP 5), David Dini (CMP 1 & CMP 5), Michael Johnston (CMP 5), Charles Mello (CMP 5), and Gregory Steinman (CMP 5). Mr. Mello voted negative on this task group comment.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13

VOTE ON PANEL ACTION:

AFFIRMATIVE: 13

(Log #1977)

1- 52 - (100-Bonding Jumper, Main): Reject

SUBMITTER: Charles Mello, Milwaukie, OR

COMMENT ON PROPOSAL NO: 1-107

RECOMMENDATION: Revise the definition of "Bonding Jumper, Main" as follows:

Bonding Jumper, Main. The ~~connection between~~ conductor used to connect the grounded circuit conductor and the equipment grounding conductor at the service equipment, at each building or structure where supplied from a common service, or at the source of a separately derived system.

SUBSTANTIATION: The original proposal was correct in its substantiation when it pointed out that limiting this definition and forcing the creation on another term causes confusion and makes the Code less user friendly. The first sentence of Section 250.30(a)(1) states: "A bonding jumper in compliance with Sections 250-28(a) through (d), that is sized for the derived phase conductors," is to be installed. Note that Section 250-28 is the section for sizing the Main Bonding Jumper and it is not for the service but is specifically for a separately derived system. This section then specifically defines the sizing to be based on the derived phase conductors to be used in place of the "service entrance conductors" which is done at the service. Also, note that the product standards for panelboards, switchboards and other equipment that may be supplied with a bonding jumper, to connect the grounded circuit conductor and the equipment grounding conductors and enclosure, require this item to be labeled as a "Main Bonding Jumper".

The panel statement shows some of the confusion that exists when it stated the reason to maintain this difference was to "... ensure the specific identification of the connection between grounded feeder and branch grounding conductors and the grounded service conductor at the service." Branch grounding conductors by definition are something going to a grounding electrode which is not even part of this issue. Other than a possible historical reference, there is no technical reason to not identify the conductor that connects the grounded system conductor to the equipment grounding conductors and in many cases the grounding electrode conductor as the "main bonding jumper" without regard to if that system point is at a service, at a second building or structure served by a common service, or at a separately derived system.

Using the term "bonding jumpers" (Bonding Jumper. A reliable conductor to ensure the required electrical conductivity between metal parts required to be electrically connected) as the panel suggests equates this very important system conductor to the same level as the very general terminology meaning many things in a system assembly such as the means to join loosely fitted metal parts of equipment, or the bonding of raceways because of concentric or eccentric openings.

The new proposed language was to offer an alternative definition and align with a definition change accepted by the panel in proposal 1-146 for the grounding electrode conductor. The language needs to be the same for services, separately derived systems, and where multiple buildings or structures exist. The conductor being connecting the system grounded conductor and the associated equipment grounding conductors should be consistently defined whether it is at the service or at a building supplied by a feeder or at the source of a separately derived system. The term main bonding jumper should be used consistently where system equipment grounding conductors are connected via a bond to the system grounded conductor. A similar proposal and comment to change Section 250.30(a)(1) has also been submitted.

PANEL ACTION: Reject.

PANEL STATEMENT: The panel concludes that the use of this language would conflict with the present use of the term "main bonding jumper" in Article 250.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13

VOTE ON PANEL ACTION:

AFFIRMATIVE: 13

(Log #454)

1- 53 - (100-Circuit Integrity): Reject

SUBMITTER: Technical Correlating Committee on Signaling Systems for the Protection of Life and Property

COMMENT ON PROPOSAL NO: 1-113

RECOMMENDATION: In place of the proposed new definition, substitute the following:

Circuit Integrity. The ability of a circuit to continue to perform its function after exposure of the circuit conductors (wires or cable) to specific fire conditions for a specified period of time.

SUBSTANTIATION: This proposed definition clarifies the general meaning of circuit integrity as it is used in various paragraphs of the Code (such as 700-9(d)(1)(f) and 760-2). The specific fire conditions and specific time period of fire exposure will be determined by the use requirements and confirmed by the fire tests to which the wire or cable, alone or in combination with a wiring system, is subjected by the listing agency. Thus, different paragraphs of the Code could require distinct fire conditions and

distinct time period of fire exposure. The listing for wire or cable, alone or in combination with a wiring system, used in each such case would confirm that the wire, cable, or system meets the specific circuit integrity requirements.
PANEL ACTION: Reject.
PANEL STATEMENT: This definition is not appropriate as a general definition for the Code as it is too narrow in scope. "Circuit Integrity" as commonly understood in the industry is not just associated with performance of a conductor following exposure to fire conditions.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #511)

1- 54 - (100-Circuit Integrity): Reject
SUBMITTER: Stanley D. Kahn, Tri-City Electric Co., Inc.
COMMENT ON PROPOSAL NO: 1-113
RECOMMENDATION: In place of the proposed new definition, substitute the following:
Circuit Integrity. The ability of a circuit to continue to perform its function after exposure of the circuit conductors (wires or cable) to specific fire conditions for a specified period of time.
SUBSTANTIATION: This proposed definition clarifies the general meaning of circuit integrity as it is used in various paragraphs of the code (such as 700-9(d)(1)(f) and 760-2). The specific fire conditions and specific time period of fire exposure will be determined by the use requirements and confirmed by the fire tests to which the conductor (wire or cable), alone or in combination with a wiring system, is subjected by the listing agency. Thus, different paragraphs of the code could require distinct fire conditions and distinct time period of fire exposure. The listing for wire or cable, alone or in combination with a wiring system, used in each case would confirm that the wire, cable, or system meets the specific circuit integrity requirements.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Comment 1-53.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #2148)

1- 55 - (100-Circuit Integrity): Reject
SUBMITTER: James Conrad, Rockbestors-Surprenant Cable Corp.
COMMENT ON PROPOSAL NO: 1-114
RECOMMENDATION: Accept Proposal 1-114 ROP but revise text as follows:
~~Circuit Integrity~~ (CI) Cable. A cable listed and marked with a suffix "-CI" that ensures continued operation of critical circuits during a specific time under fire conditions.
FPN No. 1: One method of testing CI cable is UL Subject 2196 bulletin dated 4, 2000
SUBSTANTIATION: I agree with the panel statement that the submitter's references listed in the substantiation are not the same. Currently "CI" cables are only specified for use in Article 760 to meet the survivability requirements for fire alarm circuits. However, we should not limit the use of "CI" cable to Article 760. The suffix "-CI" is attached only to a cable after it passes a fire and water spray test in accordance with UL Subject 2196. With the unique ability to maintain circuit integrity of an electrical cable, when attacked by fire, the "CI" listing could be attached to any UL Listed Type cable that passes the UL 2196 fire test designated for "CI" cables. For example, a Type CL3 cable that passes the "CI" test could be marked Type CL3-CI and be used to meet the survivability requirements of not only Article 760 but anywhere fire protection of a critical circuit is needed. See companion Comments on 15-114 ROP.
PANEL ACTION: Reject.
PANEL STATEMENT: This term is used in only Article 760 and does not meet the minimum requirements to include it in Article 100. The panel reaffirms its statement on Proposal 1-114.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
COMMENT ON AFFIRMATIVE:
DOLLARD: See my Comment on Affirmative Vote on Comment 10-57.

(Log #1444)

1- 56 - (100-Circuit Integrity Cable): Accept
SUBMITTER: Kenneth E. Vannice, Leviton/NSI-Colortran/Rep. Leviton
COMMENT ON PROPOSAL NO: 1-113
RECOMMENDATION: Reject the proposal.
SUBSTANTIATION: The proposed definition would not clarify the intent of 700-9(d)(1)(f) regarding the type of cable to be used. Article 700, specifically 700-9(d)(1)(f) does not mandate the use of circuit integrity cable. It only requires a cable listed to maintain circuit integrity for a minimum of 1 hour. Cables other than those labeled as CI, which are listed for a minimum 1-hour fire rating would meet the requirements of 700-9(d)(1)(f).
This comment was developed by a Task Group consisting of the following Panel 15 members: Kenneth E. Vannice, Chair; John R. Kovacik; Michael V. Glenn; Dale A. Triffo; and Peter W. Amos.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #1628)

1- 57 - (100-Circuit Integrity Cable): Reject
SUBMITTER: James Conrad, Rockbestos-Surprenant Cable Corp.
COMMENT ON PROPOSAL NO: 1-113
RECOMMENDATION: Accept Proposal 1-113 ROP but revise text as follows:
Circuit Integrity Cable. A cable that remains electrically functional during a fire exposure test and after the impact, erosion and cooling effect of a water hose stream test.
SUBSTANTIATION: The term circuit integrity is currently used in Section 700-9(d)(1)(f) and in a companion Proposal 15-94 ROP for Section 695-6(b) to describe cables that must be protected against potential damage by fire (Fire Resistive Cables).
Fire Resistive Cables are listed in the UL Building Material Directory and are defined by "The ability of the cable to remain electrically functional during a fire exposure test and after the impact, erosion and cooling effect of a water hose stream test". It is important to have the term "circuit integrity" describing these cables and not the term "fire resistive" because of the confusion associated with the words "fire resistive" and "fire resistant" which are used throughout the industry differently.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Comment 1-53.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #2147)

1- 58 - (100-Circuit Integrity Cable): Reject
SUBMITTER: James Conrad, Rockbestos-Surprenant Cable Corp.
COMMENT ON PROPOSAL NO: 1-113
RECOMMENDATION: Accept Proposal 1-113 ROP but revise text as follows:
Circuit Integrity Cable. A cable that remains electrically functional during a fire exposure test and after the impact, erosion and cooling effect of a water hose stream test.
SUBSTANTIATION: The term "circuit integrity" is currently used in Section 700-(d)(1)(f) and in a companion Proposal 15-94 ROP for Section 695-6(b) to describe cables that must be protected against potential damage by fire (Fire Resistive Cables).
Fire Resistive Cables are listed in the UL Building Material Directory and are defined by "The ability of the cable to remain electrically functional during a fire exposure test and after the impact, erosion and cooling effect of a water hose stream test". It is important to have the term "circuit integrity" describing these cables and not the term "fire resistive" because of the confusion associated with the words "fire resistive" and "fire resistant" which are used throughout the industry differently.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Comment 1-53.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #455)

1- 59 - (100-Circuit Integrity (CI) Cable),): Accept
SUBMITTER: Technical Correlating Committee on Signaling Systems for the Protection of Life and Property
COMMENT ON PROPOSAL NO: 1-114
RECOMMENDATION: The Technical Correlating Committee on the National Fire Alarm Code recommends that Code Panel 1 continue to reject the relocation of the definition of "Fire Alarm Circuit Integrity (CI) Cable" from Article 760 to Article 100.
SUBSTANTIATION: Refer to the companion comment on Proposal 1-113. The existing definition in 760-2 should be retained in order to define the application of circuit integrity to meet the specific needs of fire alarm systems.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #2221)

1- 60 - (100-Concealed): Reject
SUBMITTER: Robert H. Keis, Dover, DE
COMMENT ON PROPOSAL NO: 1-117
RECOMMENDATION: This proposal should be accepted instead of rejected.
SUBSTANTIATION: Mr. Trout's substantiation is correct. It seems strange that what can't be seen is exposed. Section 410-30(c) requires that when flexible cord is used to connect the fixture, the cord must be visible for its entire length outside the fixture. (It cannot penetrate a suspended ceiling). Section 400-8(2) does not permit flexible cord to run through holes in walls, structural ceilings, suspended ceilings, dropped ceilings, or floors. Section 400-8(5) does not permit flexible cord to be used "where concealed behind building walls, structural ceilings, suspended ceilings, dropped ceilings, or floors." But, by the definition of "exposed" in Article 100, flexible cord is permitted behind a suspended ceiling, just so it does not penetrate the ceiling getting there. How can something be concealed and exposed at the same time? If as the panel suggests, this change results in unintended consequences to other NEC articles, maybe they should be corrected also.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel reaffirms its statement on Proposal 1-117. There is no compelling need demonstrated to revise the present definition. Any such change in a definition should be accompanied by proposals recognizing the affects on existing rules.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #1761)

1- 61 - (100-Coordination): Accept
SUBMITTER: Jim Pauley, Square D Company
COMMENT ON PROPOSAL NO: 1-122
RECOMMENDATION: The panel should reconsider and reject the proposal.
SUBSTANTIATION: The definition is not consistent with the usage of the term in the Code. 240-12 discuss Electrical System Coordination and provides some alternatives to address a possible hazard to personnel or equipment. The definition as proposed in Article 100 relates primarily to a performance issue and not a concern regarding 90-1(a) – hazards arising from the use of electricity.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #282)

1- 62 - (100-Coordination (Selective)): Reject
SUBMITTER: James T. Dollard, Jr., IBEW Local Union 98
COMMENT ON PROPOSAL NO: 1-122
RECOMMENDATION: Accept in principle revised as follows:
"Coordination (Selective). Proper localization of ~~a fault~~ an overcurrent condition to restrict outages to the equipment affected, accomplished by the choice of selective ~~fault~~ overcurrent-protective devices."
SUBSTANTIATION: This comment is the work of a Task Group assigned to address the request of CMP 1 for response from CMP 10 on the panel action to accept Proposal 1-122. The Task Group consisted of the following members of CMP 10. Chair, Jim Dollard; John Brezan; Carl Fredericks; Clive Klimblin; Charles Eldridge; George Gregory; George Ockuly and Vince Saporita.
The Task Group is in favor of moving the definition into Article 100, but feels that such a move should also be accompanied by a slight modification to the definition.
The addition of this definition to Article 100 will have a global effect on the use of this term in the National Electrical Code.
As presently written in the 1999 NEC, the definition of "Coordination" is limited to section 240-12. Proposal 10-3b which was accepted in this cycle, would have limited the definition to Article 240. The term "Coordination" in Article 240 exists only in Section 240-12. However, defining "Coordination" in Article 100 has a global impact on the NEC, therefore it is necessary to modify the present text.
The task group suggests that the word "fault" be changed to the word "overcurrent" two times in the definition. The task group believes that the need for coordination applies to all overcurrent conditions, not just to fault conditions. By definition, overcurrent covers overload, short-circuit, and ground fault. It is not enough to coordinate for just "fault" conditions but overcurrent conditions as well. This slight modification of the definition also fits with the other associated sections in the NEC.
See companion comment to Proposal 10-3b developed by this Task Group.
PANEL ACTION: Reject.
PANEL STATEMENT: 1. The selective coordination contemplated in the proposed definition goes beyond the stated purpose of the Code, into, "restricting outages" within equipment.
2. The comment at hand, No. 1-62, recommends a very sweeping change to the NEC, which would necessitate coordinating not just short-circuit protection, but also overload protection. There is no justification for such a broad change.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #1549)

1- 63 - (100-Damp Location): Reject
SUBMITTER: Ravindra H. Ganatra, Alcan Cable
COMMENT ON PROPOSAL NO: 1-124
RECOMMENDATION: Recommend that this proposal be rejected.
SUBSTANTIATION: Damp location is essentially a dry location which occasionally becomes damp. Hence the "dry and damp" rating applies to products used in these locations. It is not a dry location which is subjected to "moderate degrees of moisture". Products exposed to moisture regardless of the degree of moderation or saturation are required to bear wet rating. Thus, proposed change would eliminate requirements for wet rating in product standards. We believe that this is not the intent of Code Making Panel 1.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Comment 1-64.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #1023)

1- 64 - (100-Damp Locations): Reject
SUBMITTER: Kenneth F. Kempel, Underwriters Laboratories Inc.
COMMENT ON PROPOSAL NO: 1-124
RECOMMENDATION: Revise the definition accepted by CMP-1 as follows:
(a) Delete the first sentence and replace with:
A space protected from the weather that is subject to condensed water vapor or fine particles of water suspended in air or temperature differentials sufficient to cause moisture in the air to condense on utilization equipment.
(b) Add a new last sentence:
Interior air conditioned spaces are generally excluded.
The revised definition would read as follows:
Damp Location. A space protected from the weather that is subject to condensed water vapor or fine particles of water

suspended in air or temperature differentials sufficient to cause moisture in the air to condense on utilization equipment. Examples of such locations include partially protected locations under canopies, marquees, roofed open porches, and like locations, and interior locations subject to moderate degrees of moisture, such as some basements, some barns, and some cold-storage warehouses. Interior air conditioned spaces are generally excluded.

SUBSTANTIATION: This comment is submitted on behalf of the Code-Making Panel 18 task group that included Michael Ber, Robert Cochran, Kenneth Kempel and Saul Rosenbaum. We agree with Mr. Minick that the wording accepted in principle by Code-Making Panel 1 could be further revised to add clarity. We believe that the revised wording included in this comment achieves this objective.

The intent of this definition is to describe the environment surrounding a piece of utilization equipment that would warrant protection against the effects of water vapor that condenses into water droplets on the equipment surfaces or where it can be absorbed into electrical insulating materials. This can happen in locations where fog comes into contact with equipment or where the temperature of the equipment surface is below the dew point of the surrounding air, causing moisture to condense on it.

These conditions don't typically occur in air conditioned interior spaces; however, some may argue that bathrooms or portions of bathrooms are interior air conditioned spaces where it can. The adjective "generally" is included to provide the latitude some authorities having jurisdiction may need to declare a bathroom a damp location.

PANEL ACTION: Reject.

PANEL STATEMENT: The language from Proposal 1-124 clearly expresses the panel's intent.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13

VOTE ON PANEL ACTION:

AFFIRMATIVE: 13

(Log #364)

1- 65 - (100-Disconnecting Means): Reject

SUBMITTER: Dan Leaf, Palmdale, CA

COMMENT ON PROPOSAL NO: 1-126

RECOMMENDATION: Accept proposal.

SUBSTANTIATION: The Panel Statement that requirements for disconnecting means are specified in the relevant Code sections is true only if that means a disconnecting means is required; not true if it means the type, size, rating, or other parameters are specified. The proposal references many sections that have no specifics regarding those parameters. Where disconnecting means are specified without specifics a terminal connector or wire splicing device literally complies with "device or group of devices or other means." Refer to proposal substantiation re: disconnection of a grounded conductor, line and load side conductors and two switches supplying one set of fuses.

PANEL ACTION: Reject.

PANEL STATEMENT: The panel reaffirms its statement on Proposal 1-126. A wire connector may well constitute a disconnecting means if a Code requirement so allows. A definition should not preclude this. Requirements are not permitted in a definition.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13

VOTE ON PANEL ACTION:

AFFIRMATIVE: 13

(Log #3)

19- 3 - (100-Dustproof): Accept

SUBMITTER: Technical Correlating Committee National Electrical Code

COMMENT ON PROPOSAL NO: 1-128

RECOMMENDATION: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 19 for consideration in Article 547.

SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.

PANEL ACTION: Accept.

PANEL STATEMENT: Refer to Comment 19-10a.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 8

VOTE ON PANEL ACTION:

AFFIRMATIVE: 8

COMMENT ON AFFIRMATIVE:

MCCULLOUGH: In the panel statement, change the referenced comment number to 19-10a. Coment 19-15a was the number used during the panel meeting and was subsequently changed after the statement was written.

(Log #3a)

1- 66 - (100-Dustproof): Accept

SUBMITTER: Technical Correlating Committee National Electrical Code

COMMENT ON PROPOSAL NO: 1-128

RECOMMENDATION: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 19 for consideration in Article 547.

SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13

VOTE ON PANEL ACTION:

AFFIRMATIVE: 13

(Log #4)

1- 67 - (100-Dwelling): Accept

SUBMITTER: Technical Correlating Committee National Electrical Code

COMMENT ON PROPOSAL NO: 1-130

RECOMMENDATION: The Technical Correlating Committee directs that the panel reconsider their action based on the fact that the Style Manual directs that definitions be listed in alphabetical order. This action will be considered by the Panel as a Public Comment.

SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.

PANEL ACTION: Accept.

PANEL STATEMENT: The panel accepts the direction to reconsider the action on Proposal 1-130.

The panel concludes that in this instance, it is more logical to list definitions according to the number of dwellings being described, beginning with the general definition of "Dwelling Unit." This will be clearer for Code users than listing these definitions in alphabetical order.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13

VOTE ON PANEL ACTION:

AFFIRMATIVE: 13

(Log #1194)

1- 68 - (100-Enclosure): Reject

SUBMITTER: Michael W. Smith, Guarantee Electrical Company

COMMENT ON PROPOSAL NO: 1-135

RECOMMENDATION: The word "Enclosure" could mean a variety of different areas or cabinet/boxes. Thus, we may want to divide these up by type.

Enclosure (Area) - A fence, partition or structure surrounding an electrical equipment installation for the purpose of restricting access to, or prevent personnel from accidentally contacting energized parts, or to protect the equipment from physical damage.

Enclosure (Case or Housing) - A Case or Housing of electrical apparatus or device intended to prevent accidental contact with energized parts and to protect the apparatus or device from physical damage.

Enclosure (Underground) See Cabinets and cutout boxes and junction and pull boxes.)

Article 370 - Definition

Enclosure (Underground) - A box, handhole, or manhole used for installation, splicing or access to cables or conductors. The enclosure shall be provided with a securable cover.

SUBSTANTIATION: UL has provided a new listing for "Underground Enclosure", such as Strongwell Quazite composite polymer concrete boxes. However, these boxes are primarily intended for cable installation and splicing and not for installation of equipment. Thus, the definition of "Enclosure" as it is written in the 1999 NEC could be misinterpreted to allow installation of equipment or apparatus in an underground enclosure which is not listed for such use.

PANEL ACTION: Reject.
PANEL STATEMENT: The proposed definition included in the comment does not add clarity, contains a requirement, and uses the term being defined in the definition.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #2220)

1- 69 - (100-Exposed): Reject
SUBMITTER: Robert H. Keis, Dover, DE
COMMENT ON PROPOSAL NO: 1-138
RECOMMENDATION: This proposal should be accepted instead of rejected.
SUBSTANTIATION: Mr. Trout's substantiation is correct. It seems strange that what can't be seen is exposed. Section 410-30(c) requires that when flexible cord is used to connect the fixture, the cord must be visible for its entire length outside the fixture. (It cannot penetrate a suspended ceiling). Section 400-8(2) does not permit flexible cord to run through holes in walls, structural ceilings, suspended ceilings, dropped ceilings, or floors. Section 400-8(5) does not permit flexible cord to be used "where concealed behind building walls, structural ceilings, suspended ceilings, dropped ceilings, or floors." But, by the definition of "exposed" in Article 100, flexible cord is permitted behind a suspended ceiling, just so it does not penetrate the ceiling getting there. How can something be concealed and exposed at the same time? If as the panel suggests, this change results in unintended consequences to other NEC articles, maybe they should be corrected also.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel reaffirms its statement on Proposal 1-138. There is no compelling need demonstrated to revise the present definition. Any such change in a definition should be accompanied by proposals recognizing the affects on existing rules.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #512)

1- 70 - (100-Fire Alarm Circuit Integrity (CI) Cable): Accept
SUBMITTER: Stanley D. Kahn, Tri-City Electric Co., Inc.
COMMENT ON PROPOSAL NO: 1-114
RECOMMENDATION: Continue to reject the relocation of the definition of "Fire Alarm Circuit Integrity (CI) Cable" from Article 760 to Article 100.
SUBSTANTIATION: Refer to the Panel 16 companion comment on Proposal 1-113. The existing definition in 760-2 should be retained in order to define the application of circuit integrity to meet the specific needs of fire alarm systems.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #1701)

1- 71 - (100-First Floor of a Building (New)): Accept in Principle
SUBMITTER: Jason Fischer, Bad Axe, MI
COMMENT ON PROPOSAL NO: 3-65
RECOMMENDATION: Add a new definition for First floor of a building to Article 100 to read as follows: The first floor of a building shall be that floor that has fifty percent or more of the exterior wall surface area level with or above finished grade. Delete this sentence from Section 336-5(a)(1) second paragraph.
SUBSTANTIATION: This definition is needed in the following sections: 336-5(a)(1), 339-3(a)(4) and 342-3(c). The definition belongs in Article 100, not buried deep in a section of Article 336. As the original submitter requested, this is moving material from Article 336 to Article 100.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Comment 1-174
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #1762)

1- 72 - (100-Ground Fault Circuit Interrupter): Reject
SUBMITTER: Jim Pauley, Square D Company
COMMENT ON PROPOSAL NO: 1-142
RECOMMENDATION: Revise the FPN from the Panel action on the Proposal as follows:
"FPN: Class A ground-fault circuit interrupters trip when the current to ground has a value greater than ~~in the range of 4 to~~ 6 mA. For further information, see Standard for Ground-Fault Circuit Interrupters, UL 943."
SUBSTANTIATION: The panel action is the right way to move forward with this issue and will go a long way to clearing up confusion in the field about the use of the term "ground-fault circuit interrupter" throughout the NEC. This comments recommends only a minor revision to the FPN. The proposal wording of the FPN implies that the GFCI will only operate on ground-fault currents in the 4-6mA range. In reality, the GFCI operates on any ground-fault current above 6mA.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel concludes that the accepted FPN of Proposal 1-142 is correct as presently written.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #260)

1- 73 - (100-Ground-Fault Circuit Interrupter): Reject
SUBMITTER: C. James Erickson, Newark, DE
COMMENT ON PROPOSAL NO: 1-142
RECOMMENDATION: This proposal should be rejected, and the wording left as in the 1999 National Electrical Code.
SUBSTANTIATION: The submitter's substantiation is wrong when he says the present code calls for Class A protection. The present definition allows any device that hastens the de-energization of the system, without causing nuisance trips. A de-energized system is a safe system. Experimentation on sheep has demonstrated that to cause heart fibrillation required 500 ma for 6 HZ.[1]. At that level of current, ground fault devices will open faster than in six cycles. Another reference places 50 or 60 HZ fibrillation values for a male adult at: ma = 115/t^1/2.[2]. At 6 HZ this would be 11500 ma. The same reference recommends 40 percent of this value for an adult women (4600 ma).
The submitter has not documented cases where the present definition has caused safety problems. The user must be allowed to choose protection that will allow the circuit to operate, or ground fault protection will be bypassed.
Code Making Panel 12 has limited voltage on impedance heating systems to 30 volts for personnel protection; but has allowed up to 80 volts "where ground-fault circuit-interrupter protection for personnel is provided". These systems typically have ground leakage currents measured in amperes.
Internationally, 20 and 30 ma devices have been used for many years for personnel protection. The submitter has not documented any problems arising from this usage. While there is a lot of effort being put forth by standards bodies to harmonize standards, this would be a step in the wrong direction. Can we tell Canadians, English, Germans, Etc., that their widely used devices do not protect personnel?
[1] "Electric shock hazard", Charles F. Dalziel, IEEE Spectrum, February 1972.
[2] "ELECTRIC SCHOCK", Peter N. Saveskie, Worldwide Telecommunications Series, Vol. 5 No. 10, TAI Incorporated.
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter's substantiation is not entirely correct. A Class A GFCI is required for personnel protection in general branch-circuit applications in the USA. The submitter of the comment did not consider the fact that a Class A GFCI in the USA provides protection against inability to let go as well as ventricular fibrillation. Let-go protection (not ventricular fibrillation protection) demands that the device trip when the current to ground from a high-impedance fault exceeds 5 mA. This is important in the USA because of all the Class 0 products (single insulation, no protective earthing conductor) that are commonplace in the USA.
Submitter's statement regarding 20 mA and 30 mA devices used in other countries is irrelevant to the definition of Ground-Fault Circuit Interrupter. Those devices are residual current-operated devices, not GFCIs.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #2005)

1- 74 - (100-Ground-Fault Circuit Interrupter): Reject
SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc.
COMMENT ON PROPOSAL NO: 1-142
RECOMMENDATION: Change "for a Class A device" to "for the applicable conditions."
SUBSTANTIATION: The panel wording has the unintended result of eliminating Class B devices, which are still produced for swimming pool lighting installed prior to local adoption of the 1965 NEC. The limits in the FPN convey sufficient explanation to allow the user to distinguish between these devices and low level (usually 30 mA) devices for Section 427-22 and related applications.
PANEL ACTION: Reject.
PANEL STATEMENT: The 1999 Code does not permit Class B GFCIs. The fact that classified replacement units are still being produced is not sufficient substantiation for changing the definition.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #365)

1- 75 - (100-Grounding Electrode Conductor): Accept in Part
SUBMITTER: Dan Leaf, Palmdale, CA
COMMENT ON PROPOSAL NO: 1-146
RECOMMENDATION: Accept in principle, revise panel action:
GROUNDING ELECTRODE CONDUCTOR
The conductor used to connect the grounding electrode to the equipment grounding conductor(s), to the grounding conductor, or to both, at the service or to the building or structure disconnecting means where supplied by branch circuits or feeders, or to a separately derived system or other derived system.
SUBSTANTIATION: The grounding electrode conductor, while usually connected at the service equipment, is permitted to be connected at any accessible point from the load end of the service drop or lateral to the service equipment (disconnect) per 250-24(a)(1)(d).
A building or structure may be required to have a grounding electrode whether or not supplied by a common service (and therefore a grounding electrode conductor).
Present wording appears to permit a connection to the equipment grounding conductor and grounded conductor ("or both") at buildings served by a feeder or branch circuit which is not permitted by 250-32(b).
Section 250-30 permits a connection which is not at the source of a separately derived system.
An alternative power source generator initially installed as a back-up or peak power source, with a solid conductor connection to a circuit conductor of a normal service transformer secondary results in neither being a separately derived system, per definition. Other Code sections may require grounding of such derived systems and the conductor from the grounding electrode should also be designated a grounding electrode conductor, otherwise it is outside the definition.
PANEL ACTION: Accept in Part.
Accept deletion of "equipment" after "service" as recommended. Reject the balance of the comment.
PANEL STATEMENT: The balance of the comment is rejected as it does not provide clarity. See panel action and statement on Comment 1-76.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #1133)

1- 76 - (100-Grounding Electrode Conductor): Accept in Principle
SUBMITTER: Paul Dobrowsky, Holley, NY
COMMENT ON PROPOSAL NO: 1-146
RECOMMENDATION: Revise the definition as follows:
Grounding Electrode Conductor. The conductor used to connect the grounding ~~electrode~~ electrode(s) to the equipment grounding conductor, to the grounded conductor, or to both, at the service equipment, at each building or structure where supplied from a common service, or at the source of a separately derived system.
SUBSTANTIATION: The action taken by Code-Making Panel 1 is consistent with Code-Making Panel 5's action on Proposals 5-123 and 5-124. The term "electrode(s)" is suggested to replace "electrode" because there may be more than one electrode.
This comment was developed and reviewed by a task group consisting of Paul Dobrowsky (CMP 5), David Dini (CMP 1 and CMP 5), Michael Johnston (CMP 5), Charles Mello (CMP 5), and Gregory Steinman (CMP 5).
PANEL ACTION: Accept in Principle.
Revise the definition as follows:
Grounding Electrode Conductor. The conductor used to connect the grounding ~~electrode~~ electrode(s) to the equipment grounding conductor, to the grounded conductor, or to both, at the service ~~equipment~~, at each building or structure where supplied from a common service, or at the source of a separately derived system.
PANEL STATEMENT: Revise the term "service equipment" to "service" to correlate with panel action on Comment 1-75.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #5)

2- 2 - (100-Habitable Room (Space) (New)): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 1-148
RECOMMENDATION: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 2 for action in Article 210.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
The panel accepts the direction of the Technical Correlating Committe. However, rejects adding the definition of "Habitable Room" in Article 210.
PANEL STATEMENT: The submitter has not provided substantiation which would warrant a requirement for a definition of the referenced terms in order to provide more clarity to Sections 210-8, 210-52, and 210-70. Applicable building codes can be referenced for this purpose.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #691)

1- 77 - (100-Liquid, Combustible; Liquid Flammable): Reject
SUBMITTER: William E. Bickner, Stillwater, MN
COMMENT ON PROPOSAL NO: 1-160
RECOMMENDATION: This proposal should be accepted.
SUBSTANTIATION: The NFPA 497 definitions of these terms omit details of those in NFPA 30 which are not necessary for the purposes of that standard. Using the same philosophy, the proposed definitions provide information important to electricians, electrical contractors, and electrical engineers which is not now included in the NEC. With very few exceptions, electrical contractors and electricians do not have copies of NFPA 30 (or 497). If the panel is concerned about the incomplete definitions, which the submitter cannot envision as creating any problems, the statement "See NFPA 30, Flammable and Combustible Liquids Code, for complete information" could be added.
PANEL ACTION: Reject.
PANEL STATEMENT: Specialized requirements for electrical installations in hazardous (classified) locations are covered in Articles 500, 501, 502, 505, and 513-516. Adding definitions of flammable and combustible liquids to Article 100 will not improve usability of this Code.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #911)

1- 78 - (100-Live Parts): Reject
SUBMITTER: David A. Kerr, Jr., Friendsville, PA
COMMENT ON PROPOSAL NO: 1-163
RECOMMENDATION: Reject proposal and panel action.
SUBSTANTIATION: The proposed definitions are less clear. Most equipment contains live parts which are safely guarded by covers. Persons who open covers are supposed to know what they are doing. Insulating material on terminals might be a good idea, but you can't make the world idiot proof.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel concurs with the Comment 1-81.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #1550)

1- 79 - (100-Live Parts): Reject
SUBMITTER: Ravindra H. Ganatra, Alcan Cable
COMMENT ON PROPOSAL NO: 1-163
RECOMMENDATION: Recommend that this proposal be rejected.
SUBSTANTIATION: The present defination of live parts does not differentiate between guarded and unguarded installations. For the purpose of the application of this definition to make installations that are in compliance with the NEC, the criterion "a shock hazard exists" in this definition is a necessary condition.

Panel Action to revise the definition to satisfy the submitters concern could be misinterpreted. For example, two insulated conductors may not come in contact with each other (as in a cabled construction), because they are live parts. Panel Action could have a significant impact on the meaning of the phrase "live parts" used in over 60 places in the code.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action on Comment 1-81. Code rules specify requirements to provide protection from live parts such as isolation, insulation, and guarding. The definition should not itself describe protection methods.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #1565)

1- 80 - (100-Live Parts): Accept
SUBMITTER: Paul Dobrowsky, Holley, NY
COMMENT ON PROPOSAL NO: 1-163
RECOMMENDATION: Revise as follows:
Live Parts. Energized conductive components.
SUBSTANTIATION: Provides a simple clear definition. Conductors, buses, and terminals can all be considered components. This definition compliments the use of the term throughout the NEC allowing specific requirements to address guarding (enclosing or elevating). The issue of presenting a shock hazard depends on the relative position of a person to the parts. Elevated and enclosed live parts are a shock hazard if a person is near enough to them. When the door of an enclosure is closed the parts are not considered to be shock hazard but they are still live.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 2
EXPLANATION OF NEGATIVE:
HITTINGER: The definition as it appears in the 1999 NEC provides clear and concise wording.

MINICK: NEMA continues to support the current 1999 NEC definition of "live parts" as the current definition is consistent with the way the term is used in the NEC. A Webster's definition is not needed and does not add clarity and in fact may confuse users of the NEC and be less clear.

(Log #2248)

1- 81 - (100-Live Parts): Accept
SUBMITTER: Paul Dobrowsky, Holley, NY
COMMENT ON PROPOSAL NO: 1-163
RECOMMENDATION: Revise text as follows:
Live Parts. Energized conductive components.
SUBSTANTIATION: Provides a simple clear definition. Conductors, buses, and terminals can all be considered components. This definition compliments the use of the term throughout the NEC allowing specific requirements to address guarding (enclosing or elevating). The issue of presenting a shock hazard depends on the relative position of a person to the parts. Elevated and enclosed live parts are a shock hazard if a person is near enough to them. When the door of an enclosure is closed the parts are not considered to be shock hazard but they are still live.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
MINICK: NEMA continues to support the current 1999 NEC definition of "live parts" as the current definition is consistent with the way the term is used inthe NEC. A Webster's definition is not needed and does not add clarity and in fact may confuse users of the NEC and be less clear.

(Log #1228)

1- 82 - (100-Luminaire): Reject
SUBMITTER: Dann Strube, Lanesville, IN
COMMENT ON PROPOSAL NO: 1-165
RECOMMENDATION: This proposal should have been rejected.
SUBSTANTIATION: The proposal, intended to be international, does not agree with the international definition in Section 410-1 FPN.

This is a companion comment to my comments for the entire document. If rejected here, the panel should revise the definition of luminaire to match the international version. If we want to look international we should at least get the definition right.
PANEL ACTION: Reject.
PANEL STATEMENT: The definition is clear and appropriate for its use in the NEC.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #1682)

1- 83 - (100-Luminaire): Reject
SUBMITTER: Gersil N. Kay, Conservation Lighting International Ltd.
COMMENT ON PROPOSAL NO: 1-1
RECOMMENDATION: The NEC and the ASHRAE/IESNA Standard 90.1-1999 should include the expression "luminaire or other lighting systems" throughout both documents. Then those creating the plans and specifications will be made aware of additional lighting tools at their disposal, even if the standard contains minimum requirements.
SUBSTANTIATION: As a second-generation commercial electrical contractor, the word luminaire has always meant a lighting fixture. In fact, that is the National Electrical Contractors' Association's understanding, too. However, the glossary of ASHRAE/IESNA Standard 90.1-1999 defines "luminaire" as a complete lighting system, which is something altogether different. Light pipe and glass fibre optics are lighting systems, not individual units with separate light sources. They are composed of a common light source, one or more light guides powered by it, and optional fittings to control the beam.

It is reported in CEE magazine that the 2002 National Electric Code is replacing the terms "fixture", "fixtures" and similar words with "luminaire" or "luminaires" throughout the code. The definition of luminaire includes the lamps, diffusers, reflectors, ballasts and similar parts of what have been commonly known as lighting fixtures, each with their own light source. This definition therefore excludes lighting systems which are much more energy efficient than traditional incandescent, fluorescent and halogen lamps.

If the goal of reducing energy consumption by 20% is to be reached, electrical contractors, architects, engineers, lighting and interior designers will have to be made aware of the more efficient lighting products that are to be used in conjunction with restrictive controls and wattage limitations.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel concludes that products described in the substantiation are not necessarily precluded by the use of the term luminaire.

The term "luminaire or other lighting system" in ASHRAE/IESNA 90.1-1999 is intended to describe natural daylighting as well as

electric lighting. The term "luminaire (lighting fixture)" is appropriate for this Code.

The additional words do not provide clarity or add to the usefulness of the NEC. The concern of the submitter does not relate to the replacement of the term "fixture" with "luminaire".

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #1683)

2- 3 - (100-Luminaire): Reject
SUBMITTER: Gersil N. Kay, Conservation Lighting International Ltd.
COMMENT ON PROPOSAL NO: 2-1
RECOMMENDATION: The NEC and the ASHRAE/IESNA Standard 90.1-1999 should include the expression "luminaire or other lighting systems" throughout both documents. Then those creating the plans and specifications will be made aware of additional lighting tools at their disposal, even if the standard contains minimum requirements.
SUBSTANTIATION: As a second-generation commercial electrical contractor, the word luminaire has always meant a lighting fixture. In fact, that is the National Electrical Contractors' Association's understanding, too. However, the glossary of ASHRAE/IESNA Standard 90.1-1999 defines "luminaire" as a complete lighting system, which is something altogether different. Light pipe and glass fibre optics are lighting systems, not individual units with separate light sources. They are composed of a common light source, one or more light guides powered by it, and optional fittings to control the beam.

It is reported in CEE magazine that the 2002 National Electric Code is replacing the terms "fixture", "fixtures" and similar words with "luminaire" or "luminaires" throughout the code. The definition of luminaire includes the lamps, diffusers, reflectors, ballasts and similar parts of what have been commonly known as lighting fixtures, each with their own light source. This definition therefore excludes lighting systems which are much more energy efficient than traditional incandescent, fluorescent and halogen lamps.

If the goal of reducing energy consumption by 20% is to be reached, electrical contractors, architects, engineers, lighting and interior designers will have to be made aware of the more efficient lighting products that are to be used in conjunction with restrictive controls and wattage limitations.
PANEL ACTION: Reject.
PANEL STATEMENT: The term "luminaire" does not represent a lighting system. See definition of "luminaire" in Proposal 1-165.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #1684)

3- 2 - (100-Luminaire): Reject
SUBMITTER: Gersil N. Kay, Conservation Lighting International Ltd.
COMMENT ON PROPOSAL NO: 3-1
RECOMMENDATION: The NEC and the ASHRAE/IESNA Standard 90.1-1999 should include the expression "luminaire or other lighting systems" throughout both documents. Then those creating the plans and specifications will be made aware of additional lighting tools at their disposal, even if the standard contains minimum requirements.
SUBSTANTIATION: As a second-generation commercial electrical contractor, the word luminaire has always meant a lighting fixture. In fact, that is the National Electrical Contractors' Association's understanding, too. However, the glossary of ASHRAE/IESNA Standard 90.1-1999 defines "luminaire" as a complete lighting system, which is something altogether different. Light pipe and glass fibre optics are lighting systems, not individual units with separate light sources. They are composed of a common light source, one or more light guides powered by it, and optional fittings to control the beam.

It is reported in CEE magazine that the 2002 National Electric Code is replacing the terms "fixture", "fixtures" and similar words with "luminaire" or "luminaires" throughout the code. The definition of luminaire includes the lamps, diffusers, reflectors, ballasts and similar parts of what have been commonly known as lighting fixtures, each with their own light source. This definition therefore excludes lighting systems which are much more energy efficient than traditional incandescent, fluorescent and halogen lamps.

If the goal of reducing energy consumption by 20% is to be reached, electrical contractors, architects, engineers, lighting and interior designers will have to be made aware of the more efficient lighting products that are to be used in conjunction with restrictive controls and wattage limitations.
PANEL ACTION: Reject.
PANEL STATEMENT: Code-Making Panel 3 does not have jurisdiction over Article 100 definitions and cannot act on a comment to change a definition not under its control. The NEC Technical Correlating Committee has directed that the term "fixture" be included after the term "luminaire" throughout the Code for consistency.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1685)

4- 2 - (100-Luminaire): Reject
SUBMITTER: Gersil N. Kay, Conservation Lighting International Ltd.
COMMENT ON PROPOSAL NO: 4-1
RECOMMENDATION: The NEC and the ASHRAE/IESNA Standard 90.1-1999 should include the expression "luminaire or other lighting systems" throughout both documents. Then those creating the plans and specifications will be made aware of additional lighting tools at their disposal, even if the standard contains minimum requirements.
SUBSTANTIATION: As a second-generation commercial electrical contractor, the word luminaire has always meant a lighting fixture. In fact, that is the National Electrical Contractors' Association's understanding, too. However, the glossary of ASHRAE/IESNA Standard 90.1-1999 defines "luminaire" as a complete lighting system, which is something altogether different. Light pipe and glass fibre optics are lighting systems, not individual units with separate light sources. They are composed of a common light source, one or more light guides powered by it, and optional fittings to control the beam.

It is reported in CEE magazine that the 2002 National Electric Code is replacing the terms "fixture", "fixtures" and similar words with "luminaire" or "luminaires" throughout the code. The definition of luminaire includes the lamps, diffusers, reflectors, ballasts and similar parts of what have been commonly known as lighting fixtures, each with their own light source. This definition therefore excludes lighting systems which are much more energy efficient than traditional incandescent, fluorescent and halogen lamps.

If the goal of reducing energy consumption by 20% is to be reached, electrical contractors, architects, engineers, lighting and interior designers will have to be made aware of the more efficient lighting products that are to be used in conjunction with restrictive controls and wattage limitations.
PANEL ACTION: Reject.
PANEL STATEMENT: Nothing prohibits the use of lighting systems now. A luminaire is part of a lighting system.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1686)

5- 2 - (100-Luminaire): Reject
SUBMITTER: Gersil N. Kay, Conservation Lighting International Ltd.
COMMENT ON PROPOSAL NO: 5-1
RECOMMENDATION: The NEC and the ASHRAE/IESNA Standard 90.1-1999 should include the expression "luminaire or other lighting systems" throughout both documents. Then those creating the plans and specifications will be made aware of additional lighting tools at their disposal, even if the standard contains minimum requirements.
SUBSTANTIATION: As a second-generation commercial electrical contractor, the word luminaire has always meant a lighting fixture. In fact, that is the National Electrical Contractors' Association's understanding, too. However, the glossary of ASHRAE/IESNA Standard 90.1-1999 defines "luminaire" as a complete lighting system, which is something altogether different. Light pipe and glass fibre optics are lighting systems, not individual units with separate light sources. They are composed of a common

light source, one or more light guides powered by it, and optional fittings to control the beam.

It is reported in CEE magazine that the 2002 National Electric Code is replacing the terms "fixture", "fixtures" and similar words with "luminaire" or "luminaires" throughout the code. The definition of luminaire includes the lamps, diffusers, reflectors, ballasts and similar parts of what have been commonly known as lighting fixtures, each with their own light source. This definition therefore excludes lighting systems which are much more energy efficient than traditional incandescent, fluorescent and halogen lamps.

If the goal of reducing energy consumption by 20% is to be reached, electrical contractors, architects, engineers, lighting and interior designers will have to be made aware of the more efficient lighting products that are to be used in conjunction with restrictive controls and wattage limitations.

PANEL ACTION: Reject.

PANEL STATEMENT: Lighting systems can include the use of luminaires as part of the lighting system. The comment suggests a change should also be made to ASHRAE/IESNA Standard 90.1-1999. This document would have its own editorial and change process that could not be changed by the proposals or comments to the NFPA 70 document. Lighting systems and the requirements for lighting systems are presently covered in various articles of the NEC. Luminaires would just be a component of the lighting systems.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16

VOTE ON PANEL ACTION:

AFFIRMATIVE: 16

(Log #1687)

6- 2 - (100-Luminaire): Reject

SUBMITTER: Gersil N. Kay, Conservation Lighting International Ltd.

COMMENT ON PROPOSAL NO: 6-1

RECOMMENDATION: The NEC and the ASHRAE/IESNA Standard 90.1-1999 should include the expression "luminaire or other lighting systems" throughout both documents. Then those creating the plans and specifications will be made aware of additional lighting tools at their disposal, even if the standard contains minimum requirements.

SUBSTANTIATION: As a second-generation commercial electrical contractor, the word luminaire has always meant a lighting fixture. In fact, that is the National Electrical Contractors' Association's understanding, too. However, the glossary of ASHRAE/IESNA Standard 90.1-1999 defines "luminaire" as a complete lighting system, which is something altogether different. Light pipe and glass fibre optics are lighting systems, not individual units with separate light sources. They are composed of a common light source, one or more light guides powered by it, and optional fittings to control the beam.

It is reported in CEE magazine that the 2002 National Electric Code is replacing the terms "fixture", "fixtures" and similar words with "luminaire" or "luminaires" throughout the code. The definition of luminaire includes the lamps, diffusers, reflectors, ballasts and similar parts of what have been commonly known as lighting fixtures, each with their own light source. This definition therefore excludes lighting systems which are much more energy efficient than traditional incandescent, fluorescent and halogen lamps.

If the goal of reducing energy consumption by 20% is to be reached, electrical contractors, architects, engineers, lighting and interior designers will have to be made aware of the more efficient lighting products that are to be used in conjunction with restrictive controls and wattage limitations.

PANEL ACTION: Reject.

PANEL STATEMENT: The additional language does not enhance the understanding of the Code.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 10

NOT RETURNED: 1 Ferrell

(Log #1688)

7- 2 - (100-Luminaire): Reject

SUBMITTER: Gersil N. Kay, Conservation Lighting International Ltd.

COMMENT ON PROPOSAL NO: 7-1

RECOMMENDATION: The NEC and the ASHRAE/IESNA Standard 90.1-1999 should include the expression "luminaire or other lighting systems" throughout both documents. Then those creating the plans and specifications will be made aware of additional lighting tools at their disposal, even if the standard contains minimum requirements.

SUBSTANTIATION: As a second-generation commercial electrical contractor, the word luminaire has always meant a lighting fixture. In fact, that is the National Electrical Contractors' Association's understanding, too. However, the glossary of ASHRAE/IESNA Standard 90.1-1999 defines "luminaire" as a complete lighting system, which is something altogether different. Light pipe and glass fibre optics are lighting systems, not individual units with separate light sources. They are composed of a common light source, one or more light guides powered by it, and optional fittings to control the beam.

It is reported in CEE magazine that the 2002 National Electric Code is replacing the terms "fixture", "fixtures" and similar words with "luminaire" or "luminaires" throughout the code. The definition of luminaire includes the lamps, diffusers, reflectors, ballasts and similar parts of what have been commonly known as lighting fixtures, each with their own light source. This definition therefore excludes lighting systems which are much more energy efficient than traditional incandescent, fluorescent and halogen lamps.

If the goal of reducing energy consumption by 20% is to be reached, electrical contractors, architects, engineers, lighting and interior designers will have to be made aware of the more efficient lighting products that are to be used in conjunction with restrictive controls and wattage limitations.

PANEL ACTION: Reject.

PANEL STATEMENT: The additional language does not enhance the understanding of the Code.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:

AFFIRMATIVE: 15

(Log #1689)

8- 2 - (100-Luminaire): Reject

SUBMITTER: Gersil N. Kay, Conservation Lighting International Ltd.

COMMENT ON PROPOSAL NO: 8-1

RECOMMENDATION: The NEC and the ASHRAE/IESNA Standard 90.1-1999 should include the expression "luminaire or other lighting systems" throughout both documents. Then those creating the plans and specifications will be made aware of additional lighting tools at their disposal, even if the standard contains minimum requirements.

SUBSTANTIATION: As a second-generation commercial electrical contractor, the word luminaire has always meant a lighting fixture. In fact, that is the National Electrical Contractors' Association's understanding, too. However, the glossary of ASHRAE/IESNA Standard 90.1-1999 defines "luminaire" as a complete lighting system, which is something altogether different. Light pipe and glass fibre optics are lighting systems, not individual units with separate light sources. They are composed of a common light source, one or more light guides powered by it, and optional fittings to control the beam.

It is reported in CEE magazine that the 2002 National Electric Code is replacing the terms "fixture", "fixtures" and similar words with "luminaire" or "luminaires" throughout the code. The definition of luminaire includes the lamps, diffusers, reflectors, ballasts and similar parts of what have been commonly known as lighting fixtures, each with their own light source. This definition therefore excludes lighting systems which are much more energy efficient than traditional incandescent, fluorescent and halogen lamps.

If the goal of reducing energy consumption by 20% is to be reached, electrical contractors, architects, engineers, lighting and interior designers will have to be made aware of the more efficient lighting products that are to be used in conjunction with restrictive controls and wattage limitations.

PANEL ACTION: Reject.

PANEL STATEMENT: The term luminaire is consistent with the product standard and definition accepted for Article 100.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #1690)

9- 2 - (100-Luminaire): Reject
SUBMITTER: Gersil N. Kay, Conservation Lighting International Ltd.
COMMENT ON PROPOSAL NO: 9-1
RECOMMENDATION: The NEC and the ASHRAE/IESNA Standard 90.1-1999 should include the expression "luminaire or other lighting systems" throughout both documents. Then those creating the plans and specifications will be made aware of additional lighting tools at their disposal, even if the standard contains minimum requirements.
SUBSTANTIATION: As a second-generation commercial electrical contractor, the word luminaire has always meant a lighting fixture. In fact, that is the National Electrical Contractors' Association's understanding, too. However, the glossary of ASHRAE/IESNA Standard 90.1-1999 defines "luminaire" as a complete lighting system, which is something altogether different. Light pipe and glass fibre optics are lighting systems, not individual units with separate light sources. They are composed of a common light source, one or more light guides powered by it, and optional fittings to control the beam.

It is reported in CEE magazine that the 2002 National Electric Code is replacing the terms "fixture", "fixtures" and similar words with "luminaire" or "luminaires" throughout the code. The definition of luminaire includes the lamps, diffusers, reflectors, ballasts and similar parts of what have been commonly known as lighting fixtures, each with their own light source. This definition therefore excludes lighting systems which are much more energy efficient than traditional incandescent, fluorescent and halogen lamps.

If the goal of reducing energy consumption by 20% is to be reached, electrical contractors, architects, engineers, lighting and interior designers will have to be made aware of the more efficient lighting products that are to be used in conjunction with restrictive controls and wattage limitations.
PANEL ACTION: Reject.
PANEL STATEMENT: The inclusion of the words "or other lighting systems" does not add clarity to the Code. A self-contained luminaire is the only equipment appropriate for inclusion in Code-Making Panel 9 Articles, which focus on the impact of equipment weight and size on its supporting enclosures. Also, see action and statement on Comment 9-1.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1691)

10- 2 - (100-Luminaire):
Note: Based on the Technical Correlating Committee action on Proposal 10-1, the Technical Correlating Committee directs that Comment 10-2 be reported as "Reject".
SUBMITTER: Gersil N. Kay, Conservation Lighting International Ltd.
COMMENT ON PROPOSAL NO: 10-1
RECOMMENDATION: The NEC and the ASHRAE/IESNA Standard 90.1-1999 should include the expression "luminaire or other lighting systems" throughout both documents. Then those creating the plans and specifications will be made aware of additional lighting tools at their disposal, even if the standard contains minimum requirements.
SUBSTANTIATION: As a second-generation commercial electrical contractor, the word luminaire has always meant a lighting fixture. In fact, that is the National Electrical Contractors' Association's understanding, too. However, the glossary of ASHRAE/IESNA Standard 90.1-1999 defines "luminaire" as a complete lighting system, which is something altogether different. Light pipe and glass fibre optics are lighting systems, not individual units with separate light sources. They are composed of a common light source, one or more light guides powered by it, and optional fittings to control the beam.

It is reported in CEE magazine that the 2002 National Electric Code is replacing the terms "fixture", "fixtures" and similar words with "luminaire" or "luminaires" throughout the code. The definition of luminaire includes the lamps, diffusers, reflectors, ballasts and similar parts of what have been commonly known as lighting fixtures, each with their own light source. This definition therefore excludes lighting systems which are much more energy efficient than traditional incandescent, fluorescent and halogen lamps.

If the goal of reducing energy consumption by 20% is to be reached, electrical contractors, architects, engineers, lighting and interior designers will have to be made aware of the more efficient lighting products that are to be used in conjunction with restrictive controls and wattage limitations.
PANEL ACTION: Accept in Part.
In the wording in the Comment, the panel accepts the inclusion of the word "luminaire".

The panel does not accept the inclusion of the wording "or other lighting systems".
PANEL STATEMENT: See panel action and statement on Comment 10-1. Also, see the definition of "luminaire" located in the Fine Print Note of Section 410-1. The other types of lighting systems mentioned by the submitter are included in the present definition of "luminaire".
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #1692)

12- 2 - (100-Luminaire):
Note: The Technical Correlating Committee directs that the action on this Comment be reported as "Reject" to correlate with the action taken on Comment 1-83.
SUBMITTER: Gersil N. Kay, Conservation Lighting International Ltd.
COMMENT ON PROPOSAL NO: 12-1
RECOMMENDATION: The NEC and the ASHRAE/IESNA Standard 90.1-1999 should include the expression "luminaire or other lighting systems" throughout both documents. Then those creating the plans and specifications will be made aware of additional lighting tools at their disposal, even if the standard contains minimum requirements.
SUBSTANTIATION: As a second-generation commercial electrical contractor, the word luminaire has always meant a lighting fixture. In fact, that is the National Electrical Contractors' Association's understanding, too. However, the glossary of ASHRAE/IESNA Standard 90.1-1999 defines "luminaire" as a complete lighting system, which is something altogether different. Light pipe and glass fibre optics are lighting systems, not individual units with separate light sources. They are composed of a common light source, one or more light guides powered by it, and optional fittings to control the beam.

It is reported in CEE magazine that the 2002 National Electric Code is replacing the terms "fixture", "fixtures" and similar words with "luminaire" or "luminaires" throughout the code. The definition of luminaire includes the lamps, diffusers, reflectors, ballasts and similar parts of what have been commonly known as lighting fixtures, each with their own light source. This definition therefore excludes lighting systems which are much more energy efficient than traditional incandescent, fluorescent and halogen lamps.

If the goal of reducing energy consumption by 20% is to be reached, electrical contractors, architects, engineers, lighting and interior designers will have to be made aware of the more efficient lighting products that are to be used in conjunction with restrictive controls and wattage limitations.
PANEL ACTION: Hold.
PANEL STATEMENT: The submitter's comment includes new material that has not been subject to public review. Paragraph 4-4.6.2.2 of the NFPA regulations requires that this comment be held for processing as a proposal for the next revision cycle.

The submitter should recognize that his proposal is not in proper form and the panel suggests that he resubmit his recommendation indicating the exact wording suggested and where he feels it should be located in the NEC.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 9
NOT RETURNED: 2 Kelley, Laney

(Log #1693)

14- 2 - (100-Luminaire): Reject
SUBMITTER: Gersil N. Kay, Conservation Lighting International Ltd.
COMMENT ON PROPOSAL NO: 14-2
RECOMMENDATION: The NEC and the ASHRAE/IESNA Standard 90.1-1999 should include the expression "luminaire or other lighting systems" throughout both documents. Then those creating the plans and specifications will be made aware of additional lighting tools at their disposal, even if the standard contains minimum requirements.
SUBSTANTIATION: As a second-generation commercial electrical contractor, the word luminaire has always meant a lighting fixture. In fact, that is the National Electrical Contractors' Association's understanding, too. However, the glossary of ASHRAE/IESNA Standard 90.1-1999 defines "luminaire" as a complete lighting system, which is something altogether different. Light pipe and glass fibre optics are lighting systems, not individual units with separate light sources. They are composed of a common light source, one or more light guides powered by it, and optional fittings to control the beam.

It is reported in CEE magazine that the 2002 National Electric Code is replacing the terms "fixture", "fixtures" and similar words with "luminaire" or "luminaires" throughout the code. The definition of luminaire includes the lamps, diffusers, reflectors, ballasts and similar parts of what have been commonly known as lighting fixtures, each with their own light source. This definition therefore excludes lighting systems which are much more energy efficient than traditional incandescent, fluorescent and halogen lamps.

If the goal of reducing energy consumption by 20% is to be reached, electrical contractors, architects, engineers, lighting and interior designers will have to be made aware of the more efficient lighting products that are to be used in conjunction with restrictive controls and wattage limitations.
PANEL ACTION: Reject.
PANEL STATEMENT: The definition of "luminaire" as adopted by CMP 1 is consistent with this action.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #1694)

15- 2 - (100-Luminaire): Reject
SUBMITTER: Gersil N. Kay, Conservation Lighting International Ltd.
COMMENT ON PROPOSAL NO: 15-1
RECOMMENDATION: The NEC and the ASHRAE/IESNA Standard 90.1-1999 should include the expression "luminaire or other lighting systems" throughout both documents. Then those creating the plans and specifications will be made aware of additional lighting tools at their disposal, even if the standard contains minimum requirements.
SUBSTANTIATION: As a second-generation commercial electrical contractor, the word luminaire has always meant a lighting fixture. In fact, that is the National Electrical Contractors' Association's understanding, too. However, the glossary of ASHRAE/IESNA Standard 90.1-1999 defines "luminaire" as a complete lighting system, which is something altogether different. Light pipe and glass fibre optics are lighting systems, not individual units with separate light sources. They are composed of a common light source, one or more light guides powered by it, and optional fittings to control the beam.

It is reported in CEE magazine that the 2002 National Electric Code is replacing the terms "fixture", "fixtures" and similar words with "luminaire" or "luminaires" throughout the code. The definition of luminaire includes the lamps, diffusers, reflectors, ballasts and similar parts of what have been commonly known as lighting fixtures, each with their own light source. This definition therefore excludes lighting systems which are much more energy efficient than traditional incandescent, fluorescent and halogen lamps.

If the goal of reducing energy consumption by 20% is to be reached, electrical contractors, architects, engineers, lighting and interior designers will have to be made aware of the more efficient lighting products that are to be used in conjunction with restrictive controls and wattage limitations.
PANEL ACTION: Reject.
PANEL STATEMENT: A luminare is not a lighting system. Also refer to the panel action and statement on Comment 15-1.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 18
VOTE ON PANEL ACTION:
AFFIRMATIVE: 18
COMMENT ON AFFIRMATIVE:
KLEIN: 1. Luminaire is precisely defined by The Illuminating Engineering Society of North America as: "A complete lighting unit consisting of a lamp or lamps and ballast(s) (when applicable) together with the parts designed to distribute the light, to position and protect the lamps, and to connect the lamps to the power supply."
2. Optical fiber and "Light Pipe" are neither lighting systems nor luminaires, they are components of a luminaire.

(Log #1695)

16- 2 - (100-Luminaire): Reject
SUBMITTER: Gersil N. Kay, Conservation Lighting International Ltd.
COMMENT ON PROPOSAL NO: 16-1
RECOMMENDATION: The NEC and the ASHRAE/IESNA Standard 90.1-1999 should include the expression "luminaire or other lighting systems" throughout both documents. Then those creating the plans and specifications will be made aware of additional lighting tools at their disposal, even if the standard contains minimum requirements.
SUBSTANTIATION: As a second-generation commercial electrical contractor, the word luminaire has always meant a lighting fixture. In fact, that is the National Electrical Contractors' Association's understanding, too. However, the glossary of ASHRAE/IESNA Standard 90.1-1999 defines "luminaire" as a complete lighting system, which is something altogether different. Light pipe and glass fibre optics are lighting systems, not individual units with separate light sources. They are composed of a common light source, one or more light guides powered by it, and optional fittings to control the beam.

It is reported in CEE magazine that the 2002 National Electric Code is replacing the terms "fixture", "fixtures" and similar words with "luminaire" or "luminaires" throughout the code. The definition of luminaire includes the lamps, diffusers, reflectors, ballasts and similar parts of what have been commonly known as lighting fixtures, each with their own light source. This definition therefore excludes lighting systems which are much more energy efficient than traditional incandescent, fluorescent and halogen lamps.

If the goal of reducing energy consumption by 20% is to be reached, electrical contractors, architects, engineers, lighting and interior designers will have to be made aware of the more efficient lighting products that are to be used in conjunction with restrictive controls and wattage limitations.
PANEL ACTION: Reject.
PANEL STATEMENT: It is the understanding of the panel that the term "luminaire" is intended to be a direct replacement for and equivalent to the term "lighting fixture" and is not intended to denote a lighting system. Using the term "luminaire" to denote both a single fixture and a complete lighting system will become extremely confusing to users of the NEC.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21

(Log #1696)

17- 2 - (100-Luminaire): Accept in Part
SUBMITTER: Gersil N. Kay, Conservation Lighting International Ltd.
COMMENT ON PROPOSAL NO: 17-1
RECOMMENDATION: The NEC and the ASHRAE/IESNA Standard 90.1-1999 should include the expression "luminaire or other lighting systems" throughout both documents. Then those creating the plans and specifications will be made aware of additional lighting tools at their disposal, even if the standard contains minimum requirements.
SUBSTANTIATION: As a second-generation commercial electrical contractor, the word luminaire has always meant a lighting fixture. In fact, that is the National Electrical Contractors' Association's understanding, too. However, the glossary of ASHRAE/IESNA Standard 90.1-1999 defines "luminaire" as a complete lighting system, which is something altogether different. Light pipe and glass fibre optics are lighting systems, not individual units with separate light sources. They are composed of a common

light source, one or more light guides powered by it, and optional fittings to control the beam.

It is reported in CEE magazine that the 2002 National Electric Code is replacing the terms "fixture", "fixtures" and similar words with "luminaire" or "luminaires" throughout the code. The definition of luminaire includes the lamps, diffusers, reflectors, ballasts and similar parts of what have been commonly known as lighting fixtures, each with their own light source. This definition therefore excludes lighting systems which are much more energy efficient than traditional incandescent, fluorescent and halogen lamps.

If the goal of reducing energy consumption by 20% is to be reached, electrical contractors, architects, engineers, lighting and interior designers will have to be made aware of the more efficient lighting products that are to be used in conjunction with restrictive controls and wattage limitations.

PANEL ACTION: Accept in Part.

The panel accepts the inclusion of the term "luminaire" but not the part that would add the term "other lighting systems."

PANEL STATEMENT: The NEC does not dictate the type of light source to be used and does not preclude lighting systems of a nonelectrical nature. Refer to the panel action and statement on Comment 17-1.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:

AFFIRMATIVE: 15

(Log #1697)

18- 2 - (100-Luminaire):

Note: It was the action of the Technical Correlating Committee that this comment be reported as "Reject" to correlate with the action on Comment 1-83.

SUBMITTER: Gersil N. Kay, Conservation Lighting International Ltd.

COMMENT ON PROPOSAL NO: 18-1

RECOMMENDATION: The NEC and the ASHRAE/IESNA Standard 90.1-1999 should include the expression "luminaire or other lighting systems" throughout both documents. Then those creating the plans and specifications will be made aware of additional lighting tools at their disposal, even if the standard contains minimum requirements.

SUBSTANTIATION: As a second-generation commercial electrical contractor, the word luminaire has always meant a lighting fixture. In fact, that is the National Electrical Contractors' Association's understanding, too. However, the glossary of ASHRAE/IESNA Standard 90.1-1999 defines "luminaire" as a complete lighting system, which is something altogether different. Light pipe and glass fibre optics are lighting systems, not individual units with separate light sources. They are composed of a common light source, one or more light guides powered by it, and optional fittings to control the beam.

It is reported in CEE magazine that the 2002 National Electric Code is replacing the terms "fixture", "fixtures" and similar words with "luminaire" or "luminaires" throughout the code. The definition of luminaire includes the lamps, diffusers, reflectors, ballasts and similar parts of what have been commonly known as lighting fixtures, each with their own light source. This definition therefore excludes lighting systems which are much more energy efficient than traditional incandescent, fluorescent and halogen lamps.

If the goal of reducing energy consumption by 20% is to be reached, electrical contractors, architects, engineers, lighting and interior designers will have to be made aware of the more efficient lighting products that are to be used in conjunction with restrictive controls and wattage limitations.

PANEL ACTION: Hold.

PANEL STATEMENT: The submitter has introduced new material in his recommendation to add "other lighting systems" which has not had previous public review. The panel has placed this comment on hold in accordance with Section 4-4.6.2.2 of the NFPA Regulations Governing Committee Projects.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 10

VOTE ON PANEL ACTION:

AFFIRMATIVE: 10

(Log #1698)

19- 4 - (100-Luminaire): Reject

SUBMITTER: Gersil N. Kay, Conservation Lighting International Ltd.

COMMENT ON PROPOSAL NO: 19-1

RECOMMENDATION: The NEC and the ASHRAE/IESNA Standard 90.1-1999 should include the expression "luminaire or other lighting systems" throughout both documents. Then those creating the plans and specifications will be made aware of additional lighting tools at their disposal, even if the standard contains minimum requirements.

SUBSTANTIATION: As a second-generation commercial electrical contractor, the word luminaire has always meant a lighting fixture. In fact, that is the National Electrical Contractors' Association's understanding, too. However, the glossary of ASHRAE/IESNA Standard 90.1-1999 defines "luminaire" as a complete lighting system, which is something altogether different. Light pipe and glass fibre optics are lighting systems, not individual units with separate light sources. They are composed of a common light source, one or more light guides powered by it, and optional fittings to control the beam.

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If the goal of reducing energy consumption by 20% is to be reached, electrical contractors, architects, engineers, lighting and interior designers will have to be made aware of the more efficient lighting products that are to be used in conjunction with restrictive controls and wattage limitations.

PANEL ACTION: Reject.

PANEL STATEMENT: The accepted definition of Luminaire (by Panel 1) is proper within the context of NEC requirements. The definition does not exclude light pipe or fiber optic systems as they consist of a lamp and the parts to distribute the light, which is the language of the definition.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 8

VOTE ON PANEL ACTION:

AFFIRMATIVE: 8

(Log #1699)

20- 2 - (100-Luminaire): Reject

SUBMITTER: Gersil N. Kay, Conservation Lighting International Ltd.

COMMENT ON PROPOSAL NO: 20-1

RECOMMENDATION: The NEC and the ASHRAE/IESNA Standard 90.1-1999 should include the expression "luminaire or other lighting systems" throughout both documents. Then those creating the plans and specifications will be made aware of additional lighting tools at their disposal, even if the standard contains minimum requirements.

SUBSTANTIATION: As a second-generation commercial electrical contractor, the word luminaire has always meant a lighting fixture. In fact, that is the National Electrical Contractors' Association's understanding, too. However, the glossary of ASHRAE/IESNA Standard 90.1-1999 defines "luminaire" as a complete lighting system, which is something altogether different. Light pipe and glass fibre optics are lighting systems, not individual units with separate light sources. They are composed of a common light source, one or more light guides powered by it, and optional fittings to control the beam.

It is reported in CEE magazine that the 2002 National Electric Code is replacing the terms "fixture", "fixtures" and similar words with "luminaire" or "luminaires" throughout the code. The definition of luminaire includes the lamps, diffusers, reflectors, ballasts and similar parts of what have been commonly known as lighting fixtures, each with their own light source. This definition therefore excludes lighting systems which are much more energy efficient than traditional incandescent, fluorescent and halogen lamps.

If the goal of reducing energy consumption by 20% is to be reached, electrical contractors, architects, engineers, lighting and interior designers will have to be made aware of the more efficient lighting products that are to be used in conjunction with restrictive controls and wattage limitations.

PANEL ACTION: Reject.

PANEL STATEMENT: The action taken in Comment 20-1 maintains the word "fixture" as well as "luminaire". See panel statement for Comment 20-1.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 10

VOTE ON PANEL ACTION:

AFFIRMATIVE: 10

(Log #347)

1- 84 - (100-Metal Enclosed Power Switchgear): Accept
SUBMITTER: William T. Fiske, I T S North America
COMMENT ON PROPOSAL NO: 1-166
RECOMMENDATION: Do not change CMP-1 action to accept.
SUBSTANTIATION: The word, "may" in this context, is equivalent to, "could".
Proposed definition does not contain permissive language, so that, "shall be permitted" is not warranted.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #477)

1- 85 - (100-Metal Enclosed Power Switchgear): Accept
SUBMITTER: William T. Fiske, Intertek Testing Services
COMMENT ON PROPOSAL NO: 1-166
RECOMMENDATION: Do not change CMP 1 action to Accept.
SUBSTANTIATION: The word "may," in this context, is equivalent to, "could."
Proposed definition does not contain permissive language, so that, "shall be permitted," is not warranted.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #6)

1- 86 - (100-Metal-Enclosed Power Switchgear (New)): Accept
Note: The Technical Correlating Committee does not agree with the panel statement. Definitions can be modified, as necessary, to suit the document.
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 1-166
RECOMMENDATION: The Technical Correlating Committee directs the panel to review the use of the word "may" in accordance with 3.1 of the NEC Style Manual. This action will be considered by the Panel as a Public Comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
PANEL STATEMENT: The panel accepts the direction of the Technical Correlating Committee. However, since this definition originates with another standard, IEEE C37.20.2-1993, it is not appropriate to modify this definition in the NEC.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #907)

1- 87 - (100-Neutral (New)): Reject
SUBMITTER: David A. Kerr, Jr., Friendsville, PA
COMMENT ON PROPOSAL NO: 1-169
RECOMMENDATION: Accept in Principle.
SUBSTANTIATION: The panels are shirking their responsibility by refusing to define neutral. The term neutral does have meaning. A definition could say, "the use of the term neutral is deprecated because it is hard to define accurately and is routinely misused." You could give a list of permitted uses, then a list of incorrect uses. Such a list definition would not be elegant; it would be didactic. The code should serve as a training manual for qualified persons who use it but make mistakes because of foggy language. Don't force people to read between the lines. Don't try to write one incredibly long unbroken sentence to cover all possible electrical systems.
Please look at proposal 10-26a for 240-20(b). They use the word neutral. What does it mean?
PANEL ACTION: Reject.
PANEL STATEMENT: The comment does not contain proposed text as required by Section 4-4.5(c) of the Regulations Governing Committee Projects.
The substantiation describes definitions that are not suitable for inclusion in the NEC.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
ABSTENTION: 1
EXPLANATION OF ABSTENTION:
ANTHONY: Although a supporter of the original rejection, I have since been enlightened by the comments and by debate on the topic with other friends of the National Electric Code. A world-class document such as the NEC should contain more substantive information about a fundamental technical term which appears 80-odd times, even though there may be no "silver bullet" definition that fits neatly in this Article. The difficulty in doing a clean job of it is difficult, as the following excerpt from the Canadian Electrical Code shows:
"Neutral means that conductor (when one exists) of a polyphase circuit or single-phase, 3-wire circuit which is intended to have a voltage such that the voltage differences between it and each of the other conductors are approximately equal in magnitude and are equally spaced in phase (Appendix B)".
"Appendix B: By definition, a "neutral conductor" of a circuit requires that there be at least three conductors in that circuit. However, in the trade, the term "neutral conductor" is commonly applied to that conductor of a 2-wire circuit which is connected to a conductor that is grounded at the supply end. Care should therefore be used in the use of this term when applying the Code."
While neither the original proposal nor the following comments provided the silver bullet, this vote is intended to demonstrate sympathy with the submitters and the commenters. Perhaps the objective could be met with an annex or an appendix in a future version of the NEC.

(Log #1187)

1- 88 - (100-Neutral): Reject
SUBMITTER: Joe Tedesco, NTT Inc.
COMMENT ON PROPOSAL NO: 1-169
RECOMMENDATION: Please accept the proposal.
Define neutral as follows:
"Neutral. A grounded conductor having the same voltage to each ungrounded conductor of the same 3-wire, or 4-wire circuit."
SUBSTANTIATION: The definition is reasonable and is needed. The Panel comment does not address the question! The term "Neutral" should be defined, or it should be removed from the Code! Acceptance will settle the questions!
PANEL ACTION: Reject.
PANEL STATEMENT: Neither the comment nor the proposal is appropriate for the definition of "neutral" since a neutral is not necessarily a grounded conductor.
The submitter is incorrect. For example, one definition may be "a conductor of a circuit where the vectorial sum of the nominal voltages from all other conductors within a circuit with respect to it is zero." But the panel does not believe this definition or any definition proposed adds useability to the Code.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
ABSTENTION: 1
EXPLANATION OF ABSTENTION:
ANTHONY: See my Explanation of Absention vote on Comment 1-87.

(Log #248)

15- 3 - (100-On-Site Power Production Facility and Standby Power Production Faciltiy): Accept
SUBMITTER: R. Schneider, Joslyn Clark Controls, Inc.
COMMENT ON PROPOSAL NO: 1-173
RECOMMENDATION: This comment is to advise that the proposal has been processed to the proposer's satisfaction under Log #337 15-79 (695-2) and that no further action by Code-Making Panel 1 is required.
SUBSTANTIATION: Code-Making Panel 15 has processed this.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 18
VOTE ON PANEL ACTION:
AFFIRMATIVE: 18

(Log #7)

15- 4 - (100-On-Site Power Production Facility (New) and Standby Power Production Facility (New)): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 1-173
RECOMMENDATION: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 15 for consideration. This action will be considered by the Panel as a Public Comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
PANEL STATEMENT: The panel reaffirms its previous action on Proposal 15-79.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 18
VOTE ON PANEL ACTION:
AFFIRMATIVE: 18

(Log #556)

1- 89 - (100-Oven, Wall Mounted): Accept
SUBMITTER: Robert A. McCullough, Ocean County Construction Insp. Dept., NJ
COMMENT ON PROPOSAL NO: 1-174
RECOMMENDATION: Continue to accept the panel action to delete the definition.
SUBSTANTIATION: The panel statement is correct in that the term is commonly understood.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #746)

1- 90 - (100-Oven, Wall-Mounted): Accept
SUBMITTER: Robert M. Milatovich, Clark County
COMMENT ON PROPOSAL NO: 1-174
RECOMMENDATION: Code Making Panel 20, Task Group, supports the action of Code Making Panel 1 to delete the definition.
SUBSTANTIATION: CMP 20 Task Group Members: Robert Milatovic; George Anchales; Scott Cline; William King; Robert Egan; Donald Talka; James Pearce.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #1763)

1- 91 - (100-Panelboard): Accept
SUBMITTER: Jim Pauley, Square D Company
COMMENT ON PROPOSAL NO: 1-175
RECOMMENDATION: Revise the definition from the 1999 NEC to read as follows:
"Panelboard. A single panel or group of panel units designed for assembly in the form of a single panel; including buses, automatic overcurrent devices, and equipped with or without switches for the control of light, heat, or power circuits; designed to be placed in a cabinet or cutout box placed in or against a wall~~, or~~ partition, or other support, and accessible only from the front. "
SUBSTANTIATION: The definition as revised by the proposal is unacceptable. The previous definition provided clear guidance that panelboards could be in or on a wall. This clarity needs to be retained. The revision provided in this comment is to address the original submitter's concern by indicating that other supports besides walls are acceptable.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #449)

1- 92 - (100-Qualified Person): Accept in Principle
SUBMITTER: Joseph A. Tedesco, J A Tedesco Associates, Inc
COMMENT ON PROPOSAL NO: 1-178
RECOMMENDATION: Accept the panel action to revise the definition as follows:
"Qualified Person. One who has skills and knowledge related to the construction and operation of the equipment and has received safety training on the hazards involved."
SUBSTANTIATION: The person who has the skills and proper knowledge of the entire electrical system will have been trained to recognize the hazards, and knows how to operate equipment.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Comment 1-94.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
TROGLIA: I believe the panel should have accepted this comment. See my explanation of negative vote on Comment 1-94.

(Log #1445)

1- 93 - (100-Qualified Person): Reject
SUBMITTER: Kenneth E. Vannice, Rep. USITT
COMMENT ON PROPOSAL NO: 1-178
RECOMMENDATION: Amend the revised text as follows:
"Qualified Person. One who has skills and knowledge of the construction and operation of the equipment and who has knowledge of the applicable safety standards."
SUBSTANTIATION: The term "qualified persons" is used in various sections of the code. The term has different specific criteria in the different sections. Some sections specifically require "qualified persons" to perform electrical work of different types.
The panel's revised wording requires "training" but does not specify what this training is. Nor does it demonstrate that this training exists. It may possibly be mandating training where none exists. Or it may, inadvertently, mandate training of the wrong specific skills or knowledge. The phrase "training" is too open to interpretation and may cause confusion, possibly reducing, not increasing safety.
There are many types of specialized electrical work performed within the context of the NEC that do not have or need specific training such as would be given by a formal safety training program. These types of work instead rely on informal training such as on the job training and/or job experience. Many highly qualified electricians have received no "formal" training. The panel's revised wording, if taken to mean that formal training is mandatory, could prohibit the most qualified, and therefore safest, persons from performing the work.
Further, implicit in any requirement of training is the fact that certification of some kind would be necessary to verify that personnel have been trained. In the absence of specific certification programs, it is not practical or responsible to mandate "training".
Further, current OSHA regulations already prevail in this area, making the requirement of training by the NEC redundant.
PANEL ACTION: Reject.
PANEL STATEMENT: "Applicable safety standards" is too broad. Many users of the NEC would take that to include product safety standards. Knowledge of product safety standards is not needed for one to be a Qualified Person as defined in the Code.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #1544)

1- 94 - (100-Qualified Person): Accept
SUBMITTER: Michael J. Johnston, International Association of Electrical Inspectors
COMMENT ON PROPOSAL NO: 1-178
RECOMMENDATION: Revise Article 100 - Definition of Qualified Person.
Qualified Person. One who has the skills and knowledge related to the construction and operation of the electrical equipment and installations and has received safety training on the hazards involved.

Add the word "electrical" before "equipment" and "and installations" in the revised definition to clarify its coverage.
SUBSTANTIATION: I support the revision to this definition. Qualified person, as previously defined, was not specific enough. The revision to the definition is a good one and more in tune with the proposal (1-5) to delete 90-1(c), which was accepted by Panel 1. Inserting the term "has the training" in the definition of qualified person further emphasizes that 90-1(c) can be deleted. By adding the wording proposed in the comment will eliminate question as to the term equipment used by itself, although by definition it is clear how far reaching equipment should be.
PANEL ACTION: Accept.
PANEL STATEMENT: The panel does not necessarily agree with the submitter's substantiation.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
TROGLIA: I believe it may be necessary for a person to have skills and knowledge related to the construction and operation of other than specific electrical equipment, in the overall context of an installation, to be considered as "qualified". I am in agreement with the panel action on Proposal 1-178.
COMMENT ON AFFIRMATIVE:
ANTHONY: This change strengthens the NEC objective of promoting the safe use of electricity which I support. We should be alert to how the language of this change will play out in the risk management and code-training community, however.
IVORY: Definition of a qualified person was necessary for Article 100 and now we're specific that to be a qualified person, it requires related training in electrical equipment and installation, as well as safety training.

(Log #1888)

1- 95 - (100-Qualified Person): Accept in Principle
SUBMITTER: Michael I. Callanan, International Brotherhood of Electrical Workers
COMMENT ON PROPOSAL NO: 1-178
RECOMMENDATION: Continue to Accept this proposal in principle in part.
SUBSTANTIATION: The IBEW recognizes that this definition has been expanded to include existing federal OSHA regulations. We applaud the panel's action in recognizing the importance of safety training throughout our industry. We do not believe that there will be any financial burden to the employer, since safety training requirements have existed for over 25 years.
This comment represents the official position of the International Brotherhood of Electrical Workers Codes & Standards Committee.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Comment 1-94.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
TROGLIA: I believe the panel should have accepted this comment. See my explanation of negative vote on Comment 1-94.
COMMENT ON AFFIRMATIVE:
IVORY: The NEC will now require related electrical installation training to be a Qualified Person.

(Log #344)

1- 96 - (100-Remote -Control Circuit): Reject
SUBMITTER: William T. Fiske, I T S North America
COMMENT ON PROPOSAL NO: 1-181
RECOMMENDATION: Do not change CMP-1 decision to accept.
SUBSTANTIATION: The NEC 1999 definition matches the defined work, and in addition, is consistent with the definition of Motor Control Circuit in Section 430-71.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and substantiation on Comment 1-97.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #970)

1- 97 - (100-Remote Control circuit): Accept
SUBMITTER: Larry F. Miller, National Electrical Manufacturers Association (NEMA)
COMMENT ON PROPOSAL NO: 1-181
RECOMMENDATION: The Panel should reject this proposal.
SUBSTANTIATION: The word "remote" is necessary to avoid confusion as pointed out in the Panel 16 action on proposal 16-30. Many control circuits exist that are actuated locally or directly by means of push buttons or switches. Distance is not the issue as much as the concept that, for remote control, a relay or similar device actuates the circuit from a remote or external input.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #1122)

1- 98 - (100-Remote Control Circuit): Reject
SUBMITTER: Paul Dobrowsky, Holley, NY
COMMENT ON PROPOSAL NO: 1-181
RECOMMENDATION: The proposal should continue to be accepted.
SUBSTANTIATION: The definition of premises wiring uses the term "control wiring" and many other articles use the term "control circuit" to describe these types of circuits. Article 430 uses the term "motor control circuit" without the word remote. A control circuit at its connection point to a control transformer or Class 2 power supply inside an enclosure doesn't seem remote. The requirements applicable to control circuits do not change based on how far they are from the device, equipment, or system being controlled. A corresponding proposal has been submitted to Code-Making Panel 16.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and substantiation on Comment 1-97.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #8)

1- 99 - (100-Remote-Control Circuit): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 1-181
RECOMMENDATION: It was the action of the Technical Correlating Committee that further consideration be given to the comments expressed in the voting. This action will be considered by the panel as a public comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
PANEL STATEMENT: The panel accepts the direction of the Technical Correlating Committee to consider the comments expressed in the voting. See action and substantiation on Comment 1-97.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #474)

1- 100 - (100- Remote-control Circuit): Reject
SUBMITTER: William T. Fiske, Intertek Testing Services
COMMENT ON PROPOSAL NO: 1-181
RECOMMENDATION: Do not change CMP 1 decision to accept.
SUBSTANTIATION: The NEC 1999 definition matches the defined word, and in addition, is consistent with the definition of Motor Control Circuit in Section 430-71.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and substantiation on Comment 1-97.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #345)

1- 101 - (100-Service Point): Accept
SUBMITTER: William T. Fiske, I T S North America
COMMENT ON PROPOSAL NO: 1-185
RECOMMENDATION: Do not change CMP 1 decision to reject.
SUBSTANTIATION: Submitter's substantiation erroneously sets the cusp between 2 codes, namely the NESC and the NEC, rather than between the utility company and its customer, which is where it belongs.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
COMMENT ON AFFIRMATIVE:
TROGLIA: See my comment on vote on Comment 1-26a.

(Log #475)

1- 102 - (100-Service Point): Accept
SUBMITTER: William T. Fiske, Intertek Testing Services
COMMENT ON PROPOSAL NO: 1-185
RECOMMENDATION: Do not change CMP 1 decision to reject.
SUBSTANTIATION: Submitter's substantiation erroneously sets the cusp between 2 codes, namely the NESC and the NEC, rather than between the utility company and its customer, which is where it belongs.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #1350)

1- 103 - (100-Service Point): Reject
SUBMITTER: David P. Brown, Baltimore Gas and Electric Co/EEI
COMMENT ON PROPOSAL NO: 1-185
RECOMMENDATION: This Proposal should be Accepted as submitted.
SUBSTANTIATION: I don't agree with what the Panel has stated in their Panel Statement. I believe that this Proposal makes the definition of service point very clear in terms of which Code applies (NEC or NESC). Additionally, this change is needed to correlate with my recommendation to reject Proposal 1-10 and to accept Proposal 1-11.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel reaffirms its statement on Proposal 1-185. See panel action and statement on Comments 1-26a and 1-28.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
COMMENT ON AFFIRMATIVE:
TROGLIA: See my comment on vote on Comment 1-26a.

(Log #2006)

1- 104 - (100-Service Point): Reject
SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc.
COMMENT ON PROPOSAL NO: 1-185
RECOMMENDATION: Accept the proposal.
SUBSTANTIATION: This is a companion comment to a far more extensive one directed at Proposal 1-11. It allows for jurisdictional recognition of the use of the NESC in lieu of Article 225 in major industrial campuses that effectively function as their own utilities. The panel statement that this wording would not eliminate conflicts with the NESC is belied by consistent reports from major industrial entities to the effect that they insist on utilizing the NESC for their outdoor high and medium voltage distributions. Code-Making Panel 9, with good reason, credited such reports in its final action on the manhole rules in Article 370. These facilities need a clear method of demarcation, so the NESC will not be applied in areas where the NEC alone should apply. Every indication suggests that if this comment and its companion are accepted, the NESC Correlating Committee will fall into line with reciprocal language. This action is long overdue.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel reaffirms its statement on Proposal 1-185. See panel action and statement on Comments 1-26a and 1-28.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
COMMENT ON AFFIRMATIVE:
TROGLIA: See my comment on vote on Comment 1-26a.

(Log #346)

1- 105 - (100-Structure): Reject
SUBMITTER: William T. Fiske, I T S North America
COMMENT ON PROPOSAL NO: 1-188
RECOMMENDATION: Reject the proposal to add definition of structure.
SUBSTANTIATION: First the proposed definition is not different from common usage of the word, "structure" so there is no special NEC definition needed.
Second, the proposed definition is too broad. It would include, for example, drainage canals and dirt roads.
PANEL ACTION: Reject.
PANEL STATEMENT: Since the term structure is used many places in the Code, it is appropriate to define it in Article 100. Using the same definition as the 2000 International Building Code will help improve coordination among regulatory codes.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
TROGLIA: This comment should be accepted in principle. See my explanation of negative vote on Comment 1-107.

(Log #476)

1- 106 - (100-Structure): Reject
SUBMITTER: William T. Fiske, Intertek Testing Services
COMMENT ON PROPOSAL NO: 1-188
RECOMMENDATION: Reject the proposal to add definition of structure.
SUBSTANTIATION: First, the proposed definition is not different from common usage of the word, "structure," so there is no special NEC definition needed.
Second, the proposed definition is too broad. It would include, for example, drainage canals and dirt roads.
PANEL ACTION: Reject.
PANEL STATEMENT: Since the term structure is used many places in the Code, it is appropriate to define it in Article 100. Using the same definition as the 2000 International Building Code will help improve coordination among regulatory codes.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
TROGLIA: This comment should be accepted in principle. See my explanation of negative vote on Comment 1-107.

(Log #1608)

1- 107 - (100-Structure): Reject
SUBMITTER: Robert Molde, Xeel Energy
COMMENT ON PROPOSAL NO: 1-188
RECOMMENDATION: Proposal 1-188 should be Accepted in Principle; Proposal 1-189 should be Accepted.
SUBSTANTIATION: In many instances farms and similar facilities have their service equipment on a wood pole in the yard (see example in 230.21). A "pole" is placed in the ground or "erected". As such it is not built or constructed on the site.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Comment 1-105.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
TROGLIA: This comment should be accepted. I agree with the comment and Proposal 1-189.

(Log #1609)

1- 108 - (100-Structure): Reject
SUBMITTER: Robert Molde, Xeel Energy
COMMENT ON PROPOSAL NO: 1-189
RECOMMENDATION: Proposal 1-188 should be Accepted in Principle; Proposal 1-189 should be Accepted.
SUBSTANTIATION: In many instances farms and similar facilities have their service equipment on a wood pole in the yard (see example in 230.21). A "pole" is placed in the ground or "erected". As such it is not built or constructed on the site.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Comment 1-105.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
TROGLIA: This comment should be accepted. I agree with the comment and Proposal 1-189.

(Log #2007)

1- 109 - (100-Structure (new)): Hold
SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc.
COMMENT ON PROPOSAL NO: 1-188
RECOMMENDATION: Revise as follows:
"A combination of materials assembled at a fixed location to give support or shelter."
SUBSTANTIATION: This definition has a more descriptive quality that will not be misapplied to manufactured items placed as a unit. It conforms to the present BOCA definition, namely: "a combination of materials assembled at a fixed location to give support or shelter, such as a building, framework, retaining wall, tent, reviewing stand, platform, bin, fences over six feet high, sign, flagpole, recreational tramway, mast for radio antenna, or the like."
PANEL ACTION: Hold.
PANEL STATEMENT: The Panel concludes that this comment contains new material and desires to "hold" this comment. The panel desires that Proposal 1-188 continue to be accepted.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #2236)

1- 110 - (100-Subpanel): Reject
SUBMITTER: Andre R. Cartal, Bldg Dept., Princeton Borough, NJ
COMMENT ON PROPOSAL NO: 1-191
RECOMMENDATION: Please reconsider the proposal.
SUBSTANTIATION: I know that the term "subpanel" is not used in the NEC but that is the only document that does not use it. The term is used, printed, spoken, described, discussed, responded to at Seminars, at great length and providing this definition makes the NEC easier to understand and more user friendly.
PANEL ACTION: Reject.
PANEL STATEMENT: The Panel agrees with the submitter that the term is commonly used within the trade, but it is not used in the Code. Including a definition of "subpanel" in Article 100 is not essential to the proper application of the NEC.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

COMMENT ON AFFIRMATIVE:
ANTHONY: The commentor makes a good point. Perhaps a proposal might be made for a Fine Print Note for the 2005 edition, as other definitions have Fine Print Notes clarifying topical considerations.

ARTICLE 110 — REQUIREMENTS FOR ELECTRICAL INSTALLATIONS

(Log #9)

1- 111 - (110-1): Accept
Note: The Technical Correlating Committee advises that article scope statements are the responsibility of the Technical Correlating Committee and the Technical Correlating Committee accepts the Panel Action.
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 1-203a
RECOMMENDATION: The Technical Correlating Committee advises that Article Scope statements are the responsibility of the Technical Correlating Committee and the Technical Correlating Committee accepts the Panel Action. The Technical Correlating Committee directs that Code-Making Panel 1 correlate this Proposal with the information in the Technical Correlating Committee Note on Proposal 1-308. This action will be considered by the Panel as a Public Comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
Revise the scope statement in Section 110.1 to read as follows:
Scope. This article covers general requirements for the examination and approval, installation and use, access to and spaces about electrical conductors and equipment, and tunnel installations.
PANEL STATEMENT: The panel accepts the direction of the Technical Correlating Committee. The panel recognizes that the Technical Correlating Committee has responsibility over the scope of articles and submits the revised text for consideration and recommends approval of the proposed language. The panel understands that by action of the Technical Correlating Committee on Proposal 1-308, Part D, Tunnel Installations Over 600 Volts, Nominal, of Article 110 remains in Article 110.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #2089)

1- 112 - (110-1 (New)): Reject
SUBMITTER: Michael P. O'Quinn, MOGO Enterprises, Inc.
COMMENT ON PROPOSAL NO: 1-235
RECOMMENDATION: Revise text to read as follows:
110.1 Flash Protection Switchboards, panelboards, and motor control centers installed in other than residential occupancies shall be marked ~~in the field~~ to ~~indicate the~~ with one of the following:
(1) Incident energy in calories per square centimeter for a worker at a distance of 457 mm (18 in.).
FPN: See NFPA 70E-2000, Electrical Safety Requirements for Employee Workplaces, for calculation methods and charts related to incident energy.
(2) A sign readily visible stating the following:
THIS LOCATION IS A HAZARD RISK CATEGORY (0-4).
ALL PERSONS WITHIN 4 FEET OF THIS EQUIPMENT WHEN ENERGIZED MUST WEAR APPROPRIATE PERSONAL PROTECTIVE EQUIPMENT (PPE) ACCORDING TO THIS CATEGORY.
FPN: See NFPA 70E-2000, Electrical Safety Requirements for Employee Workplaces, Table 3-3.9.1 for Hazard Risk Category classification.
SUBSTANTIATION: 2-1.3.3 of NFPA 70E states that a Flash hazard analysis must be done before a person approaches any exposed electrical conductor or circuit part not placed in a safe work condition. 2-1.3.3.2 states how to determine the flash protection boundary (normally 4 feet when system is 600V or below), and 2-1.3.3.3 states that if work is performed within the flash protection boundary, a flash hazard analysis, documented by the employer, shall be done determining the incident energy exposure of the worker (in calories per square centimeter) based on the working distance.
But the last sentence of 2-1.3.3.3 states: "As an alternative, the PPE requirements of 3-3.9 of Part II shall be permitted to be used in lieu of the detailed flash hazard analysis approach described in 2-1.3.3.2 of Part II." This is the reason for the second option for marking.
If option (2) is used, the switchboard, panelboard, or motor control equipment, along with its voltage class and type of work to be done, will be used with Table 3-3.9.1 to determine the Hazard

Risk Category. Then 3-3.9.2 states Table 3-3.9.2 can be used to determine the protective clothing and other protective equipment needed.

It is important to note that Hazard Risk assessment and workplace safety are the responsibility of the employer, and have nothing to do with electrical installation. It is questionable whether this falls into the "practical safeguarding of persons and property" outlined in 90.1(A) of the NEC. Add to this the numerous alterations and changes that can be made to an electrical installation at the time of initial installation and after, and it becomes clear the employer, with the help of OSHA and NFPA 70E-2000, is totally responsible for this marking.

PANEL ACTION: Reject.

PANEL STATEMENT: The panel agrees with the submitter regarding the importance of providing warning of potential arc flash hazards, but concludes the action on Comment 1-152 is more approptiate for the NEC.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13

VOTE ON PANEL ACTION:

AFFIRMATIVE: 13

(Log #1390)

1- 113 - (110-3(a)(1), FPN): Reject

SUBMITTER: Kari Barrett, American Chemistry Council

COMMENT ON PROPOSAL NO: 1-205

RECOMMENDATION: Delete FPN.

SUBSTANTIATION: The panel rejected the proposal to add another method to determine suitability and stated in its substantiation that suitability is not limited to only listing and labeling. Removing the FPN will eliminate any implied or inferred limitation.

PANEL ACTION: Reject.

PANEL STATEMENT: The panel reaffirms its action to reject Proposal 1-205. The submitter has not provided information to support the recommendation in the comment. The Fine Print Note contains useful information to aid the approving authority.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

NEGATIVE: 1

EXPLANATION OF NEGATIVE:

PRICHARD: Eliminating the fine print note would remove any implied or inferred limitation to equipment suitability and add clarity to the code.

(Log #1017)

1- 114 - (110-3(b), FPN): Reject

SUBMITTER: Nicholas Ludlam, Factory Mutual Research

COMMENT ON PROPOSAL NO: 1-205a

RECOMMENDATION: Although I agree with the panel statement, I believe that the committee should accept the new FPN as originally proposed.

FPN: Installation instructions may be provided on a certificate supplied with the apparatus.

SUBSTANTIATION: In discussing the use of certificates with members of ISA SP12, which is one committee responsible for hazardous location product standards, one concern of users and the NRTLs, is that if a certificate is issued then it may include special conditions for safe use. These special conditions may not necessarily form part of the listing. By making a reference to a certificate in the NEC, it will bring to the attention of users that they should be looking at the instruction/installation manual and the certificate. Therefore, the addition of this FPN would close a potential loophole.

PANEL ACTION: Reject.

PANEL STATEMENT: All of the instructions issued by the supplier of a listed product, that relate to that product's suitability for installation and use per the NEC are "instructions included in the listing and labeling."

The authority having jurisdiction is responsible for approving conductors and equipment and has different methods of making that determination. The Panel is not convinced that the proposed language will benefit the AHJ beyond what is already provided in 110-3.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13

VOTE ON PANEL ACTION:

AFFIRMATIVE: 13

(Log #1188)

1- 115 - (110-3(c)): Reject

SUBMITTER: Joe Tedesco, NTT Inc.

COMMENT ON PROPOSAL NO: 1-207

RECOMMENDATION: Please accept the proposal as submitted.

SUBSTANTIATION: I agree with the negative vote to "Reject" action. Removal of unused circuits, is already covered elsewhere in the NEC where abandoned outlets are left. See Sections 354-7 and 356-7 and 358-13. The information in NFPA 1 is not difficult to understand, and should not be a problem to enforce.

PANEL ACTION: Reject.

PANEL STATEMENT: No additional technical substantiation has been provided for this proposed change. Sections 354-7, 356-7 and 358-13 all deal with a particular situation (spliced conductors in raceways) which is not the same as that described in rejected Proposal 1-207.

The panel disagrees with the explanation of the negative vote on Proposal 1-207 in that the proposed revision is a modest one.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

ABSTENTION: 1

EXPLANATION OF ABSTENTION:

ANTHONY: There seems to be some contradiction between the original proposal and the substantiation that appeared in the comment. In view of this situation, I have taken a neutral position on the voting but stand behind the justification given for my negative vote in the proposal stage. I believe that the electric power and telecommunication industry should migrate toward the practice of removing abandoned cables. At the moment, it may not be practical to establish this practice in a national standard such as the NEC. Friends of the NEC should know, however, that some local jurisdictions - the City of Chicago among them - already assert the requirement.

(Log #548)

1- 116 - (110-9): Reject

SUBMITTER: Robert B. Alexander, Fluor Daniel

COMMENT ON PROPOSAL NO: 1-211

RECOMMENDATION: Accept the proposal.

SUBSTANTIATION: The panel statement referring "complex systems design criteria" to Section 90-4 is precisely why "specific inclusion in the NEC" is necessary. My personal experience is that very few authorities having jurisdiction (AHJ) have the technical expertise necessary to determine that "equivalent objectives" have been "achieved by establishing and maintaining effective safety" in these cases.

As a Professional Engineer (PE), I am legally and ethically obligated to point out that these designs under consideration do not "technically" meet the "letter" of the NEC. Most AHJs will then take the most conservative approach. The fact that I am willing to seal the design and accept personal responsibility for it is rarely a consideration. The owners, operators, designers, manufacturers and installers of an installation all hold liability. In my primary state of licensure, I also hold personal liability in the designs I seal, as do most PEs in the US. Most AHJs cannot be held liable, personally or otherwise. (See new Section 80.29)

PANEL ACTION: Reject.

PANEL STATEMENT: No additional technical substantiation has been provided for this proposed change. Instead, the submitter's material indicates that issues of this design complexity would create enforcement problems if included in this Code. This issue best remains addressed through application of Section 90-4 since the proposal is only one of a number of possible approaches that may be judged to provide for equivalent safety.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13

VOTE ON PANEL ACTION:

AFFIRMATIVE: 13

COMMENT ON AFFIRMATIVE:

ANTHONY: The commentor makes a good point. Perhaps another place for this is sources (transformers) in parallel operation. See 450-7.

(Log #1460)

1- 117 - (110-9): Reject

SUBMITTER: Jim Brozek, Acton, MA

COMMENT ON PROPOSAL NO: 1-210

RECOMMENDATION: This proposal should be accepted. See action on Proposal 10-66 (Section 240-85). At the very least, an FPN as written by Panel 10 for Proposal 10-66 should be included.

SUBSTANTIATION: Single pole interrupting ratings for multi-pole circuit breakers may have tested interrupting ratings less than the marked 3-pole interrupting rating. See UL Standard 489.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel continues to support the action to reject and the panel statement on Proposal 1-210. The submitter has not provided any new substantiation.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #1469)

1- 118 - (110-9): Reject
SUBMITTER: Vincent J. Saporita, Cooper Bussmann
COMMENT ON PROPOSAL NO: 1-210
RECOMMENDATION: This proposal should be modified by changing "circuit breakers" to "overcurrent protective devices" in the first line and changing "circuit breaker" to "overcurrent protective device" in the third line. The modified proposal would then read: "Multi-pole overcurrent protective devices shall have a single-pole interrupting rating sufficient for the nominal circuit voltage and current that is available at the line terminals of the overcurrent protective device when utilized on corner grounded systems, resistance grounded systems, ungrounded systems and center point grounded delta systems."
SUBSTANTIATION: "Circuit breakers" needs to be changed to "overcurrent protective devices" because there are listed self-protected starters and listed manual motor controllers that are being used to meet requirements in Article 430. These devices, like circuit breakers, may have much lower interrupting capability when trying to interrupt full phase-to-phase voltage across only one pole, as can be the case in the various types of systems described in the proposal. For safety purposes, users need to realize that these multi-pole devices can violently explode when applied within their 3-pole interrupting rating, on other than solidly grounded wye systems. For further information, please refer to Proposal 10-66, which passed in Panel 10 by an 11 to 1 vote.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel continues to support the action to reject and the panel statement on Proposal 1-210. The panel does not agree with the statement that manual motor starters are overcurrent protection devices in the context of 110-9.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #2350)

1- 119 - (110-9): Reject
SUBMITTER: Paul S. Hamer, San Ramon, CA
COMMENT ON PROPOSAL NO: 1-211
RECOMMENDATION: The wording of the proposal should be accepted and added to the NEC.
SUBSTANTIATION: I agree with Mr. Floyd's negative comment. This is a practice that has proven to be safe as commonly applied in industry, and should be recognized as such in the NEC. An open transition can be much riskier from a process point of view.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Comment 1-116.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #2363)

1- 120 - (110-9): Reject
SUBMITTER: Mark Goodman, BP (ARCO)
COMMENT ON PROPOSAL NO: 1-211
RECOMMENDATION: Add the following text after the first sentence: "During the momentary paralleling of an automatically controlled power transfer, the single source condition interrupting rating shall be considered adequate provided there is no intentional time delay in the transfer and the parallel condition cannot be maintained".
SUBSTANTIATION: This comment supports the concept of the proposal, but suggests alternate language.
The condition identified in the proposal is common in double ended substation arrangements where maintaining power to the loads is critical for operation or system safety. It is also a common practice in generating stations where continuity of power flow may be required for public safety. These systems are designed for only a momentary parallel condition, typically only long enough for the closure of the paralleling breaker to initialize the opening of the designated breaker returning the system to single source configuration. During the brief parallel time (often only a few cycles), the short circuit rating of the switchgear feeder breakers may be exceeded. This added provision in 110-9 would recognize this arrangement and establish limitations under which it can be applied.
IEEE 666, Design Guide for Electric Power Service Systems for Generating Stations, section 4.6.1 specifically allows this arrangement and equipment rating.
The Explanation of Negative provided by Mr. Floyd is also supported in this comment.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Comment 1-116.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #1680)

1- 121 - (110-11): Reject
SUBMITTER: Gersil N. Kay, Conservation Lighting International Ltd.
COMMENT ON PROPOSAL NO: 1-214
RECOMMENDATION: All switchgear and other power supplying systems should be installed above grade so that water from manmade or natural disasters will not impeded operation of life safety equipment.
SUBSTANTIATION: In 1996, I sent two additions to the National Electric Code. At that time they were not included. They are more important now than ever.
PANEL ACTION: Reject.
PANEL STATEMENT: It is impractical to require that this type of equipment be installed above grade. Many buildings have portions of the structure located below grade and to prohibit this type of equipment from being located in those areas based on the possibility of a natural disaster is not justified. There has not been any technical substantiation provided.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #2233)

1- 122 - (110-12): Accept
SUBMITTER: Andre R. Cartal, Bldg Dept., Princeton Borough, NJ
COMMENT ON PROPOSAL NO: 1-218
RECOMMENDATION: This proposal should be rejected.
SUBSTANTIATION: This proposal, if accepted, places the responsibility for a torque inspection on the Electrical Inspector, even when these connections are energized as they are in the majority of installations or they are not accessible as in meter bases.
Section 110-14 (FPN) already covers the submitter's concerns.
PANEL ACTION: Accept.
PANEL STATEMENT:
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #1136)

1- 123 - (110-12(a)): Accept
SUBMITTER: Mark R. Berner, EEI/PPL Utilities
COMMENT ON PROPOSAL NO: 1-215
RECOMMENDATION: Code-Making Panel 1 should accept the proposal in principle, revised to reword 110.12(A) as follows:
"Unused cable or raceway openings in boxes, raceways, auxiliary gutters, cabinets, cutout boxes, meter socket enclosures, equipment cases, or housings shall be effectively closed to afford

protection substantially equivalent to the wall of the equipment. Where metallic plugs or plates are used with nonmetallic enclosures, they shall be recessed at least 6 mm (1/4 in.) from the outer surface of the enclosure."

If Code-Making Panel 1 accepts this comment, and conditional on such action, Code-Making Panel 9 advises Code-Making Panel 1 of its intent to delete 370.18 and to continue to accept Proposal 9-56, which deletes the current content of 373.4.

SUBSTANTIATION: This action avoids the problem of broadening the scope of this requirement beyond the present code in potentially unintended ways, while adhering to the proposal's concept of centralizing in a general article of the code what is truly a generic requirement. This concept, broadened to include Section 370.18, is in accordance with earlier NEC changes with the same objective. In addition, it accords with the Code-Making Panel 1 action in this code making cycle on Proposal 1-233, which also centralizes a generic requirement in one general code article.

The wording suggested in this comment includes the "cable or raceway" limitation now in Section 370.18, which was accepted by Code-Making Panel 9 in the 1996 cycle to prevent this rule from being applied to a weep hole in a wet location. In addition, this wording precludes the requirement from being mistakenly applied to ventilation openings or other openings that are a legitimate part of the equipment design. This wording also incorporates the clarifying wording accepted by Code-Making PanelP 9 in its action this cycle on Proposal 9-55 related to the positioning of metal closures in nonmetallic enclosures.

PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #1610)

1- 124 - (110-12(d) (New)): Reject
SUBMITTER: Robert Molde, Xeel Energy
COMMENT ON PROPOSAL NO: 1-218
RECOMMENDATION: Revise the Committee Action text as follows:

"(d) Terminations. Terminations for electrical connections to devices and equipment which are bolted shall be torqued as required by the manufacture of the electrical device or equipment."

SUBSTANTIATION: Torque requirements should only apply to bolted connections. A medium voltage load break separable insulated connector is not a bolted termination.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and substantiation on Comment 1-122.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #969)

1- 125 - (110-12(e) (New)): Accept
SUBMITTER: Larry F. Miller, National Electrical Manufacturers Association (NEMA)
COMMENT ON PROPOSAL NO: 1-218
RECOMMENDATION: The Panel should reject this proposal.
SUBSTANTIATION: The tightening torque specified for a particular product is often the result of the evaluation of the product in accordance with a product standard. The product standard has recognized the need to specify a tightening torque. As a result, the manufacturer provides the tightening torque information with the product. The FPN in 110-14 acknowledges this by stating that there are many terminations and equipment marked with torque values. Mr. Minick states in his Explanation of Negative that 110-3(b) currently instructs the installer to follow the manufacturer's instructions, which in the case of these products includes the tightening torque value. The result of applying the requirement in 110-3(b) is that any termination or equipment must be installed and tightened to the torque specified by the manufacturer. Consequently, Mr. Minick is accurate in his assertion that the additional wording of the new section is redundant.

This new section will also impose the need to provide recommended torque values for terminations for electrical connections for many products that do not now require a torque specification. Products such as wiring devices, connectors and couplings for conduit systems, ground and box cover screw connections and many other products are evaluated to product standards that do not require a marked tightening torque. These product standards contain test and construction requirements that take into account the conditions that the electrical connection will be exposed to in the field. The product standards have established that a marked tightening torque is not required to ensure proper installation of these products. These products have been safely installed for many years without the need to specify a tightening torque. There is no justification for the panel to adopt a new requirement that may impose a torque marking for these products.

Another aspect of the proposal that must be taken into consideration is that the submitter has not provided substantiation that any unsafe installations have resulted from the incorrect or improper tightening torque of electrical connections. The panel should not adopt a new section that may impose additional product requirements unless there is substantiation that indicates these new requirements will alleviate a problem.

PANEL ACTION: Accept.
PANEL STATEMENT: The panel does not necessarily agree with all of the substantiation.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #1551)

1- 126 - (110-12(e) (New)): Accept
SUBMITTER: Ravindra H. Ganatra, Alcan Cable
COMMENT ON PROPOSAL NO: 1-218
RECOMMENDATION: Recommend that this proposal be rejected.
SUBSTANTIATION: Although we agree with submitter's intent to ensure proper installation of terminations, we recommend that the Panel reject this recommendation. We agree and support the comment made by Mr. Minick in his negative vote. Proposal recommends a part of "how to" instead of "what" and it belongs in the manufacturer's instructions or other training manuals. If this recommendation is accepted then there will be a need to accept similar recommendation (on "how to") for compression conncetions and other similar items.
PANEL ACTION: Accept.
PANEL STATEMENT: The panel does not necessarily agree with all of the substantiation.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #1864)

1- 127 - (110-12(e)): Accept
SUBMITTER: Timothy M. Croushore, Allegheny Power
COMMENT ON PROPOSAL NO: 1-218
RECOMMENDATION: Code Making Panel 1 should reject the original proposal. The wording is redundant.
SUBSTANTIATION: I agree with Mr. Minick that Section 110-3(b) currently instructs users to follow all manufacturer's instructions included in the listing and labeling of listed and labeled equipment. The intent of the submitter is presently addressed in Section 110-14 and the Fine Print Note.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #1450)

1- 128 - (110-14): Reject
SUBMITTER: Eric Stromberg, The Dow Chemical Company
COMMENT ON PROPOSAL NO: 1-222
RECOMMENDATION: Terminations that are in a climate controlled atmosphere, where the conditions of maintenance ensure the reliability of the HVAC system, need not be considered in determining the ampacity of the conductor.
SUBSTANTIATION: In industrial plants, it is common to have motor control centers in air-conditioned buildings. The '99 code allows motor leads to be considered as 75 degree C terminations. If, however, the termination in the MCC room is not listed as 75

degree C, the 60 degree C column still needs to be used for conductor sizing (for circuits less than 100 amps). Practically speaking, because of the amount of air conditioning in these rooms, the terminations will never get close to the 60-degree rating. Adding this sentence will fulfill the intent of the '99 code in allowing the 75 degree C column to be used for sizing conductors for motors.
PANEL ACTION: Reject.
PANEL STATEMENT: Rules for determining conductor ampacity based on ambient temperature are located in Article 310. The substantiation provided by the submitter does not justify the recommended action.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #1988)

1- 129 - (110-14(a)): Reject
SUBMITTER: William F. Laidler, Rep. Massachusetts Electrical Code Advisory Committee
COMMENT ON PROPOSAL NO: 1-225
RECOMMENDATION: Revise the proposed sentence to read:
Where No. 10 stranded conductors are terminated on and not looped through such terminals, the terminals shall be identified for such use, or the strands at the terminals shall be made solid.
SUBSTANTIATION: The present substantiation for the proposal adequately addresses the concerns expressed in the panel statement. Limiting the proposal to address only No. 10 AWG conductors may receive a more favorable response, as surely members of the panel can relate to past personal experiences trying to tuck each and every strand (was 7 strands, now 19 strands) under a screw-head (sometimes nipping off a stray strand to avoid the future problem it could cause and wishing the time had been taken to tin the conductors).
PANEL ACTION: Reject.
PANEL STATEMENT: This substantiation does not address the panels objections as expressed in the 2002 NEC ROP. Those objections remain valid.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #904)

1- 130 - (110-14(c)(1)d): Reject
SUBMITTER: Charles B. Schram, Wilmette, IL
COMMENT ON PROPOSAL NO: 1-230
RECOMMENDATION: Accept the proposal.
SUBSTANTIATION: While the proposed language may appear to be redundant to 110-14(c)(1)(c) it is not because the language of 110-14(c)(1) limits the application to "only one of" (a), (b), (c) or (d). Therefore, (c) and (d) cannot both be applied. The proposed revision of (d) makes (c) also applicable - for the controller end - when (d) is applied - to the motor end. Another possible way to accomplish the intent would be to revise the last clause of 110-14(c)(1) to "shall be used for only one of (a), (b) or (c), or for both (c) and (d)."
PANEL ACTION: Reject.
PANEL STATEMENT: The provisions of Section 110-14 have to be applied to each termination in the circuit. The rule for motor terminations is specific and addressed in Section 110-14(c)(1)(d). The controller termination is addressed in Section 110-14(c)(1)(c). The panel reaffirms that the proposal would only provide redundant language within the same NEC Section.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #10)

1- 131 - (110-15 (New)): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 1-235
RECOMMENDATION: The Technical Correlating Committee directs the panel to change "residential" to "dwelling" to comply with current word usage. In addition, the Technical Correlating Committee directs the panel to use the proper metrication in the text. This action will be considered by the Panel as a Public Comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
PANEL STATEMENT: CMP-1 has incorporated the requested change from "residential" to "dwelling" in the panel action on Comment 1-152. Further, the need for metric units has been removed from the proposed Code text.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #581)

1- 132 - (110-15 (New)): Accept
SUBMITTER: C. John Beck, Pacific Gas & Electric Co.
COMMENT ON PROPOSAL NO: 1-233
RECOMMENDATION: CMP 4 Task Group recommends support for Accept in Part by CMP 1.
SUBSTANTIATION: A Task Group of CMP 4 members reviewed the material and action by CMP 1 on Proposal 1-233. The Task Group consisted of: John Beck; William Lewis; Tom Adams; Junior Owings, Floyd Ferris, Howard Hughes, and John Young. The members of the CMP 4 Task Group support the action taken by CMP 1 to Accept in Part Proposal 1-233, High-Leg Marking.
PANEL ACTION: Accept.
PANEL STATEMENT: See panel statement on Comment 1-136.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #603)

1- 133 - (110-15 (New)): Reject
SUBMITTER: John E. Propst, Equilon Enterprises, LLC
COMMENT ON PROPOSAL NO: 1-235
RECOMMENDATION: Revise as follows:
110-15 Flash Protection. For other than residential occupancies, the appropriate level of personal protective equipment shall be documented and made readily available for switchboards, panelboards, loadcenters and motor control centers ~~shall be marked in the field to indicate the incident energy in calories per square centimeter~~ for a worker at a distance of 18 in.
SUBSTANTIATION: The proposed revised text of the original proposal is attempting to correct two deficiencies. First, there are additional means of identifying the most appropriate level of PPE other than the calculated incident energy in calories per square centimeter. For example, a locations procedure for applying NFPA 70E may incorporate the PPE requirements by categories or layers. The second issue is related to the marking of PPE requirements directly on equipment. For some facilities utilizing modern methods of documentation, it may be more appropriate to document PPE requirements on one-line diagrams, equipment cross-section drawings, other computer databased systems. Having the requirements shown on the equipment, may actually hinder effective application of PPE because requirements will most likely change in time as we learn more about flash protection and the continued improvements in PPE by manufacturers. Permitting the definition of requirements on revisable documentation will permit the employer to keep accurate requirements as available PPE and system configuration changes.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Comment 1-152. Availability of PPE is not an installation issue, and cannot be covered by the NEC. This comment addresses an issue better dealt with by the Technical Committee on Electrical Safety Requirements for Employee Workplaces.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #971)

1- 134 - (110-15 (New)): Reject
SUBMITTER: Larry F. Miller, National Electrical Manufacturers Association (NEMA)
COMMENT ON PROPOSAL NO: 1-235
RECOMMENDATION: The Panel should reject this proposal.
SUBSTANTIATION: The proposed requirement cannot be accurately enforced and could actually reduce electrical safety. Personnel safety can only be assured when equipment is deenergized before performing any work. When personnel decide to work on a piece of energized equipment, there is a great deal of knowledge and expertise required. Attempting to mandate some energy marking on the equipment will lead to a false sense of security and will increase the hazard because personnel will become complacent about all of the other necessary requirements to perform safe work. Furthermore, this type of requirement will lead personnel to "gamble" by working on pieces of equipment with smaller energy numbers assuming that smaller energy calculations is "safer".

In order to ensure that proper safety procedures are followed, personnel should receive proper training about all of the requirements in NFPA 70E. Within NFPA 70E, the energy number calculations are a very small portion of the discussion and in fact relegated to an annex of 70E due to the controversy surrounding the calculation methods.

Enforcement in the wide and varied applications of the involved products will be impossible. The NEC is an installation document to be enforced by the authorities having jurisdiction. The authority having jurisdiction will have great difficulty in verifying the accuracy of the information that is required to be marked in the field. In fact, great confusion (and potential conflicts) will arise over the variety of calculation methods and the availability of verified information in order to make a reliable calculation.

As an additional hazard, it is noted that in performing a particular task, the electrician could be facing many different energy numbers within a lineup of electrical equipment. Thus each switchboard, panelboard, or motor control center in the same equipment room could have different ratings based upon the available fault current. Should maintenance personnel only review the "lower" number on many pieces of gear, improper equipment selection will result.

The panel is also encouraged to review Mr. Minick's "Explanation of Negative Comment" in the ROP.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel agrees with the concerns on enforcement and emphasizing other safe work practices, but concludes the action on Comment 1-152 is more appropriate for the NEC.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
COMMENT ON AFFIRMATIVE:
MINICK: NEMA continues to support the position that personnel safety can best be assured when equipment is de-energized before performing any work.

(Log #1005)

1- 135 - (110-15): Reject
SUBMITTER: Gil McGoldrick, Square D Company
COMMENT ON PROPOSAL NO: 1-235
RECOMMENDATION: The panel should reconsider and reject the proposal.
SUBSTANTIATION: We have much concern about the proposal and urge the panel to reconsider and reject the proposal. The proposal would require a field applied marking on switchboards, panelboards and motor-control centers to indicate the incident energy for a worker at a distance of 18 in. Presumably the objective is to attempt to have this available for workers that approach the equipment when it is energized. Unfortunately, the proposal is flawed in attempting to make this a requirement in the National Electrical Code. These flaws are outlined below.

1) NFPA 70E is a comprehensive document of electrical safety requirements. We have supported the development of those requirements and believe that industry can be better served if NFPA 70E were more widely adopted. However, in the concept of incident energy, NFPA 70E has found enough issues that the document itself does not support the calculations in other than an informative annex.

2) The incident energy number marked on a piece of equipment will mean little to the worker in the field. Unless that worker is intimately familiar with all the facets of NFPA 70E, improper assumptions about what the energy number indicates will be an issue and could lead to less safe working practices. If a worker is familiar with 70E to the extent necessary and they are attempting to select personal protective equipment (PPE), then the field selection methodology permitted in 2-1.3.3.3 of NFPA 70E referencing 3-3.9 will be used.

3) The application of the incident energy number by the contractor or initial installer is improper according to NFPA 70E. In order for this to be enforced by the authority having jurisdiction, the electrical contractor will face the burden of calculating the incident energy, and field marking the equipment. NFPA 70E is very clear in 2-1.3.3.3 that it is the responsibility of the employer to document the incident energy exposure or the worker. 70E allows the employer to choose doing either a detailed flash hazard analysis or use the simpler alternative of selecting the PPE from 3-3.9. NFPA 70E has always placed the burden of protection of the worker on the employer (and the worker him/herself). This NEC change attempts to place the burden on the installer and the authority having jurisdiction by forcing them to determine the "proper" energy marking.

4) Authorities having jurisdiction will have a most difficult time enforcing such a requirement. What is the proper calculation method? Of the many different methods being promoted, which one will the inspector allow or disallow? Who is responsible for ensuring that the marking remains accurate (changing OCP, transformer, etc.) all affect the marking? This will only introduce arguments on initial installation about which energy number is correct. Arguments that should not happen, since the employer is responsible for the documentation.

5) The marked incident energy number may not be appropriate for the particular field conditions. The marking would require a calculation at 18 in. What if the work being performed exposed the worker to live conductors closer than 18 in.? Is different gear required? Even the informative annex notes that the calculations are not valid for less than 18 in. (see B-5.1 and B-5.2 in NFPA 70E).

In summary, the efforts to make this a National Electrical Code requirement are out of place. We believe that NFPA 70E should be used by industry workers and it should be enforced by the employers. The NEC is an electrical installation document and cannot replace enforcement of all the proper working practices outlined in NFPA 70E. Attempts to require the markings by the NEC appear to be attempts to remove the responsibility from the employer. This should not be the objective of the NEC committee.

We also take this opportunity to remind the committee and the public, that the only safe approach to working on electrical equipment is to deenergize the equipment. Industry has yet to see an electrical worker electrocuted or burned from an arc flash while working on a piece of deenergized equipment.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel agrees with the concerns on enforcement and emphasizing other safe work practices, but concludes the action on Comment 1-152 is more appropriate for the NEC.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #1135)

1- 136 - (110-15 (New)): Accept
SUBMITTER: Mark R. Berner, EEI/PPL Utilities
COMMENT ON PROPOSAL NO: 1-233
RECOMMENDATION: The action on Proposal 1-233 should be accepted in part as originally indicated by Code-Making Panel 1 in the ROP.

If Code-Making Panel 1 accepts this comment, and conditional on such action, Code-Making Panel 9 advises Code-Making Panel 1 of its intent to delete 384.3(E).
SUBSTANTIATION: Code-Making Panel 1's action correctly addressed the general requirements. Such requirements belong in a general code article. The specific busbar arrangements for switchboards and panelboards belong in Article 384, and the CMP 1 action allows for that. These arrangements would remain in 384.3(F). The deletion of Section 384-3(E) in this context will not be new material since the action is contingent on exactly zero net change being made in the technical requirements for equipment within the scope of Article 384.

The deletion of Section 370.18 in this context will not be new material since the action is contingent on exactly zero net change being made in the technical requirements for equipment within the scope of Article 370.
PANEL ACTION: Accept.
PANEL STATEMENT: The panel concludes that the panel action on Proposal 1-233 should be reported as "Accept in Part" as

indicated in the Panel Action, and understands that there is an errata in the May 2001 NEC ROP for Proposal 1-233, first line, where this comment is reported as "accept in principle".
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #1219)

1- 137 - (110-15 (New)): Reject
SUBMITTER: Dann Strube, Lanesville, IN
COMMENT ON PROPOSAL NO: 1-125
RECOMMENDATION: This proposal should have been rejected.
SUBSTANTIATION: Mr. Minick is correct in his negative comment. This provision is unenforceable. With several calculation methods available, inspectors have no way to assure the values are accurate. NFPA 70E deals with safe work practices and so does this proposal. NFPA 70E already provides information on this issue and that document is, in fact, the proper place for requirements of this type.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel agrees with the concerns on enforcement and emphasizing other safe work practices, but concludes the action on Comment 1-152 is more appropriate for the NEC. The panel believes the submitter is addressing Proposal 1-235.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #1260)

1- 138 - (110-15): Reject
SUBMITTER: Larry T. Smith, National Electrical Seminars
COMMENT ON PROPOSAL NO: 1-235
RECOMMENDATION: Delete the following text:
110.15. Flash Protection. For other than residential occupancies, switchboards, panelboards, and motor control centers shall be marked in the field to indicate the incident energy in calories per square centimeter for a worker at a distance of 18 in.
SUBSTANTIATION: Please reconsider and reject this proposal.
Acceptance of this proposal will serve no purpose. It will not contribute to safety. It is unenforceable. It will drive a wedge between the National Electrical Code and adopting authorities.
Safe work habits and proper protective equipment are personal decisions. There is nothing to ensure that if electrical equipment is marked, as required by this proposed section, that a wireman will use the proper level of protective equipment. It's a simple fact that protective equipment should be worn at all times when work is performed on energized equipment without regard to available incident energy. This is a training issue, not a Code issue. The Code simply can't be all things for all people.
The requirement is unenforceable. This is an engineering calculation. One of the equation parameters involves bolted fault short circuit current which means that electric utilities also need to be involved in the process. Any subsequent alterations made by utilities in substations, transformers, or circuitry will affect the available incident energy.
Acceptance of this proposal will throw the industry into a state of turmoil never seen before. It's a reasonable assumption that many adoption authorities, both state and municipal, will delete the requirement in their Code adoption processes.
PANEL ACTION: Reject.
PANEL STATEMENT: The Panel disagrees with the submitter's contention that this proposed change will serve no purpose and that it will not contribute to safety. It is recognized that some people will make decisions that may not conform to recognized safety practices and that proper training is important. However, that personal decision should not deter the adoption of a rule that can help people protect themselves from a recognized hazard. See panel action and statement on Comment 1-152. Also, see the revised definition of qualified person in Comment 1-94.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #1461)

1- 139 - (110-15 (New)): Accept in Part
SUBMITTER: Thomas J. Garvey, Milwaukee, WI
COMMENT ON PROPOSAL NO: 1-235
RECOMMENDATION: Revise text as follows:
110-15. Flash Protection. For other than residential occupancies, switchboards, panelboards, loadcenters, industrial control panels, and motor control centers shall be marked in the field to indicate the incident energy in calories per square centimeter for a worker at a distance of 18 in.
SUBSTANTIATION: Electrical workers are routinely expected to troubleshoot the equipment supplied by industrial control panels. The equipment manufacturer provides a means for qualified persons to re-energize the system after the door(s) are opened. Many tasks such as current, voltage or waveform monitoring involve operation of the system with the door open. The supply to a control enclosure typically is as large as a panelboard, switchboard or motor control enclosure. The electrical workers should be given the same warning.
PANEL ACTION: Accept in Part.
The panel accepts the addition of the wording "industrial control panels." The panel rejects all other proposed wording.
PANEL STATEMENT: The panel agrees with that part of the substantiation to add industrial control panels. See panel action and statement on Comment 1-152.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #1543)

1- 140 - (110-15): Reject
SUBMITTER: Michael J. Johnston, International Association of Electrical Inspectors
COMMENT ON PROPOSAL NO: 1-235
RECOMMENDATION: Add the following new section:
110-15 Flash Protection. Switchboards, panelboards, and motor control centers installed in other than residential occupancies shall be marked to indicate the incident energy in calories per square centimeter for a worker at a distance of 18 in. (457 mm).
FPN: See NFPA 70E-2000, Electrical Safety Requirement for Employee Workplaces, for calculation methods and charts related to incident energy.
SUBSTANTIATION: I support the panel's decision to accept this proposal for the 2002 NEC. There are many issues relative to this proposal that warrant this. The statistics are enough to warrant the change as it will put another level of warning in place that will have an impact on injury counts. The NFPA 70E document already has the methods and means prescribed. This places emphasis on the fact that qualified persons should be familiar with the hazards involved. I do feel that this requirement will be difficult to enforce at first, as with many other new code requirements, but I disagree with the statement that it is "not enforceable" and having this requirement will improve levels of awareness and result in improved safety. This requirement not only has an affect on the workman, but also inspectors, and others that are involved examining, testing, etc. while equipment is energized. Many regions in the country have high levels of available short circuit current. It is understood that the incident energy calculation would be an adjustment, no question, but all new code requirements usually require an adjustment in some form or other. This change, together with the accepted change to the definition of qualified persons (ROP 1-178) will improve the safety for competent users of the NEC. It won't prevent unqualified persons from injuries that result from lack of understanding and training. I support this proposal.
PANEL ACTION: Reject.
PANEL STATEMENT: Including metric values is no longer necessary based on the panel action on Comment 1-152. See panel action and statement on Comment 1-152.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #1624)

1- 141 - (110-15 (New)): Reject
SUBMITTER: Gilbert L. Thompson, MEIA Codes and Standards
COMMENT ON PROPOSAL NO: 1-235
RECOMMENDATION: This proposal should be rejected. We realize that working on live or energized equipment is dangerous and special precautions should always be taken. Sections 110-26 through 110-59 are continually being revised to better protect

workers and others from these hazards. In fact, NFPA 70E - 2000 was designed to address the problem of electrical safety requirements for employee workplaces.
SUBSTANTIATION: We agree with the negative comment of Mr. Minick that if adopted, this new section would not be enforceable and will not provide improved electrical safety. In fact, it would take additional time to properly calculate and enforce this requirement for the field inspectors of most of the understaffed and overworked inspection authorities.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel concludes that the action taken on Comment 1-152 will add to safety. See panel action and statement on Comment 1-152.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #1727)

1- 142 - (110-15 (New)): Reject
SUBMITTER: Don Ganiere, Ottawa, IL
COMMENT ON PROPOSAL NO: 1-235
RECOMMENDATION: This proposal should be rejected.
SUBSTANTIATION: The proposal to require field markings on electrical equipment showing the "incident energy" will not add to electrical safety. Electricians who would understand the meaning of the "calores per square centimeter" would already know what protective equipment is required. Those who do not understand the term will just ignore the information as they now ignore the statement that say: "Turn off power before working on equipment". This proposal, if adopted, will have a large economic impact with little gain in safety.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel concludes that the action taken on Comment 1-152 will add to safety. See panel action and statement on Comment 1-152.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #1865)

1- 143 - (110-15): Reject
SUBMITTER: Timothy M. Croushore, Allegheny Power
COMMENT ON PROPOSAL NO: 1-235
RECOMMENDATION: Code Making Panel 1 should reject Proposal 1-235.
SUBSTANTIATION: The panel should have rejected this proposal. I agree with the negative comment of Mr. Minick. This requirement is not enforceable and will not improve electrical safety. Incident energy markings will not be understood in the field by the common electrical maintenance person. This proposal should have been given to Code Making Panel 9 for action/comment since the proposal deals with switchboards, panelboards and motor control centers.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel concludes that the action taken on Comment 1-152 will add to safety. See panel action and statement on Comment 1-152.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #2240)

1- 144 - (110-15 (New)): Accept in Part
SUBMITTER: Thomas J. Garvey, Milwaukee, WI
COMMENT ON PROPOSAL NO: 1-235
RECOMMENDATION: Revise text as follows:
110-15. Flash Protection. For other than residential occupancies, switchboards, panelboards, loadcenters, <u>industrial control panels,</u> and motor control centers shall be marked in the field to indicate the incident energy in calories per square centimeter for a worker at a distance of 18 in.
SUBSTANTIATION: Electrical workers are routinely expected to troubleshoot the equipment supplied by industrial control panels. The equipment manufacturer provides a means for qualified persons to re-energize the system after the door(s) are opened. Many tasks such as current, voltage or waveform monitoring involve operation of the system with the door open. The supply to a control enclosure typically is as large as a panelboard, switchboard or motor control enclosure. The electrical workers should be given the same warning.
PANEL ACTION: Accept in Part.
The panel accepts the addition of the wording "industrial control panels." The panel rejects all other proposed wording.
PANEL STATEMENT: The panel agrees with that part of the substantiation to add industrial control panels. See panel action and statement on Comment 1-152.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #2307)

1- 145 - (110-15 (New)): Reject
SUBMITTER: Kevin J. Lippert, Cutler- Hammer
COMMENT ON PROPOSAL NO: 1-235
RECOMMENDATION: The Proposal should be rejected.
SUBSTANTIATION: The inclusion of the proposed requirement could actually lead to less safe conditions. An "incident energy" value in "calories per square centimeter" would be meaningless to many people. Different numeric values would lead some to interpret a smaller number to mean that it would be "safer" for them to work on energized equipment without realizing that, amongst other things, NFPA 70E still requires the qualified person to:
(a) Have specified training to work on energized conductors or circuits parts
(b) Have a documented plan justifying the need to work that close
(c) Perform a risk analysis
(d) Have (b) and (c) approved by authorized management
(e) Use personal protective equipment appropriate for working on exposed energized conductors or circuit parts, and rated for the voltage and energy level involved.
The incident energy calculation is only a small portion of the many requirements needed when working on energized equipment. Safety can only be assured when all of the requirements in NFPA 70E are followed.
In the statement of the Affirmative, Mr. Anthony states: "Applying this proposal could also get much more complicated if investigations into comparative arc duration times of protective devices need to be investigated. Fault current distribution profiles may need to be determined in very large buildings." How can the authority having jurisdiction be expected to verify the accuracy of this information?
PANEL ACTION: Reject.
PANEL STATEMENT: The panel agrees with the concerns on enforcement and emphasizing other safe work practices, but concludes the action on Comment 1-152 is more appropriate for the NEC.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #544)

1- 146 - (110-16 Flash Protection): Accept in Principle
SUBMITTER: Ray A. Jones, Electrical Safety Consulting Services, Inc.
COMMENT ON PROPOSAL NO: 1-235
RECOMMENDATION: Panel action should have been accept in principle as it was; however, the principle should have been different. The new text should read as follows:
110.16 Flash Protection. Switchboards, panelboards, and motor control centers installed in other than residential occupancies shall be marked in the field to indicate if arc flash protective equipment is required to protect a worker when any door or cover is not fully closed.
FPN: See NFPA 70E-2000, Electrical Safety Requirements for Employee Workplaces, for assistance in determining if arc flash protection is needed to protect a worker from arc flash.
SUBSTANTIATION: Arc flash injury accounts for up to 80 percent of all injuries from a release of electrical energy. Electricians and other workers who may be exposed to arc flash injury must be warned if an arc flash hazard exists. As submitted, Proposal 1-235 was more restrictive than it should have been. Other methods exist to determine where an arc flash hazard exits or may exist. Section 110.16 should permit any calculation method that provides the necessary warning to workers.

PANEL ACTION: Accept in Principle.
PANEL STATEMENT: The panel concludes that the action on Section 1-152 meets the intent of the submitter.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #817)

1- 147 - (110-16 Flash Protection): Reject
SUBMITTER: Ralph Prichard, Bear, DE
COMMENT ON PROPOSAL NO: 1-235
RECOMMENDATION: Revise the text as follows:
"Flash Protection. Switchboards, panelboards, and motor control centers installed in other than residential occupancies shall be marked in the field to indicate the level of personal protection equipment ~~incident energy in calories per square centimeter~~ for a worker at a distance of 457 mm (18 in.).
SUBSTANTIATION: This will prevent many burn injuries.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Comment 1-152. This comment addresses an issue better dealt with by the Technical Committee on Electrical Safety Requirements for Employee Workplaces.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #1391)

1- 148 - (110-16 Flash Protection): Reject
SUBMITTER: Kari Barrett, American Chemistry Council
COMMENT ON PROPOSAL NO: 1-235
RECOMMENDATION: Revise the text as follows:
Flash Protection. Switchboards, panelboards, and motor control centers installed in other than residential occupancies shall be marked in the field to indicate the level of personal protection equipment ~~incident energy in calories per square centimeter~~ for a worker at a distance of 457 mm (18 in.).
SUBSTANTIATION: The level of personal protection equipment is more useful and meaningful to electricians working on the equipment.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Comment 1-152. This comment addresses an issue better dealt with by the Technical Committee on Electrical Safety Requirements for Employee Workplaces.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #1521)

1- 149 - (110-16 (New)): Reject
SUBMITTER: Michael P. O'Quinn, MOGO Enterprises, Inc.
COMMENT ON PROPOSAL NO: 1-235
RECOMMENDATION: Revise wording as follows:
Flash Protection. Switchboards, panelboards, and motor control centers installed in other than residential occupancies shall be marked ~~in the field~~ to indicate the incident energy in calories per square centimeter for a worker at a distance of 457 mm (18 in.) based on field conditions.
FPN (unchanged).
SUBSTANTIATION: This proposal appears to require the necessary information needed by a worker to safely perform electrical service around and on switchboards, panelboards, and motor control centers, if the information is coordinated with OSHA Standards and NFPA 70E in the use of protective clothing and practices.
But OSHA has maintained that worker safety is the responsibility of the building employer, specifically a safety officer. The wording of the proposal, using the phrase "...in the field...", appears to require the installing contractor to provide the labeling.
Not only is it questionable whether the information from the contractor will be correct at or after installation, the authority having jurisdiction may not be willing to add the resources to verify. The installing contractor may also be reluctant to add this legal liability. Add to that the normal field modifications and alterations that will be done to other than residential installations after the initial installation, and the initial label will be grossly incorrect, defeating the original attempt at worker safety.
By deleting the phrase "... in the field ..." and adding the comment "...based on field conditions", this requirement reverts to the building employer, based on OSHA policy. At the very least, this modification of the proposal will require a decision between the authority having jurisdiction, building employer, and OSHA on whose responsibility it will become.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel agrees with the concerns on enforcement and emphasizing other safe work practices, but concludes the action on Comment 1-152 is more appropriate for the NEC. The energy calculation requirement has been removed from the original proposal by the action of Comment 1-152.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #2008)

1- 150 - (110-16 (New)): Reject
SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc.
COMMENT ON PROPOSAL NO: 1-235
RECOMMENDATION: Reject the proposal.
SUBSTANTIATION: Although clearly well-intended, this proposal will convince the average Code user that the NEC has become the child of major industrial interests. The process for making these calculations involves higher-level mathematics even if certain assumptions are made, as covered in the NFPA 70E appendix. Making available fault calculations pushes the envelope of what is possible, but this sends the average user over the edge. Major industrial facilities have the engineering support to make this feasible, but only within such facilities.
The larger issue, however, is whether we need to so sanitize our work practices that injury becomes virtually impossible. As a former staff electrician at a college, I recall a campus-wide pay study at the time that was used to reclassify all staff pay grades from secretaries to plumbers a component of the calculations was the degree of personal risk involved in the job responsibilities. Without question, electricians received all 20 of the possible points for this element of our jobs, and that was instrumental in raising our pay grades relative to other staff.
Arc blasts happen and we need to be aware of them and take appropriate precautions. However, there is a point of diminishing returns for what will be an enormous investment in time and protective equipment for very little return. I remember when the 70E Committee opened this subject in prior revision to that standard, which I voted against at the NFPA Fall Meeting for just this reason. I was a part-time inspector at the time, usually making inspections after hours. I remember opening a meter socket afterwards as part of a service inspection (I always bring tools to every inspection), and saying to myself, sarcastically, "Golly. Here I am, violating 70E because I don't have a moon suit on. I guess I should get the utility to come and deenergize the building just so I can look inside this meter socket." Right.
If the major industrial interests, with their greater liability exposure and engineering support, want to so organize their work forces, more power to them, and I wish them every success. However, this is too much for everyday applications.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel believes that its action on Comment 1-152 will increase safety.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #2255)

1- 151 - (110-16): Reject
SUBMITTER: Noel Williams, Noel Williams Consulting
COMMENT ON PROPOSAL NO: 1-235
RECOMMENDATION: This proposal should be rejected.
SUBSTANTIATION: The proposal creates an unenforceable rule. As noted in panel comments (both negative and affirmative) accurate values are not easily obtained or confirmed by inspection. Some variables can only be estimated and may change or may vary from time to time or under different conditions. Furthermore, only a small portion of hazards are addressed anyway. The same hazards may exist at disconnects and controllers, among others.

PANEL ACTION: Reject.
PANEL STATEMENT: The panel agrees with the concerns on enforcement, but concludes the action on Comment 1-152 is more appropriate for the NEC.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #2296)

1- 152 - (110-16 (New)): Accept in Principle
SUBMITTER: Michael I. Callanan, International Brotherhood of Electrical Workers
COMMENT ON PROPOSAL NO: 1-235
RECOMMENDATION: Accept this proposal in principle. Revise Section 110-16 to read as follows:

110.16 Flash Protection. Switchboards, panelboards, and motor control centers, having a short-circuit current rating, in excess of 20,000 amperes shall be marked with the following label:
Warning!
Electrical Arc Flash Hazard.
Serious Injury or Death.
Use Appropriate Level of Personal Protective Equipment.

FPN No. 1: See NFPA 70E-2000, Electrical Safety Requirements for employee workplaces, for assistance in determining what level of arc flash protection is needed to protect a worker from arc flash.

FPN No. 2: See ANSI Z535-1998 Standards for guidelines for the design of safety signs and labels for application to products.

SUBSTANTIATION: Over the past 10 years there have been a dramatic increase in the awareness of the hazards associated with electrical arcs, blasts and flashes. The IBEW supports any effort to further increase this understanding. Specifically, the NEC should include a link to the safety requirements contained in NFPA 70E "Standard for Electrical Safety Requirements for Employee Workplaces, 2000 Edition". The original proposal is a first step, a major step in the right direction. But it does have some issues that need to be clarified. The largest being the complexity of the calculation required to determine incident energy levels in calories per square centimeter for a worker at a distance of 18 in.

Our experience indicates that workers need to understand the level of personal protective equipment necessary to safely work on or near switchboards, panelboards, MCCs. We have experienced several major injuries and fatalities where workers encountered significant arc blasts and flashes performing "routine" tasks.

One such accident is documented in the video "Once the Arc Begins." Both workers were subjected to an arc blast from a 120/208 meter socket while attempting to check voltage. The video captures the devastating effects of the blast. The most significant aspect of this case study was that the workers believed they were adequately protected when in fact, their PPE failed to protect them against 1st, 2nd and 3rd degree burns.

This proposal is a compromise intended as a first step towards creating the bridge between NFPA 70 and NFPA 70E. The proposed revision accomplishes several things.

A. It establishes a standard warning to be placed on all switchboards, panelboards and MCCs. The warning label has been designed in accordance with ANSI Z535-4-1998 "Product Safety Signs and Labels". Section 4.13.2 states that the word "warning" should be used to "indicate a potentially hazardous situation which, if not avoided, could result in death or serious injury." In addition, the label 1) states the hazard (Electrical Arc Flash), 2) Tells how to avoid the hazard (Use appropriate level of PPE) 3) identifies the consequence (Serious injury or death).

B. The proposal solves the problem of how the marking is to be accomplished. The manufacturer of the equipment will be required to provide the marking. The wording proposed does not require any specific calculation or determination as to the extent of the potential arc flash nor does it require the manufacturer to make a determination they are not capable of doing. Some may see this as a product standard requirement but it is an important step for worker safety and it falls within the stated purpose of the Code. In addition, the Code currently contains many provisions for marking and warning labels. These requirements are for both field and factory provided markings and labels. For example Section 690-10(c) reads as follows:

Single 120-Volt Supply. The inverter output of a stand-alone solar photovoltaic system shall be permitted to supply 120 volts to single-phase, 3-wire 120/240-volt service equipment or distribution panels where there are no 240-volt outlets and where there are no multiwire branch circuits. In all installations, the rating of the overcurrent device connected to the output of the inverter shall be less than the rating of the neutral bus in the service equipment. This equipment shall be marked. WARNING – SINGLE 120-VOLT SUPPLY – DO NOT CONNECT MULTIWIRE BRANCH CIRCUITS!

In addition to this section, see also section, 424-92, 490-21(b)(7), 520-53(k), 530-22(a), 530-73, 620-3(a), 620-52, and 690-17.

C. The proposal includes two FPNs. The first will provide the link to NFPA 70E and in doing so provide information as to the "appropriate level of personal protective equipment." The second will reference the ANSI Z535-1998 Standards which provide information regarding the design of the warning label. This provision simply states the words that must be included. The rest of the sign design is performance oriented and the ANSI series can provide guidance for the sign.

D. The proposal removes the direct exclusion for "residential occupancies." The manufacturer will not know where the panelboard will end up. However, it does limit the labeling requirement to those built to a short-circuit rating in excess of 20,000 amperes. Most panelboards constructed for residential application will be exempt from this requirement because they are constructed with short-circuit current ratings below 20,000 amperes.

The IBEW will support any effort which helps to identify and acknowledge the increasing problem of electrical arc blasts and flashes. We hope that this proposal moves the NEC in that direction. This comment represents the official position of the International Brotherhood of Electrical Workers Codes & Standards Committee.
PANEL ACTION: Accept in Principle.
Revise Section 110.16 to read as follows:
110.16 Flash Protection. Switchboards, panelboards, industrial control panels, and motor control centers in other than dwelling occupancies, that are likely to require examination, adjustment, servicing, or maintenance while energized, shall be field marked to warn qualified persons of potential electric arc flash hazards. The marking shall be located so as to be clearly visible to qualified persons before examination, adjustment, servicing, or maintenance of the equipment.

FPN No. 1: NFPA 70E-2000, Electrical Safety Requirements for Employee Workplaces, provides assistance in determining severity of potential exposure, planning safe work practices, and selecting personal protective equipment.

FPN No. 2: ANSI Z535.4-1998, Product Safety Signs and Labels, provides guidelines for the design of safety signs and labels for application to products.

PANEL STATEMENT: The panel concludes that requirements for warning of potential electrical hazards are within the purpose of the NEC, and agrees with the need to warn qualified persons of the potential of arc flash hazards in non-dwelling locations. However, the panel wants to emphasize the importance of de-energization and implementation of safe work practices outlined in NFPA 70E, in addition to recommending the use of appropriate personal protective equipment. The panel believes that the revised wording meets the intent of the submitter.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
ABSTENTION: 1
COMMENT ON AFFIRMATIVE:

FLOYD: In addition to raising user awareness of electric arc flash hazards, Code-Making Panel 1's action on 1-152 will also serve to stimulate innovation and advancements in product and system designs that reduce or mitigate the hazard. For example, in the past 5 years, the major US manufacturers of medium voltage switchgear have introduced advancements in designs listed as arc resistant. Increasing market demands to address this hazard through similar technology advancements will reduce the equipment installations needing warning labels as required by section 110-16.

IVORY: I concur with Mr. Callanan's original proposal which would add additional safety measures to this proposal, however, Panel 1 has taken a big step in recognizing the needs to require appropriate warnings of electrical hazards and to strongly suggest the need for using appropriate equipment when working in an energized system.

MINICK: NEMA continues to support the position that personnel safety can best be assured when equipment is de-energized before performing any work.

STAUFFER: NECA's affirmative vote indicates support for the concept of improving safety for electricians and contractors. However, it does not indicate support for either Proposal 1-235 or the Panel's Accept in Principle action on Public Comment 1-152. Both the proposal and comment are, in our judgment, seriously flawed and would not improve safety for

electricians/contractors in any realistic way. The reasons are as follows:

QUALIFIED PERSON. The wording proposed for new Section 110.16 talks about marking "to warn qualified persons of potential electric arc flash hazards." However, a Qualified Person is defined in Article 100 as "one familiar with the construction and operation of the equipment and the hazards involved." This makes the proposed requirement for warning language redundant.

FIELD MARKED. This would appear to require that the installer shall furnish the warning sign. But the sign wording is not specified; who decides what it should say? How effective can unstandardized warning language be in minimizing hazards? Who will bear the liability for this potentially ineffective warning language—the equipment's manufacturer, installer, or owner?

RESPONSE - COMPLIANCE. Since the wording is unspecified, what constitutes compliance or a safe and adequate response? How would an electrician or contractor decide what level of work practice or personal protective equipment (PPE) was appropriate in a particular field situation? Overly cautious lawyers, insurance companies, etc. might interpret this new Section 110.16 as requiring PPE for any "maintenance" procedure, including re-setting a tripped circuit breaker or replacing a screw-in fuse.

LOCATION NOT SPECIFIED. Where does the warning sign go—on the outside of the equipment, or inside the first door or cover? If installed outside, such signs may well be painted over or removed by users, particularly where panelboards are located in finished building areas. If installed inside the equipment, such signs will be seen only by Qualified Persons, who should already be aware of the hazards associated with electrical equipment and the proper precautions for minimizing these hazards.

INEFFECTIVENESS. Marking is the least effective way of trying to prevent hazards. If warning signs are almost universally required by a new Section 110.16, they will soon lose their impact and be almost universally ignored.

SCOPE CONFLICT. The subject of warning installers about electric arc flash hazards in order to motivate safety work practices is not within the scope of the National Electrical Code. Safety-related work practices, hazard risk category classifications, personal protective equipment, and information on electric arc flash hazards are covered in great detail by NFPA 70E-2000, Electrical Safety Requirements for Employee Workplaces. These complex subjects cannot be adequately covered, in a way that will improve safety, by two sentences and an informational Fine Print Note in the NEC.

EXPLANATION OF ABSTENTION:

ANTHONY: Even with the modifications to the original proposal, this change to the NEC may have unintended consequences for manufacturers, for building owners and for persons in the risk management community. While our support for electrician safety is unconditional, the practical details and the practical effects of this proposal needs more study.

(Log #284)

1- 153 - (110-22):

Note: The Technical Correlating Committee directs that this Comment and Proposal 1-237 be reported as "Reject" to correlate with theTechnical Correlating Committee action on Comment 10-58 and Proposal 10-67.

SUBMITTER: James T. Dollard, Jr., IBEW Local Union 98
COMMENT ON PROPOSAL NO: 1-237
RECOMMENDATION: Continue to accept in principle.
SUBSTANTIATION: This comment is the work of a Task Group assigned to address the request of CMP 1 for response from CMP 10 on the panel action to accept in principle Proposal 1-237. The Task Group consisted of the following members of CMP 10. Chair, Jim Dollard; John Brezan; Carl Fredericks; Clive Kimblin; Charles Eldridge; George Gregory; George Ockuly and Vince Saporita.

This Task Group accepts the Panel 1 Action to "Accept in Principle" contingent on the continued acceptance of Proposal 10-67.

PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #1781)

1- 154 - (110-22): Reject
SUBMITTER: Alan Manche, Square D Co.
COMMENT ON PROPOSAL NO: 1-241
RECOMMENDATION: The panel should reconsider this proposal and accept the original proposal that adds the words "or equivalent."
SUBSTANTIATION: Product manufacturers are going to mark the product for the appropriate hazards and comply with the ANSI Z535 standards. The explicit nature of the present wording in the NEC establishes conflict between the NEC marking restrictions and the required hazard markings outlined in ANSI Z535.4

The objective of the NEC wording is to generally convey the basic message requirement to the user. However, in order to comply with Z535.4, the exact words stated in the NEC may not be appropriate for the contemplated circumstances. Revising the text to allow "or equivalent" would permit a hazard sign to comply with the NEC and be formatted in accordance with Z535.4.

Similar proposals were submitted to a number of code panels. Panels 3, 9, 14 &15 have accepted the addition of the words "or equivalent," and panel 13 has accepted the proposal in principal and revised the marking requirements to warn of the hazard without establishing specific wording and permitting compliance with the ANSI Z535 set of standards. The panel may want to review and consider the action taken by Code-Making Panel 13 in proposal 13-25.

Most importantly, the panel needs to take action in order to reconcile the conflict between the NEC and the ANSI Z353 standards by accepting the proposal.

PANEL ACTION: Reject.
PANEL STATEMENT: The panel rejects the term "equivalent" as there is an explicit need for a specific marking that both identifies the ampacity rating of the series combination overcurrent system and that specifically notifies an installer that rated replacement components are required. The addition of the term "or equivalent" could lead to markings that are not as clear as the present wording and it is the intent of the panel that a clear and concise informational marking such as that being currently required be placed on series combination rated overcurrent equipment.
The Code does not prohibit additional markings or similar informational signs deemed necessary by a manufacturer, designer, engineer, or installer. In addition, the panel reaffirms that the word "equivalent" is considered a vague and unenforceable word according to Section 3.2.1 of the NEC Style Manual.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

Note: The sequence no. 1-155 was not used.

(Log #479)

1- 156 - (110-26(a)(1) Exception Nos. 1 through 3): Reject
SUBMITTER: William T. Fiske, Intertek Testing Services
COMMENT ON PROPOSAL NO: 1-252a
RECOMMENDATION: Restore the exceptions, as shown in 1999 NEC.
SUBSTANTIATION: Proposal 1-252a is one of several instances where an attempt to use positive language has resulted in code rules that are less clear than before.

Reverting to 1999 language makes it clear that Table 110-26(a) applies, but is modified by 3 exceptions.

PANEL ACTION: Reject.
PANEL STATEMENT: No substantiation has been provided to explain what parts of this rule the submitter believes are less clear as a result of the change to positive language and fewer exceptions, as required by the NEC Style Manual.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #888)

1- 157 - (110-26(c)): Reject
SUBMITTER: Mike O'Meara, Arizona Public Service Co.
COMMENT ON PROPOSAL NO: 1-264
RECOMMENDATION: I disagree with the code panel action to reject this proposal. Many outdoor service equipment installations are located in areas that are partially enclosed to "hide" the service equipment. If the additional 24 in. space is not required beyond the open NEMA 3R doors of the equipment, the worker can become trapped in an area with no means of escape.
SUBSTANTIATION: By requiring the additional 24 in. of space to maintain the means of egress, an emergency exit path can be maintained at all times. This will eliminate problems in many jurisdictions that consider the "normal" condition of the equipment (with the doors closed) to meet the NEC minimum requirements.

PANEL ACTION: Reject.
PANEL STATEMENT: The submitter has not provided sufficient substantiation to require this change.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
COMMENT ON AFFIRMATIVE:
HITTINGER: Even though this proposal has been rejected by the code panel, I do feel the submitter has a valid point with regard to a clear means of access and egress while hinged doors or panels are in the open position. Under normal operating conditions this is not an issue, however, during an emergency a clear path is essential and could save lives.

(Log #1063)

1- 158 - (110-26(c)): Reject
SUBMITTER: Lanny McMahill, Rep. IAEI SW Section
COMMENT ON PROPOSAL NO: 1-267
RECOMMENDATION: Accept the proposal as submitted.
SUBSTANTIATION: A 24 in. clear space should be maintained at all times to access or egress from the working space. Equipment doors should not be permitted to block this clear space.
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter has not provided sufficient substantiation to require this change.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #1100)

1- 159 - (110-26(c)): Accept
SUBMITTER: Francis C. Pologruto, MacDonald Electric Co./Rep. IBEW
COMMENT ON PROPOSAL NO: 1-260a
RECOMMENDATION: I support this proposal.
SUBSTANTIATION: This proposal will assure personnel workers in an electrical room, that they will be able to exit the room with a simple pressure on the panic bar, instead of using their hands, especially if they were injured. This proposal has been submitted in the last 3 code cycles, and finally Code-Making Panel 1 has agreed to have panic hardware on electrical room doors, that have switch gear rated 1200 amps or more!
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #1889)

1- 160 - (110-26(c)): Accept
SUBMITTER: Michael I. Callanan, International Brotherhood of Electrical Workers
COMMENT ON PROPOSAL NO: 1-260a
RECOMMENDATION: Continue to Accept this proposal.
SUBSTANTIATION: The ability to exit these areas using swing out doors and panic bars, pressure plates, or other similar devices is very important to the electrical workers of this country. We feel very strongly that, should an injury occur, swing out doors together with panic type hardware will assist in the ease of escape, prevent additional injury and facilitate rapid treatment of an injured worker. We all know that the building codes will never address the safety concerns of the electrical workers. CMP-1 is to be congratulated for recognizing the needs of electrical workers.
This comment represents the official position of the International Brotherhood of Electrical Workers Codes & Standards Committee.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
COMMENT ON AFFIRMATIVE:
HITTINGER: This is a step in the right direction to provide electrical workers with a better means of egress should an accident occur within an equipment room. The building codes do not recognize equipment rooms as high hazard areas therefore panic hardware is not required. This change does belong in the NEC.
IVORY: Let's design our buildings with safety in mind both during construction and occupancy; panic hardware on doors and exits is a big step in the right direction.

(Log #1926)

1- 161 - (110-26(c)): Accept
SUBMITTER: James T. Dollard, Jr., Philadelphia, PA
COMMENT ON PROPOSAL NO: 1-260a
RECOMMENDATION: Continue to Accept this proposal.
SUBSTANTIATION: I agree with the Panel's statement and in particular the panel recognition of the need for panic hardware. Persons who must maintain large installations of electrical equipment are required in many cases to open or remove covers of switchboards/enclosures exposing live parts. In the event of a short circuit or ground fault the tremendous power that is released results in an Arc Flash and Arc Blast. Persons working in the area are in many cases seriously burned and blinded from the results of the Arc Flash and Arc Blast. Panic hardware and doors, which open in the direction of egress, will allow persons who may be temporarily blinded and have suffered burns to the hands to exit the area.
This change is necessary and does belong in NFPA-70 the NEC. Building Codes such as BOCA presently recognize the need for panic hardware and doors, which swing in the direction of egress for "high hazard" occupancies. Unfortunately the Building Codes do not recognize an electrical equipment room with equipment rated at 1200-amps or more as a "high hazard" occupancy.
This safety driven proposal should continue to be accepted as the stated purpose of the NEC in section 90-1 is as follows: The purpose of this Code is the practical safeguarding of persons and property from hazards arising from the use of electricity.
The Primary purpose of the NEC is to protect persons and the second to protect property. This change is necessary for the protection of all persons who will maintain large installations of electrical equipment.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #2009)

1- 162 - (110-26(c)): Reject
SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc.
COMMENT ON PROPOSAL NO: 1-260a
RECOMMENDATION: Delete the sentence requiring panic hardware.
SUBSTANTIATION: Panic hardware is appropriate in areas where oil-filled equipment is common, because a fire can render a person unable to use their hands. As such, it is appropriate for transformer vaults and medium-voltage switchgear rooms, but for 600 volts and below it is excessive. Thinking back to my days as head electrician at a college, every electrical room on that campus would need its doors reconfigured, and not just in terms of providing different hardware, since many of those doors opened into the room.
PANEL ACTION: Reject.
PANEL STATEMENT: In limiting the requirement for panic hardware on exit doors to electrical rooms to those containing large equipment rated 1200 amperes or more, the intent is to avoid the situation described by the submitter. In addition, the Panel notes that the Code is not retroactive.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #718)

1- 163 - (110-26(d)): Accept
SUBMITTER: W. Creighton Schwan, Hayward, CA
COMMENT ON PROPOSAL NO: 1-269
RECOMMENDATION: Following "210-70(a)(1), Exception No. 1, insert "for switched receptacles."
SUBSTANTIATION: The Code user needs to know what will be found at the referred location without actually having to go there.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #11)

1- 164 - (110-26(e), Exception): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 1-271
RECOMMENDATION: The Technical Correlating Committee directs the panel to review the sequence and values on the metrication. This action will be considered by the Panel as a Public Comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
Revise the Exception of Section 110.26(E) to read as follows:
Exception: In existing dwelling units, service equipment or panelboards that do not exceed 200 amperes shall be permitted in spaces where the headroom is less than 2.0 m (6-1/2 ft)."
PANEL STATEMENT: The panel accepts the direction of the Technical Correlating Committee to place the metric value first. The panel chooses to use the hard conversion for this measurement. According to Section 90.9(D), compliance with numbers shown in either the SI system or the inch-pound system shall constitute compliance with this Code.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #1890)

1- 165 - (110-26(f)): Accept
SUBMITTER: Michael I. Callanan, International Brotherhood of Electrical Workers
COMMENT ON PROPOSAL NO: 1-271a
RECOMMENDATION: Continue to Accept this proposal.
SUBSTANTIATION: This proposal adds clarity, enforceability, and is more direct.
This comment represents the official position of the International Brotherhood of Electrical Workers Codes & Standards Committee.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #2011)

1- 166 - (110-26(f)): Reject
SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc.
COMMENT ON PROPOSAL NO: 1-271a
RECOMMENDATION: Revise as follows:
(F) Dedicated Equipment Space. All switchboards, panelboards, distribution boards, and motor control centers shall be located in dedicated spaces and protected from damage.
Exception: Control equipment that by its very nature or because of other rules of the Code must be adjacent to or within sight of its operating machinery shall be permitted in other spaces, but shall be protected from damage.
(1) Indoor. For indoor installations, the space equal to the width and depth of the equipment shall be kept clear of foreign systems unless protection is provided to avoid damage from condensation, leaks, or breaks in such foreign systems. This zone shall extend from the top of the electrical equipment to the structural ceiling. Sprinkler protection shall be permitted for the dedicated space where the piping complies with this section. A dropped, suspended, or similar ceiling that does not add strength to the building structure shall not be considered a structural ceiling.
(2) Outdoor. Outdoor electrical equipment shall be installed in suitable enclosures and shall be protected from accidental contact by unauthorized personnel, or by vehicular traffic, or by accidental spillage or leakage from piping systems. The working clearance space shall include the zone described in Section 110-26(A). No architectural appurtenance or other equipment shall be located in this zone.
SUBSTANTIATION: This, effectively, is the version Code Making Panel 9 voted at the end of the 1996 code cycle, changed somewhat to match its new location, as reflected in the panel action at the proposal stage. It's simple, and straightforward. It addresses genuine safety issues and nothing else. Absolutely nothing else.
I won't reiterate here the history covered in detail in the substantiation for Proposal 1-275. Suffice it to say that although the panel action (1-271a) will get cheers from some, it is deeply disturbing from the point of defending the NFPA process in public forums before disinterested parties on the political level. The issue is whether there is any credible safety issue in maintaining an absolute prohibition on foreign systems intruding below such equipment, or less than 6 ft above.
This argument has been going on for quite some time. I can remember a member of the NEC Committee (a design engineer) defending the dedicated space provision in the 1993 NEC. He liked it because, as an ironclad Code rule, he didn't have to fight for the space with the architects. He said this to the cheers of the NFPA Electrical Section five years ago, as part of a then successful floor attempt to derail a Code Making Panel 9 initiative similar to this comment. I wasn't cheering. I was cringing in horror, because I wasn't sure who might be taping the debate. If I were a building official bent on convincing a political authority to let building inspector organizations control the NEC, all I would have to do is play that tape and the debate would be over. That tape would prove to any disinterested government official that in the NEC process safety is a smokescreen to cover the convenience of our industry.
We don't own this space. It belongs to the property owner, who should be free to make bad design decisions as long as they don't compromise safety. They are the ones who have to live with those decisions. I came up wearing tools. No matter how obstructed the panelboard, I could always find some way out of that enclosure, however lacking in cost effectiveness, but safely and within the Code.
Furthermore, no such rule applies over 600V. Section 110-34(f) only requires leak protection, and relocation of foreign piping and ductwork requiring periodic maintenance or whose malfunction would endanger the electrical system. I note that Code Making Panel 1 avoided making any change to medium voltage requirements in this area. The result is that medium voltage systems end up, through simple continuity of requirements, with less severe requirements than those for 600V and below. Try explaining to a judge or government official that this is purely motivated by concerns about minimum safety, when you don't have to follow it at higher voltages, where even to a lay person it is obvious that the consequences of a failure are far greater.
This rule will turn around and bite us in many innocuous applications. We'll end up racking dwelling unit panels off basement walls just because the plumber got there first - even if the proverbial 4 in. drain runs below the panel and out of the required workspace, posing no conceivable leakage threat to the panel. That doesn't pose any safety threat, and it certainly doesn't take 6 ft of dedicated space to entrain a piece of Type NM cable to a panelboard. The industrial interests on Code Making Panel 1 should more carefully consider that the panel wording removes a blanket permission for their facilities (merely generalized to other locations in 1999 by Code Making Panel 9) to avoid this requirement that has been in the Code since the 1981 inception of the dedicated space rule.
The day is soon coming when we will be in front of political authorities trying to persuade them not to use an electrical code developed by building officials. I will be one of those leading our side of the debate. We must enter that debate with clean hands. The NEC must never be written as a tool to relieve us of our appropriate burden of communication, even if it does mean making the case with an architect that the space is in the best interest of his client. We must not destroy the moral authority of the Code as a document based solely on safety, and not on the convenience of its users.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel reaffirms its action on Proposal 1-271a. Requiring a dedicated space above the electrical equipment covered in this section provides a much safer environment for workers. The submitter's concern regarding the lack of equivalent wording covering electrical equipment rated over 600 volts is addressed in Section 110-34(F). The rule in that section prohibits pipes or ducts foreign to the equipment from being "...located in the vicinity...".
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #527)

1- 167 - (110-26(f)(1)c): Reject
SUBMITTER: Craig M. Wellman, Newark, DE
COMMENT ON PROPOSAL NO: 1-273
RECOMMENDATION: Delete the proposed change to subparagraph (c) and revert to the existing language.
Delete the proposed exception.
SUBSTANTIATION: Where sprinkler piping is required, it is not practical to keep it out of the dedicated space. This is not a problem because it does not take up much of the space and therefore does not prevent accomplishing the purpose of having the dedicated space - the ability to run additional wiring.
If a sprinkler is fused (tripped or released) in the vicinity of indoor or water-resistant electrical equipment, water will penetrate the equipment and cause shorts, shutdowns and possibly explosions which may cause extensive damage. If this is intolerable, the owner should specify a preaction sprinkler system to minimize the possibility of a false trip. Sprinklers are considered so reliable that owners may accept the risk of sprinkler failure. In any case, it should be recognized that no shield or protection will prevent water from entering the equipment. It will be ineffective and is therefore unnecessary. If installed it is likely to be unacceptable to fire marshals.
Sprinkler lines are not subject to condensation when no water is flowing and that only happens during a fire. They are not subject to leaks because the joints do not fail and there are no valves.
PANEL ACTION: Reject.
PANEL STATEMENT: It is not the intent of the panel to prohibit sprinkler protection, water or other fire suppression materials, from coming in contact with any such protected electrical equipment. It is the intent of the panel that piping and other auxiliary fire sprinkler components not be installed within the 6 foot area directly above the equipment or the area directly above the equipment up to the structural ceiling when the distance above the equipment to the structural ceiling is less than 6 feet. Design of the type of sprinkler protection for electrical equipment is not the purpose of the NEC.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #719)

1- 168 - (110-26(g)): Reject
SUBMITTER: W. Creighton Schwan, Hayward, CA
COMMENT ON PROPOSAL NO: 1-286
RECOMMENDATION: Reconsider, and Accept, reworded as follows:
"All workspace in this section shall be free of obstructions, and flat, with no sudden changes in grade.
Exception: Areas required to be arranged to drain."
SUBSTANTIATION: This revised proposal satisfies the objections in the panel statement. An extreme example of the condition this new wording would control is a panelboard in the side wall of a stairway. There are many other examples of hazards not presently prohibited. It is obvious that a person working on electrical equipment needs a safe place to stand.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel reaffirms its action and statement on Proposal 1-286. To this point in time, no substantiation or specific incidents of problems have been documented to the panel. Impeded drainage is only one concern as many outdoor locations are not flat because of the general lay of the land and enforcement of such a requirement would be impractical. Many buildings have indoor floors and areas that could not be considered to be flat, but the degree of slope or unevenness would not be considered a hazard even under the most critical examination. A global requirement such has been proposed would in many cases be impractical and unworthy of enforcement.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #1101)

1- 169 - (110-33): Accept
SUBMITTER: Francis C. Pologruto, MacDonald Electric Co./Rep. IBEW
COMMENT ON PROPOSAL NO: 1-291a
RECOMMENDATION: Accept this proposal.
SUBSTANTIATION: This proposal will assure personnel workers in an electrical room, that they will be able to exit the room with a simple pressure on the panic bar, instead of using their hands, especially if they were injured. This proposal has been submitted in the last 3 code cycles, and finally Code-Making Panel 1 has agreed to have panic hardware on electrical room doors, that have switch gear rated 1200 amps or more!
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #1891)

1- 170 - (110-33): Accept
SUBMITTER: Michael I. Callanan, International Brotherhood of Electrical Workers
COMMENT ON PROPOSAL NO: 1-291a
RECOMMENDATION: Continue to Accept this proposal.
SUBSTANTIATION: The ability to exit these areas using swing out doors and panic bars, pressure plates, or other similar devices is very important to the electrical workers of this country. We feel very strongly that, should an injury occur, swing out doors together with panic type hardware will assist in the ease of escape, prevent additional injury and facilitate rapid treatment of an injured worker. We all know that the building codes will never address the safety concerns of the electrical workers. CMP-1 is to be congratulated for recognizing the needs of electrical workers.
This comment represents the official position of the International Brotherhood of Electrical Workers Codes & Standards Committee.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
COMMENT ON AFFIRMATIVE:
IVORY: I concur with Mr. Callanan's comment, in relation to the safety being provided by requiring swing out doors and the panic hardware. This safety measure will prevent injuries in the future. I hope that the rest of the building industry will see the value and cooperate in designing future buildings.

(Log #1927)

1- 171 - (110-33): Accept
SUBMITTER: James T. Dollard, Jr., Philadelphia, PA
COMMENT ON PROPOSAL NO: 1-291a
RECOMMENDATION: Continue to Accept this proposal.
SUBSTANTIATION: I agree with the Panel's statement and in particular the panel recognition of the need for panic hardware. Persons who must maintain installations of electrical equipment at over 600-volts nominal are required in many cases to open or remove covers of switchboards/enclosures exposing live parts. In the event of a short circuit or ground fault the tremendous power that is released results in an Arc Flash and Arc Blast. Persons working in the area are in many cases seriously burned and blinded from the results of the Arc Flash and Arc Blast. Panic hardware and doors, which open in the direction of egress, will allow persons who may be temporarily blinded and have suffered burns to the hands to exit the area.
This change is necessary and does belong in NFPA-70 the NEC. Building Codes such as BOCA presently recognize the need for panic hardware and doors, which swing in the direction of egress for "high hazard" occupancies. Unfortunately the Building Codes do not recognize an electrical equipment room with equipment rated at 1200-amps or more as a "high hazard" occupancy.
This safety driven proposal should continue to be accepted as the stated purpose of the NEC in section 90-1 is as follows: The purpose of this Code is the practical safeguarding of persons and property from hazards arising from the use of electricity.
The Primary purpose of the NEC is to protect persons and the second to protect property. This change is necessary for the protection of all persons who will maintain large installations of electrical equipment.
PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #2355)

1- 172 - (110-34): Reject
SUBMITTER: Alan Manche, Square D Co.
COMMENT ON PROPOSAL NO: 1-296
RECOMMENDATION: The panel should reconsider and accept the proposal.
SUBSTANTIATION: The panel indicated in the panel statement that the proposed material is already found in 110-32, unfortunately this is not the case. The material found in 110-32 parallels the material found in the general paragraph of 110-26. The proposed text would bring 110-34 in parallel with 110-26(a). 110-34 and 110-26(a) address the working clearance depth in contrast to 110-32 that addresses height and width of the working space.

For over 600V transformers, 110-34 is generally being interpreted in a similar manner to 110-26(a), in that working clearance depth is not required for transformers since they do not "require examination, adjustment, servicing, or maintenance while energized." However, since this sentence is not explicitly contained in 110-34, questions arise with regard to this interpretation.

The acceptance of this proposal will support the majority of the installations for industrial and commercial transformer installations and clarify the working space depth requirement.
PANEL ACTION: Reject.
PANEL STATEMENT: The present text is clear and addresses the concerns of the submitter.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #366)

1- 172a - (110-34(b)and (c)): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
COMMENT ON PROPOSAL NO: 1-301
RECOMMENDATION: Accept in principle revised: (b) SEPARATION from LOW-VOLTAGE EQUIPMENT
Where switches, cutouts, or other equipment operating at 600 volts, nominal, or less are installed in a room or enclosure where there are exposed live parts or exposed conductors ~~wiring~~ operating at over 600 volts, nominal, the high-voltage equipment shall be effectively separated from the space occupied by the low-voltage equipment by a suitable partition, fence, or screen.

Exception: Switches or other equipment operating at 600 volts, nominal, or less, and serving only equipment within the high-voltage vault, room, or enclosure, shall be permitted to be installed ~~in the high voltage room or vault~~ without a partition, fence, or screen if accessible to qualified persons only.

(c) LOCKED ROOMS or ENCLOSURES. The entrance(s) to all ~~buildings~~, vaults, rooms, or other enclosures containing live parts or exposed conductors operating at over 600 volts, nominal, shall be kept locked, ~~access being allowed only to qualified persons~~, unless such entrances are under the observation of a ~~qualified~~ person at all times who is authorized to forbid entry.

Where the voltage exceeds 600 volts, nominal, permanent and conspicuous warning signs shall be provided, reading as follows: DANGER- HIGH-VOLTAGE -KEEP OUT.
SUBSTANTIATION: Proposal is corrected to indicate phrasing inadvertently added or omitted. Please review substantiation for original proposal.
PANEL ACTION: Reject.
PANEL STATEMENT: Several keywords were both omitted and added without benefit of strikethrough or underline. The panel pointed this out to the submitter with his Proposal 1-301. Errors are still noted in Comment 1-172a. The panel is still uncertain as to the submitters intent.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #1782)

1- 173 - (110-34(c)): Reject
SUBMITTER: Alan Manche, Square D Co.
COMMENT ON PROPOSAL NO: 1-302
RECOMMENDATION: The panel should reconsider i proposal and accept the original proposal that adds the words "or equivalent".
SUBSTANTIATION: Product manufacturers are going to mark the product for the appropriate hazards and comply with the ANSI Z535 standards. The explicit nature of the present wording in the NEC establishes conflict between the NEC marking restrictions and the required hazard markings outlined in ANSI Z535.4

The objective of the NEC wording is to generally convey the basic message requirement to the user. However, in order to comply with Z535.4, the exact words stated in the NEC may not be appropriate for the contemplated circumstances. Revising the text to allow "or equivalent" would permit a hazard sign to comply with the NEC and be formatted in accordance with Z535.4.

Similar proposals were submitted to a number of code panels. Panels 3, 9, 14 &15 have accepted the addition of the words "or equivalent," and panel 13 has accepted the proposal in principal and revised the marking requirements to warn of the hazard without establishing specific wording and permitting compliance with the ANSI Z535 set of standards. The panel may want to review and consider the action taken by Code-Making Panel 13 in proposal 13-25.

Most importantly, the panel needs to take action in order to reco
PANEL ACTION: Reject.
PANEL STATEMENT: The panel reaffirms that the word "equivalent" is considered a vague and unenforceable word according to Section 3.2.1 of the NEC Style Manual. The term "or equivalent" will reduce consistency and lead to a reduction in safety. The panel prefers standard wording.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

ARTICLE 200 — USE AND IDENTIFICATION OF GROUNDED CONDUCTORS

(Log #59)

5- 3 - (200-6): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 5-9
RECOMMENDATION: It was the action of the Technical Correlating Committee that this Proposal be reconsidered and correlated with the actions on Proposals 5-10, 5-11, 5-12, 5-16, 5-17, 5-19, 5-21, 5-23, 5-28, 5-31, 5-33, 5-35, 5-37, 5-47, 5-49, and 5-52. It was also the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panels 6 in sections 310-12(c) and 400-22, Code-Making Panel 7 in Section 363-19, and Code-Making Panel 15 in section 520-53(h)(2) for action.

This action will be considered by the Panel as a Public Comment by all Code-Making Panels mentioned in this Note.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
PANEL STATEMENT: The panel has reconsidered the proposals and reaffirms its previous actions.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16

(Log #59a)

6- 3 - (200-6): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 5-9
RECOMMENDATION: It was the action of the Technical Correlating Committee that this Proposal be reconsidered and correlated with the actions on Proposals 5-10, 5-11, 5-12, 5-16, 5-17, 5-19, 5-21, 5-23, 5-28, 5-31, 5-33, 5-35, 5-37, 5-47, 5-49, and 5-52. It was also the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panels 6 in sections 310-12(c) and 400-22, Code-Making Panel 7 in Section 363-19, and Code-Making Panel 15 in section 520-53(h)(2) for action.

This action will be considered by the Panel as a Public Comment by all Code-Making Panels mentioned in this Note.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
PANEL STATEMENT: CMP 6 action on Proposal 6-35 for 310-12(c) and Proposal 6-192 for 400-22 correlates with CMP 5 action on Proposal 5-9.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Ferrell

(Log #59b)

7- 3 - (200-6): Accept
Note: It was the action of the Technical Correlating Committee that a FPN following 363.19 be added that states: "FPN: The color gray may have been used in the past as an ungrounded conductor. Care should be taken when working on existing systems." This action will correlate the Code-Making Panel 7 action with the action of Code-Making Panel 5 on Proposal 5-9.
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 5-9
RECOMMENDATION: It was the action of the Technical Correlating Committee that this Proposal be reconsidered and correlated with the actions on Proposals 5-10, 5-11, 5-12, 5-16, 5-17, 5-19, 5-21, 5-23, 5-28, 5-31, 5-33, 5-35, 5-37, 5-47, 5-49, and 5-52. It was also the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panels 6 in sections 310-12(c) and 400-22, Code-Making Panel 7 in Section 363-19, and Code-Making Panel 15 in section 520-53(h)(2) for action.
This action will be considered by the Panel as a Public Comment by all Code-Making Panels mentioned in this Note.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
PANEL STATEMENT: The panel reaffirms its action on Proposal 7-281.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #59c)

15- 5 - (200-6): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 5-9
RECOMMENDATION: It was the action of the Technical Correlating Committee that this Proposal be reconsidered and correlated with the actions on Proposals 5-10, 5-11, 5-12, 5-16, 5-17, 5-19, 5-21, 5-23, 5-28, 5-31, 5-33, 5-35, 5-37, 5-47, 5-49, and 5-52. It was also the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panels 6 in sections 310-12(c) and 400-22, Code-Making Panel 7 in Section 363-19, and Code-Making Panel 15 in section 520-53(h)(2) for action.
This action will be considered by the Panel as a Public Comment by all Code-Making Panels mentioned in this Note.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
PANEL STATEMENT: Refer to the panel actions and statement on Comments 15-51 and 15-54.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 18
VOTE ON PANEL ACTION:
AFFIRMATIVE: 18

(Log #977)

5- 4 - (200-6): Reject
SUBMITTER: Palmer Hickman, Royersford, PA
COMMENT ON PROPOSAL NO: 5-9
RECOMMENDATION: Revise the recommendation of the submitter and Panel Action for Proposal 5-9 as indicated:
"Delete the words "natural gray" from Section 200-6 and where similarly used in the NEC."
"FPN: The color gray may have been used in the past as a grounded conductor. Care should be taken when working on existing systems."
SUBSTANTIATION: I would urge Code-Making Panel 5 to reconsider their position on Proposal 5-9. The fact that the Panel saw the need to add a FPN alerting users of a potentially dangerous situation should be reason enough to raise concern.
I am perplexed by the 180-degree reversal of the Panel from their stance in previous Code cycles. Panel recognition of the use of gray as an ungrounded (hot) conductor is well documented in numerous Panel Statements, and Comments of Panel members. Panel 5 voted to reject Comment 5-10 from the 1998 ROC by a 12-1 vote. The Panel Statement rejecting Comment 5-10 stated that "deleting the word "natural" would permit gray to now identify a grounded conductor, where gray has been permitted to be used by the Code for many years to identify underground conductors." It would appear that Code-Making Panel 5 is rejecting its own Panel Statement without any new substantiation other than a "show of hands" as mentioned in a Comment of Affirmative on Proposal 5-9 (2001 ROP). Another apparent unsubstantiated reversal of opinion appears in the Panel Statement rejecting Proposal 5-3 (2001 ROP).
I agree a solution is needed and is long overdue. Allowing the use of gray as a grounded conductor in violation of the Code has gone on much too long. It is suggested in a Comment of Affirmative on Proposal 5-9, that the choice causing the least impact had been made by the Panel. I respectfully disagree and would offer another. I would direct your attention to the last paragraph of the Explanation of Negative offered by Mr. Rappaport for Proposal 5-13 (2001 ROP). He suggested that "the Code Panel should, once and for all, delete natural gray as identification for the grounded conductor." Mr. Rappaport provides further insight by pointing out earlier in the same comment that "SIS wire with gray insulation for switchgear wiring is a preferred method in ANSI C37 Standards for Switchgear and is used by equipment manufacturers for all control wiring within the switchgear assemblies."
What may seem to cause the least impact could well be the most dangerous. I suggest removing the term "natural gray" and adding a FPN alerting installers, maintainers, and users that the use of natural gray as a grounded conductor is no longer permitted by Code. A Panel Statement reaffirming its long standing position that natural gray has not been available for decades, and that the use of gray as a grounded conductor is not now, and has never been, permitted as a grounded conductor by the NEC.
Advocating noncompliance does not seem prudent. There are several viable alternatives recognized by the NEC to distinguish each system grounded conductor without the need for a gray conductor as a grounded conductor. Existing installations using gray conductors as grounded conductors will remain as legal or illegal as the authority having jurisdiction allowed them to be when they were installed. Removing "natural gray" as an alternative as a grounded conductor seems to be the natural progression. It protects those who have been in compliance. We, as guardians of safety, should also be diligent in our efforts to be consistent.
PANEL ACTION: Reject.
PANEL STATEMENT: The term "natural" has already been determined to add confusion to the code relative to the identification of grounded conductors. The panel deliberated on numerous proposals to delete the term "natural gray" or just the term "natural" and found the substantiation for the latter to be acceptable. In the 1999 NEC cycle these same discussions were held without resolution and that is why there was no change from previous Codes. The panel's original action at the ROP stage was a step to eliminate the confusion caused by the word "natural" when used in the term "natural gray". Refer to the Panel statement for Proposal 5-9 in the 2001 ROP.
Conductor identification internal to various types of equipment is governed by related product standards. Manufacturers of various listed wiring methods and equipment presently use gray colored insulated conductors, intended for use as grounded conductors, in their products.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16

(Log #1981)

5- 5 - (200-6): Accept
SUBMITTER: Charles Mello, Milwaukie, OR
COMMENT ON PROPOSAL NO: 5-9
RECOMMENDATION: Leave the text as proposed by the panel action on this proposal.
SUBSTANTIATION: The panel has finally concluded after at least 3 code cycles of proposals to allow gray to be used as has been industry practice for over 40 years. The negative vote by Mr. Diaz leads to a misunderstanding of what different systems mean in Sections 200.6 and 200.7. Different systems do no necessarily mean different voltages, as proposal 5-26 would lead one to believe. The different systems could be two separate 208/120 volt systems, a 208/120 volt and a 240/120 volt system, or could be 120 Volt AC and 125 Volt DC.

The use of gray could be the first choice or the second to identify the grounded circuit conductor. It should be noted that at least one armored cable manufacturer has for over 15 years provided a UL listed cable assembly intended for use on multiwire branch circuits with a gray wire provided for the neutral.

The addition of the fine print note is an excellent method to forewarn individuals that there may be systems where a gray conductor was used as an ungrounded conductor. This is no different than systems installed in the 1950's with a dark green used as an ungrounded conductor that are still in service today even though green is reserved for equipment grounding conductors now.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16

(Log #2081)

5- 6 - (200-6): Reject
SUBMITTER: Henry A. Jenkins, Wake County
COMMENT ON PROPOSAL NO: 5-9
RECOMMENDATION: Replace the word "natural" with the word "light".
SUBSTANTIATION: Eliminating the word "natural" will leave the door open for even greater problems. In field practice, it is hard to determine the difference between a dark gray (charcoal for instance) conductor and a ungrounded conductor. This could be corrected by replacing the word "natural" with the word "light", therefore making the term "light gray". The word "light" is used as a descriptive word in Section 504-80(c) to distinguish between colors of blue in color coding intrinsically safe conductors.
PANEL ACTION: Reject.
PANEL STATEMENT: The word "light" does not add clarity to the code. The term "light" is not defined; light gray to one person may be a different light gray to another. It is the intent of the panel that the color gray should be distinctive from any other color used in the circuit to prevent confusion.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16

(Log #1659)

5- 7 - (200-6(1)): Reject
SUBMITTER: Melvin K. Sanders, TECo., Inc.
COMMENT ON PROPOSAL NO: 5-9
RECOMMENDATION: Add the following restriction wherever the word "natural" has been deleted:

Gray shall only be permitted for new installations or where presently employed.

SUBSTANTIATION: This radical departure from past practices and legalize a past Code violation can be very dangerous if unrestricted use is made. When present Code recognized identification has been faithfully followed and gray has been used as a "live" unidentified conductor, it can easily be seen that mistakes can be made leading to incorrect wiring sequences at the least, to equipment damage as incorrect voltages are introduced, to shock, to electrocutions at the worst. Relying on a fine print note that may come to exist only in a remote appendix as the only caution is simply unwise. Those presently using it could continue to do so, those areas where Code rules have been faithfully followed can have reasonable assurance that white and gray have distinct duties and the identification schemes of Section 210-4(d) (1999 Edition) for multi-wire branch circuits can be fully utilized by all parties.
PANEL ACTION: Reject.
PANEL STATEMENT: The proposed additional text does not add clarity. Providing specific consistent requirements helps ensure safety.

The Panel action by insertion of the FPN should meet the intent of the submitter's recommendation. It should be noted the reference to Section 210-4 is incorrect as this section only deals with the identification of ungrounded conductors of different systems. See the panel statement on Proposal 5-3 of the 2001 NEC ROP.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16

(Log #759)

5- 8 - (200-6(a)): Reject
SUBMITTER: Richard E. Loyd, Perryville, AR
COMMENT ON PROPOSAL NO: 5-14
RECOMMENDATION: Reconsider my proposal and accept it.
SUBSTANTIATION: I agree with the negative comment by Mr. Diaz to Proposal 5-9. I agree that gray has been used as second system color after White was used for the first system grounded color. I know of no installation where gray was used as a grounded conductor when there was only one system voltage in a building.

The panel has revised this proposal so that now gray can be used any time as a grounded conductor. This is wrong. I prefer that gray not be used at all as a grounded conductor but would prefer Mr. Diaz's compromise.

I have checked with distributors and found they will supply white wire with a colored strip as now required in 200-6(d). Therefore, gray is not needed and even the panel, by adding the fine print, note admit they are introducing and legalizing a safety hazard.
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter did not provide any technical substantiation to support his opinion. The panel is aware that there are buildings in several areas of the country that have used gray for the only grounded conductor in the building. It is the intent of CMP-5 that Section 200.6A for the 2002 NEC, permit the use of either white or gray for the first (and possibly the only) system. Section 200.6D also specifies that where multiple systems exist in a common raceway or enclosure that the first system grounded conductor is identified by white, gray or three white stripes and the second system identified differently by white, gray or three white stripes or a white with color tracer.

CMP-5 does not agree that including the FPN reference indicates a safety hazard but intends to bring attention that different situations may exist.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16

(Log #1127)

5- 9 - (200-6(a) and (b)): Reject
SUBMITTER: Paul Dobrowsky, Holley, NY
COMMENT ON PROPOSAL NO: 5-15
RECOMMENDATION: Accept the proposal.
SUBSTANTIATION: Manufacturers could also produce white colored conductors in sizes larger than 6 AWG and eliminate termination color marking entirely. Sizes 8 AWG and 6 AWG can safely be marked in the field to identify their purpose.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Proposal 5-15 in the 2001 ROP. While the comment is true for what manufacturers could do, there is still no technical substantiation to change from the present requirements. Manufacturers will make whatever products when there is sufficient demand to warrant the manufacturing. Checks with some local distributors found substantive stocks of white and gray in sizes 6 AWG, 8 AWG and 10 AWG.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NEGATIVE: 2
EXPLANATION OF NEGATIVE:
DOBROWSKY: The proposal and comment should be accepted. Why are any conductor sizes permitted to be identified only at

terminations - instead of requiring a continuous colored means of identification. Conductor sizes 8 AWG and 6 AWG can safely be marked in the field. The majority of branch circuits commonly use 10 AWG and smaller.

HAMMEL: The proposal and comment should be accepted. Why are any conductors sizes permitted to be identified only at terminations - instead of requiring a continuous colored means of identification. Conductor sizes 8AWG and 6AWG can safely be marked in the field. The majority of branch circuits commonly use 10AWG and smaller.

(Log #1726)

5- 10 - (200-6(a) and (b)): Reject
SUBMITTER: Don Ganiere, Ottawa, IL
COMMENT ON PROPOSAL NO: 5-15
RECOMMENDATION: The proposal should be accepted.
SUBSTANTIATION: Often the only substantiation for a code change is to make the code language match the field practice. In many areas, white conductors are only installed is sizes #10 and smaller. If it is safe to identify conductors #4 and larger, it is just as safe to identify smaller conductors.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Comment 5-9.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NEGATIVE: 2
EXPLANATION OF NEGATIVE:
DOBROWSKY: See my explanation of negative vote on Comment 5-9.
HAMMEL: See my explanation of negative vote on Comment 5-9.

(Log #1980)

5- 11 - (200-6(d)): Accept
SUBMITTER: Charles Mello, Milwaukie, OR
COMMENT ON PROPOSAL NO: 5-26
RECOMMENDATION: Continue to reject this proposal.
SUBSTANTIATION: Mr. Hartwell would lead one to believe that different systems is directly correlated to different voltages where having an alternate identification of the grounded conductor involved. The negative vote by Mr. Diaz seems to perpetuate this misconception and is incorrect. Different systems can be at the same voltage level and be from different sources. The use of "natural" gray would be permitted under the present Code for all grounded conductors if there was only one system. There is no requirement that white be the first choice.

The panel should not apply any more restrictions or try defining what characteristics create a different system for the use of white, gray, the use of three white stripes or white with stripes as identifiers for the grounded conductor.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16

(Log #1989)

5- 12 - (200-6(d)): Reject
SUBMITTER: William F. Laidler, Rep. Massachusetts Electrical Code Advisory Committee
COMMENT ON PROPOSAL NO: 5-26
RECOMMENDATION: The proposal should be accepted as written.
SUBSTANTIATION: As has been noted in the panel member's comment, "The term 'natural gray' is out dated and not really applicable to modern wiring systems". It has taken 75 years to come to that thinking. If natural gray can be used to identify a grounded conductor, then other shades of gray could be permitted to be used as an ungrounded conductor (and have been).

Step one deletes the word natural. Now as written a grounded conductor can be either of three choices: (1) white (2) gray or (3) three continuous white stripes on other than green insulation. Each other system-grounding conductor shall have an outer covering of white with a readily distinguishable differently colored stripe (not green) running along the insulation. Confusing, isn't it, when you consider that the entire country accepts gray to be used for systems exceeding 150 volts to ground.

The time has come for a unique but obtainable conductor identification for a grounded conductor of a second system. Let's not wait another 75 years to take step two to permit white to be used for systems not exceeding 150 volts to ground; and gray to be used for systems exceeding 150 volts to ground.
PANEL ACTION: Reject.
PANEL STATEMENT: Listed wiring methods are presently available that contain white and gray colored insulated conductors (within a single cable assembly) which are intended to identify separate grounded conductors supplied from a single system. For all installations, CMP-5 intends that white, gray, or both be permitted to be used for grounded conductors without regard to system voltages.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16

(Log #724)

5- 13 - (200-6(f)): Reject
SUBMITTER: W. Creighton Schwan, Hayward, CA
COMMENT ON PROPOSAL NO: 5-29
RECOMMENDATION: This is an important safety issue, and should be accepted.
SUBSTANTIATION: If 200-6(f) is not the appropriate location, then accept Mr. Brett's suggestion of 250-120, and it should also appear in 347-4. The panel statement that the subject is covered in 250-96 is not correct.
PANEL ACTION: Reject.
PANEL STATEMENT: It is the responsibility of the installer to verify that an appropriate equipment grounding conductor is present. Bonding can be accomplished by installing bonding jumpers, that are connected to metal enclosures at both ends of a nonmetallic raceway in accordance with Sections 250.96(A) and 250.102(E)
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16

(Log #912)

5- 14 - (200-6(f)): Reject
SUBMITTER: David A. Kerr, Jr., Friendsville, PA
COMMENT ON PROPOSAL NO: 5-29
RECOMMENDATION: Accept in principle. Place a labeling rule in 250-120 for discontinuous metal raceways. Section 250-96 does not apply.
SUBSTANTIATION: None
PANEL ACTION: Reject.
PANEL STATEMENT: This comment does not comply with 4-4.5 of the NFPA Regulations Governing Committee Project. There is no Substantiation provided.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16

(Log #1176)

5- 15 - (200-7(c)(2)): Reject
SUBMITTER: Barry F. Tower, Patten, ME
COMMENT ON PROPOSAL NO: 5-42
RECOMMENDATION: The Panel should accept this proposal as submitted.
SUBSTANTIATION: The purpose of this proposal was change to back to the pre-1999 Code. It was changed in 1999 because of one person's concern about "weekend warriors" getting themselves into trouble replacing a switch. It should not have been changed without substantiation of a safety problem - (there was none!!!). Article 90-1(c) INTENTION states: "This Code is not intended as a design specification nor an instruction manual for untrained persons."

Do you really thing that "weekend warriors" will bother to reidentify the white conductor ow switch loops? They NEVER reidentify the white conductor when they wire up their own 240 V domestic water heater. Who is going to train them on recognizing reidentified conductors? Who is going to train them on recognizing common terminals of 3-way switches? Remember the white conductor may or may not go on the common terminal of

the switch. The important thing to know is which conductor goes on the common terminal. The change made to the 1999 Code DID NOT and CANNOT solve that issue - only the skills of a trained professional can accomplish the task. Even the least experienced person can replace a 3-way switch if they know enough to locate the common terminal of the old switch and the new switch. The worst thing that they can do is wire the switch in a way that it won't work properly (assuming that they know enough to turn off the circuit breaker before beginning work).
PANEL ACTION: Reject.
PANEL STATEMENT: Where insulated conductors in cable assemblies that are white, gray or have a marking of three white stripes are used as ungrounded conductors re-identification at terminations improves safety. The NEC can not ensure that only qualified individuals perform electrical work, but that, if its requirements are followed, installations will be essentially free from hazard.

It is relatively easy for qualified persons to understand what is going on in a three-way switch loop as mentioned by the submitter's comment. However there are installations where this requirement for identification would increase safety such as in ganged boxes where a few grounded conductors could exist as well as the use of the white or gray conductor of a cable assembly as an ungrounded conductor.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16

(Log #1990)

5- 16 - (200-7(c)(2)): Reject
SUBMITTER: William F. Laidler, Rep. Massachusetts Electrical Code Advisory Committee
COMMENT ON PROPOSAL NO: 5-48
RECOMMENDATION: This proposal should be accepted as written.
SUBSTANTIATION: Section 90 says it all, this codes is not intended as a design specification nor as an instructional manual for untrained persons. The proposal for this change in the 1999 NEC should have been rejected for inadequate substantiation. The code was changed to suit the needs of one untrained and obviously, unqualified person. This present requirement is cumbersome to a capable authority having jurisdiction and is fodder to an overzealous authority having jurisdiction.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on comment 5-15. CMP-5 does not consider that re-identifying a conductor is cumbersome but is easy to accomplish and enhances safety.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16

ARTICLE 210 — BRANCH CIRCUITS

(Log #1037)

2- 4 - (210-4(e) (New)): Reject
SUBMITTER: Michael L. Last, Na'alehu, HI
COMMENT ON PROPOSAL NO: 2-15
RECOMMENDATION: Consideration for accepting the recommendation in its entirety. To reject the proposal on the basis of the definition of a multiwire branch circuit, will not cause the hazardous condition to no longer exist. To consider the proposal (2-15) as attempting to eradicate a serious electrical hazard would be beneficial to the entire electrical community. The purpose of this proposal is to make it more difficult to transform a properly functioning multiwire branch circuit into a safety hazard. And without identifying what the modified branch circuit becomes.
SUBSTANTIATION: Substantiation refers to that type of wiring as defined as a Branch Circuit, Multiwire in Article 100. The integrity of a multiwire branch circuit is maintained when there is a potential difference between the ungrounded conductors. While due to a manipulation of the ungrounded conductors, no potential difference can exist, and therefore the term for this type of wiring would not be a multiwire branch circuit, however, a true compromise to electrical safety has been established. The Panel Statement that the wiring is not a multiwire branch circuit is congruent to claiming that a controller is no longer such, when it ceases to function in a predetermined manner. The initial device is still a controller, by definition, but it has stopped to function as such. What was a branch circuit, multiwire initially, due to some change, still would be considered as a multiwire branch circuit.
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter has provided insufficient substantiation which references how a hazardous condition would exist in a multi-wire branch circuit that would have been prevented by further identification of the conductors of the multi-wire branch circuit.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #720)

2- 5 - (210-7(g)): Accept in Principle
SUBMITTER: W. Creighton Schwan, Hayward, CA
COMMENT ON PROPOSAL NO: 2-25
RECOMMENDATION: Reconsider, and accept this proposal.
SUBSTANTIATION: Whether on a multi-wire circuit or not, an energized receptacle on the same yoke with another receptacle presents a hazard to a person servicing the outlet unless all of the ungrounded conductors disconnect together.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Comment 2-6.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #1713)

2- 6 - (210-7(g)): Accept in Principle
SUBMITTER: Charles M. Trout, Maron Electric Co. Inc.
COMMENT ON PROPOSAL NO: 2-25
RECOMMENDATION: The proposal should be accepted as written.
SUBSTANTIATION: The substantiation for the original proposal apparently dwelled too much on the requirements of Section 210-4(b). The intent of this proposal is to include all multiple receptacles mounted on the same yoke regardless of type of occupancy, dwelling unit or other, regardless of type of circuitry, be it single circuit, multi-wire circuit, or multiple circuits. When a receptacle outlet is opened, the workman should be protected by requiring all ungrounded conductors to that outlet to be disconnected simultaneously. Similar, but not complete, protection has been provided in Section 210-4(b) and this proposal would cover what that section has missed.

Example: Two receptacles on the same yoke (both tabs removed from a duplex receptacle). Two separate circuits with separate neutrals feeding the receptacle outlets. Not in a dwelling unit and not a multi-wire circuit but presenting the same hazard to a workman. Yes, of course we should all check to see that it's not energized but if everyone did as we think they should, safety rules would not be necessary, but they are. And that's why we're here.
PANEL ACTION: Accept in Principle.
Revise section 210.7 in the 2002 NEC ROP to read as follows:

210.7 Branch Circuit Receptacle Requirements.

(A) Receptacle Outlet Location. Receptacle outlets shall be located in branch circuits in accordance with Part III of Article 210.

(B) Receptacle Requirements. Specific requirements for receptacles are covered in Article 406.

(C) Multiple Branch Circuits. Where more than one branch circuit supplies more than one receptacle on the same yoke, a means to simultaneously disconnect the ungrounded conductors supplying those receptacles shall be provided at the panelboard where the branch circuits originated.

PANEL STATEMENT: The revised wording meets the intent of the submitter and provides further clarity.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #1656)

2- 7 - (210-8(3)): Accept
SUBMITTER: Jack Wells, Pass & Seymour/Legrand
COMMENT ON PROPOSAL NO: 2-43
RECOMMENDATION: The Panel should continue to reject this proposal.
SUBSTANTIATION: This comment supports the action of the Panel to reject the proposal. Likewise, we support the Panel statement and the affirmative comment of Mr. Nissen on Proposal 2-32

Unfortunately, the survey mentioned in the Panel statement has taken longer than anticipated. The stated objective of the survey is "…to obtain statistically valid data to identify, define and quantify long term operation of GFCIs in the installed infrastructure. For suspected field failures, both the installation and the product must be analyzed and data compiled to enable clear definition (including conditions of use and environment) and mode of failure (e,g, SCR failure, test button failure) sufficient to define remedial action(s) if required.,"

The statistical model developed for this survey has been reviewed and confirmed by CPSC as appropriate. UL is fully involved in the collection, tabulation and analysis of the data as it comes in.

Because the data is incomplete, unanalyzed and lacks peer review it would be inappropriate for NEMA to release it at this time.

Even if the survey supports some remedial action, the Panel and Mr. Nissen are correct in stating that such action should involve the product safety standard, not the installation code.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #1804)

2- 8 - (210-8(3)): Accept
SUBMITTER: Philip M. Piqueira, General Electric Co.
COMMENT ON PROPOSAL NO: 2-44
RECOMMENDATION: This comment supports the panel action to reject Proposal 2-44.
SUBSTANTIATION: The comprehensive National Survey to evaluate the performance of installed GFCIs is, approximately, 50 percent complete. Any action taken by the panel, at this juncture, would certainly be premature. The National Survey was designed with a great deal of analysis, in consultation with statisticians, in order that the data be representative of the regions of the country where GFCIs might be prone to failure (i.e., high humidity and/or lightning strikes). This approach was necessary in order that the conclusions reached be statistically valid, and any conclusions drawn before all the data points have been collected would certainly be suspect. Further, as indicated in the panel statement, any design changes which are supported by the data should be included in the product standard.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #1805)

2- 9 - (210-8(3)): Accept
SUBMITTER: Philip M. Piqueira, General Electric Co.
COMMENT ON PROPOSAL NO: 2-32
RECOMMENDATION: This comment suports the panel action to reject Proposal 2-32.
SUBSTANTIATION: The comprehensive National Survey to evaluate the performance of installed GFCIs is, approximately, 50 percent complete. Any action taken by the panel, at this juncture, would certainly be premature. The National Survey was designed with a great deal of analysis, in consultation with statisticians, in order that the data be representative of the regions of the country where GFCIs might be prone to failure (i.e., high humidity and/or lightning strikes). This approach was necessary in order that the conclusions reached be statistically valid, and any conclusions drawn before all the data points have been collected would certainly be suspect. Further, as indicated in the panel statement, any design changes which are supported by the data should be included in the product standard.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #2358)

2- 10 - (210-8(3)): Accept
SUBMITTER: John P. Goodsell, Hubbell Incorporated- Wiring Device-Kellems
COMMENT ON PROPOSAL NO: 2-44
RECOMMENDATION: I fully support the Panel Action to Reject the proposal and fully agree with Mr. Nissen's comment.
SUBSTANTIATION: The National Electrical Code defines what installation practices must be performed in the interest of life and property protection. Standards define the requirements for the safe function and operation of product designed to adhere to those installation practices. The GFCI Section of NEMA, of which I am a member, has undertaken a project to perform a comprehensive and statistically valid field study to enable us in conjunction with Underwriters Laboratories to determine the root causes of suspected GFCI field failures and to define any remedial action(s) that may be required. While the study is well along its way to completion, it would be imprudent, at this time, to draw conclusions from the raw data as they will not be statistically valid until the study is concluded and it is certainly premature to speculate on what remedial action or actions may be appropriate.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #2359)

2- 11 - (210-8(3)): Accept
SUBMITTER: John P. Goodsell, Hubbell Incorporated- Wiring Device-Kellems
COMMENT ON PROPOSAL NO: 2-43
RECOMMENDATION: I fully support the Panel Action to Reject the proposal and fully agree with Mr. Nissen's comment.
SUBSTANTIATION: The National Electrical Code defines what installation practices must be performed in the interest of life and property protection. Standards define the requirements for the safe function and operation of product designed to adhere to those installation practices. The GFCI Section of NEMA, of which I am a member, has undertaken a project to perform a comprehensive and statistically valid field study to enable us in conjunction with Underwriters Laboratories to determine the root causes of suspected GFCI field failures and to define any remedial action(s) that may be required. While the study is well along its way to completion, it would be imprudent, at this time, to draw conclusions from the raw data as they will not be statistically valid until the study is concluded and it is certainly premature to speculate on what remedial action or actions may be appropriate.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #2360)

2- 12 - (210-8(3)): Accept
SUBMITTER: John P. Goodsell, Hubbell Incorporated- Wiring Device-Kellems
COMMENT ON PROPOSAL NO: 2-32
RECOMMENDATION: I fully support the Panel Action to Reject the proposal and fully agree with Mr. Nissen's comment.
SUBSTANTIATION: The National Electrical Code defines what installation practices must be performed in the interest of life and property protection. Standards define the requirements for the safe function and operation of product designed to adhere to those installation practices. The GFCI Section of NEMA, of which I am a member, has undertaken a project to perform a comprehensive and statistically valid field study to enable us in conjunction with Underwriters Laboratories to determine the root causes of suspected GFCI field failures and to define any remedial action(s) that may be required. While the study is well along its way to completion, it would be imprudent, at this time, to draw conclusions from the raw data as they will not be statistically valid until the study is concluded and it is certainly premature to speculate on what remedial action or actions may be appropriate.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #1058)

2- 13 - (210-8(a)): Accept in Principle in Part
SUBMITTER: Lanny McMahill, Rep. IAEI SW Section
COMMENT ON PROPOSAL NO: 2-35
RECOMMENDATION: Accept the revised text as proposed.
SUBSTANTIATION: See the information from NIOSH which I have provided to support this proposal.

The use of GFCI protection in dwelling units is a proven technology. In the interest of personnel safety, this technology should apply to all occupancies and locations. Accepting this proposal is another step toward consistency in the application of the code.

NOTE: Supporting Material is available for review at NFPA Headquarters.
PANEL ACTION: Accept in Principle in Part.
Add a new Item 3 to existing 210-8(b) to read as follows:
"(3) Kitchens."

The panel does not accept the submitter's recommendation to change the title of Section 210-8(a) from "Dwelling Units" to "All Occupancies".
PANEL STATEMENT: The panel has accepted in principle the concept of the submitter's comment to extend the GFCI requirement to nondwelling unit kitchens only by adding a new (3) in Section 210-8(b).

The panel did not extend GFCI requirements to all locations because the submitter's substantiation only addressed commercial kitchens sufficiently.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #1545)

2- 14 - (210-8(a)): Accept in Principle in Part
SUBMITTER: Michael J. Johnston, International Association of Electrical Inspectors
COMMENT ON PROPOSAL NO: 2-35
RECOMMENDATION: Requesting that the Code Making Panel reconsider the action on this proposal. This proposal should be accepted and additional information has been provided to be included as substantiation. Normally the code gets changed or revised based on history or data. It also can be changed or revised based on additional safety that the changes affords the users and general public. The code is not very often changed in a proactive manner. Accepting this proposal does address all of these areas. It provides added safety from electrical shock and electrocution, it is in parallel with the requirements already in place for dwelling units. The hazards are the same, and sometimes even greater in occupancies other than dwelling units. Accepting this proposal would be proactive and would increase the safety for users and the public.
SUBSTANTIATION:

Subject: 25-year-old Restaurant Manager Electrocuted in North Carolina

Cause: Electrocution

Summary: On August 3, 1986, a 25-year-old male restaurant manager was cleaning the floor of the kitchen when he came in contact with a refrigerator that had a ground fault. The manager was electrocuted. The restaurant was closed and the manager's wife and 2-year-old daughter were in the dining area waiting for him to finish. The victim, who was wearing tennis shoes, put soap and water on the floor. He slipped and grabbed the handle of a commercial refrigerator. The refrigerator had a ground fault – the cord did not have a ground prong. The ground fault was apparently caused by excessive wear on the insulation of the conductors (wires) supplying power to the compressor. The conductors were exposed at a cut-out hole in the case of the refrigerator, were not protected from abrasion, and were not protected by strain relief. The victim's wife heard a noise in the kitchen. She successfully pulled the victim from the refrigerator into the dining area, though she was shocked in the process. She summoned help and began CPR, but to no avail.

Recommendations:

• All electrical equipment (such a refrigerator) should be designed and maintained to comply with all applicable requirements of the National Electrical Code. In this case, the defects in the refrigerator apparently developed over time and were not recognized as hazardous. The refrigerator was bought used and the owner had no owner's manual.

• Restaurant owners and managers should be encouraged to conduct formalized safety training for all restaurant employees.

• All electrical receptacles (outlets) in restaurant kitchens should be protected by ground fault circuit interrupters. See NIOSH Alert (85-104).

Subject: Electrocution in a Fast Food Restaurant

Cause: Electrocution

Summary: On June 30, 1984, at about 1:05 A.M., an 18-year-old male employee with 15 months experience at a fast food restaurant was electrocuted while plugging a portable electric toaster into a 110 volt/20 amp receptacle.

At the time of the incident, employees had closed the restaurant and damp-mopped the floors. About 5 to 10 minutes after mopping, the victim was in the process of plugging the toaster into a floor outlet when he received a shock. The assistant manager and other employees were elsewhere and did not see the victim. The assistant manager heard a scream and investigated. The assistant manager and the other workers found the victim with one hand on the plug, and the other hand wrapped around the receptacle box, and with his face on top of the outlet. An employee tried to take the victim's pulse but was shocked. The assistant manager went to the breaker box to open the breaker for that circuit, but could not find the specific breaker. He then called the emergency squad, returned to the box and found the right breaker. The victim had by then been in contact with the current for 3 to 8 minutes. An employee checked the victim's pulse and found very rapid radial pulse. The employee and assistant manager then unlocked the front door and placed another call to the rescue squad. The employee check the victim's pulse again and found none. An employee living nearby arrived and started CPR, which was continued by the rescue squad upon its arrival. CPR was administered for 1./5 hours. The victim was DOA at the local hospital. Two different electricians later evaluated the circuit and found no serious problems. It is surmised that while holding the plug, the victim's right hand slipped forward to make contact through the index finger to the energized prong. With his left hand holding the spring-loaded cover open, a current path through the arms, chest, and heart would be established from the prong to the ground. After the accident the employer required employees to open circuits at the breaker box before plugging and unplugging equipment. This strategy is not recommended because it relies on positive human action and places excessive wear on breakers.

Recommendations:

• Ground Fault Circuit Interrupter Breakers (GFCI's) would have interrupted the circuit before sufficient current has passed to cause physical damage to the body. They are recommended as the best solution.

• The location and design of the receptacles, the design of the plug, and the recent mopping contributed to the incident.

• CPR should be initiated when an unstable pulse is detected, rather than later when no pulse is found.

Subject: Worker Electrocuted in Mushroom Cannery in Ohio

Cause: Electrocution

Summary: On March 5, 1985, a 21-year-old male was electrocuted while attempting to unclog a drain trough located beneath a mushroom processing table. Apparently, the worker steadied himself by grasping the motor connection box while kneeling in water.

Prior to the accident, the cannery owner had been ordered by the city to reduce the amount of solid waste leaving the plant, because it was plugging drains and causing floods on public property. The employer tried to use removable filters over the drains, but employees failed to replace the filters, and so the employer bolted down a solid grate that had to cleaned by hand. At 9:30 A.M., the victim was ordered to the mushroom processing room and told to unclog a 7-inch-wide drain trough located under a processing table. A motor connection box was located under the table, 42 inches above the trough. Water had backed up behind the drain to form a pool 3 feet in diameter and 4 inches deep. The worker was in contact with the electric current for about 15 seconds. The worker was not observed, but a co-worker who reached for the victim received a shock, and a second worker was shocked by the table. Another co-worker immediately de-enrgized the equipment and the victim fell face down in the water. Medics arrived 8 minutes after the incident and attempted to revive the victim, who was DOA at a local hospital. On opening the motor connection box about 8 ounces of water poured out. The box was rusted and had many sharp edges.
(text illegible)
of the insulation was torn off and was probably the source of the electrical energy. The insulation could have been torn by pulling on the box's power cord. The motor was not suitable for wet applications.

Recommendations:

• The plant's electrical system should be inspected and brought up to the requirements of the National Electrical Code. Where appropriate, ground-fault circuit breakers should be installed.

• Workers should be required to wear appropriate protective gear.

• Insulating barriers mechanically attached to the processing machinery would be desirable.

• The mushroom processing procedure should be modified to reduce the number of mushrooms that fall on the floor.

• Management should implement a hazard identification program and request help from the Industrial Commission of Ohio in developing a comprehensive health and safety program.

Subject: Maintenance Mechanic Electrocuted While Touching Damaged Power Cord

Cause: Electrocution

Summary: On December 22, 1988, a 37-year-old male maintenance mechanic was electrocuted when he grasped a power cord with damaged insulation and contacted an exposed energized conductor. The employer is a meat-packing plant. At the end of each production shift, maintenance workers unplug two strapping machines used to package meat, and move them to the maintenance shop for the night. The plant floor is then washed. The machines are inspected and returned the next day. The machines are portable wheel-mounted units. Strapping material is fed from a fiberglass spool mounted on top. The machines have flexible power cords with twist-lock male plugs, attached to receptacles (outlets) on the end of cords hanging from the ceiling. On the day of the incident, a power cord on one machine was repeatedly rubbed by the edge of the rotating fiberglass spool. The point of contact was about 2.5 inches from the plug. Friction wore a half inch-long hole through the outer cover and through the insulation around one wire. The floor was wet. Fiberglass in non-conductive, and so the damage did not energize the machine. At about 5:00 P.M. the victim came to unplug the machine. He was wearing a damp pair of worn leather boots. As he grasped the plug, a finger of his right hand contacted the damaged section of cable and a bare 277-volt conductor. Current passed through his body to the wet floor. A foreman tried to free the victim's hand with a plastic scoop, but failed. The forman then struck the plug above the victims' hand knocking it loose from the cable. The victim lost consciousness. A company nurse began CPR, and a rescue squad was notified. The victim was pronounced dead about 1 hour and 15 minutes after the incident.

Recommendations:

• Permanent fixed wiring should be used whenever possible. When this is not practical, armored or protected cable should be used when cables can be contacted by moving parts.

• Strain relief should be provided where connections on power cords are subject to being pulled apart. See the National Electrical Code (NEC 400-10).

• Disconnect devices should be located close to equipment. See NEC 380-8. If the possibility of confusion exists, the disconnects should be clearly labeled. See NEC 110-22.

• Electrical safety training should be provided to all employees likely to be exposed to energized equipment.

• Periodic safety inspection of all electrically powered equipment should be performed to detect and correct problems. In this case, though the machines were "inspected", no one noticed that the damaged power cord had been previously abraded.

Prevention: Elements of an Electrical Safety Program (text illegible)

At least on of the following five factors was present in all 224 incidents evaluated by the FACE program: (1) established safe work procedures were either not implemented or not followed; (2) adequate or required personal protective equipment was not provided or worn; (3) lockout-tagout procedures were either not implemented or not followed; (4) compliance with existing OSHA, NEC, and NESC regulations were not implemented; and (5) worker and supervisor training in electrical safety was not adequate. These subjects are addressed in various NIOSH Alters [26-36] and related publications. [37]

Most of the 224 occupational electrocution incidents investigated as part of the FACE program could have been prevented through compliance with existing OSHA, NEC, and NESC regulations; and/or the use of adequate personal protective equipment (PPE). All workers should receive hazard awareness training so that they will be able to identify existing and potential hazards present in their workplaces and relate the potential seriousness of the injuries associated with each hazard. Once these hazards are identified, employers should develop measures that would allow for their immediate control. Based on an analysis of this data, to reduce occupation electrocutions, employers should:

• Develop and implement a comprehensive safety program and, when necessary, revise existing programs to throughly address the area of electrical safety in the workplace.

Ensure compliance with existing OSHA regulations Subpart S of 29 CFR 1910.302 through 1910.399 of the General Industry Safety and Health Standards[3] and Subpart K of 29 CFR 1926.402 through 1926.408 of the OSHA Construction Safety and Health Standards[4].

• Provide all workers with adequate training in the identification and control of the hazards associated with electrical energy in their workplace.

• Provide additional specialized electrical safety training to hose workers working with or around exposed components of electric circuits. This training should include, but not be limited to, training in basic electrical theory, proper safe work procedures, hazard awareness and identification, proper use of PPE, proper lockout/tagout procedures, first aid including CPR, and proper rescue procedures. Provisions should be made for periodic retraining as necessary.

• Develop and implement procedures to control hazardous electrical energy which include lockout and tagout procedures and ensure that workers follow these procedures.

• Provide those workers who work directly with electrical energy with testing or detection equipment that will ensure their safety during performance of their assigned tasks.

• Ensure Compliance with the National Electrical Code[5] and the National Electrical Safety Code[6].

• Conduct safety meetings at regular intervals.

• Conduct scheduled and unscheduled safety inspections at worksites.

• Actively encourage all workers to participate in workplace safety.

• In construction setting, conduct a jobsite survey before starting any work to identify any electrical hazards, implement appropriate control measures, and provide training to employees specific to all identified hazards.

• Ensure that proper personal protective equipment is available and worn by workers where required (including fall protection equipment).

• Conduct job hazard analyses of all tasks that might expose workers to the hazards associated with electrical energy and implement control measures that will adequately insulate and isolate workers from electrical energy.

• Identify potential electrical hazards and appropriate safety interventions during the planning phase of construction or maintenance projects. This planning should address the project from start to finish to ensure workers have the safest possible work environment.

The FACE data indicates that although many companies had comprehensive safety programs, in many cases they were not completely implemented. This underscores the need for increased management and worker understanding, awareness, and ability to identify the hazards associated with working on or in proximity to develop and implement a comprehensive safety program. In some cases, this may entail the development of additional worker training, and/or the evaluation and restructuring of existing safety programs. Management should also provide adequate training in electrical safety to all workers and strictly enforce adherence to established safe work procedures and policies. Additionally, adequate personal protective equipment should be available where appropriate. Information or assistance in accomplishing these measures can be provided by OSHA, electrical safety consultants, or other agencies or associations that deal with electrical safety. A strong commitment to safety by both management and workers is essential in the prevention of severe occupational injuries and death due to contact with electrical energy.

Overview of Electrical Hazards, Virgil Casini, B.S.

Electricity is a ubiquitous energy agent to which many workers in different occupations and industries are exposed daily in the performance of their duties. Many workers know that the principal danger from electricity is that of electrocution, but few really understand just how minute a quantity of electrical energy is required for electrocution. In reality, the current drawn by a tiny 7.5 watt, 120-volt lamp, passed from hand to hand or hand to foot across the chest is sufficient to cause electrocution.[1] The number of people who believe that normal household current is not lethal or that powerlines are insulated and do not pose a hazard is alarming. Electrocutions may result from contact with an object as seemingly innocuous as a broken light bulb or as lethal as an overhead powerline, and have affected workers since the first electrical fatality was recorded in France in 1879 when a stage carpenter was killed by an alternating current of 250 volts.[2]

The information in the following two sections (Definitions and Effects of Electrical Energy) is intended as a basic explanation of electricity and the effects of electrical energy. Unless otherwise indicated, information in these sections is derived from OSHA

electrical standards, [3,4] the National Electrical Code (NEC)[5], and the National Electrical Safety Code[6]. Official definitions of electrical terms can be found in these same documents.

Definitions:

Electricity is the flow of an atom's electrons through a conductor. Electrons, the outer particles of an atom contain a negative charge. If electrons collect on an object, that object is negatively charged. If the electrons flow from an object through a conductor, the flow is called electric current. Four primary terms are used in discussing electricity: voltage, resistance, current and ground.

Voltage is the fundamental force or pressure that causes electricity to flow through a conductor and is measured in volts. Resistance is anything that impedes the flow of electricity through a conductor and is measured in Ohms. Current is the flow of electrons from a source of voltage through a conductor and is measured in amperes (Amps). If the current flows back and forth (a cycle) through a conductor, it is called alternating current (AC). In each cycle the electrons flow first in one direction, then the other. In the United States, the normal rate is 60 cycles per second {or 60 Hertz (Hz)]. If current flows in one direction only (as in a car battery), it is called direct current (DC).

AC is most widely used because it is possible to step up or step down (i.e., increase or decrease) the current through a transformer. For example, when current from an overhead powerline is run through a pole-mounted transformer, it can be stepped down to normal household current.

OHM's (current = voltage/resistance) can be used to rotate these three elements mathematically. A ground is a conducting connection, whether or not unitentional, between an electric circuit on equpment and the earth or some conducting body that serves in place of the earth.

Effects of Electrical Energy

Electrical injuries consist of four main types: electrocution (fatal), electric shock, burns, and falls caused as a result of contact with electrical energy.

Electrocution results when a human is exposed to a lethal amount of electrical energy. To determine how contact with an electrical source occurs, characteristics of the electrical source before the time of the incident must be evaluated (pre-event). For death to occur, the human body must become part of an active electrical circuit having a current capable of overstimulating the nervous system or causing damage to internal organs. The extent of injuries received depends on the current's magnitude (measured in Amps), the pathway of the current through the body and the duration of current flow through the body (event) the resulting damage to the human body and the emergency medical treatment ultimately determine the outcome of the energy exchange (post-ever)[7].

Electrical injuries may occur in various ways: direct contact with electrical energy, injuries that occur when electricity arcs (an arc is a flow of electrons through a gas, such as air) to a victim at ground potential (supplying an alternative path to ground), flash burns from the heat generated by an electrical arc, and flame burns from the ignition of clothing or other combustible, nonelectrical materials. Direct contact and arcing injuries produce similar effects. Burns at the point of contact with electrical energy can be caused by arcing to the skin, heating at the point of contact by a high-resistance contact or higher voltage currents. (text illegible) voltages will normally result in burns at the sites where the electrical current enters and exits the human body. High voltage contact burns may display only small superficial injury; however, the danger of these deep burns destroying tissue subcutaneously exists.[8] Additionally, internal blood vessels may clot, nerves in the area of the contact point may be damaged, and muscle contractions may cause skeletal fractures either directly or in association with falls from elevation.[9] It is also possible to have a low-voltage electrocution without visible marks to the body of the victim.

Flash burns and flame burns are actually thermal burns. In these situations, electrical current does not flow through the victim and injuries are often confined to the skin.

Contact with electrical current could cause a muscular contraction or a startle reaction that could be hazardous if it leads to a fall from elevation (ladder, aerial bucket, etc.) or contact with dangerous equipment.[10]

The NEC describes high voltage as greater than 600 volts AC.[5] Most utilization circuits and equipment operate at voltages lower than 600 volts, including common household circuits 110/120 volts); most overhead lighting systems used in industry or office buildings and department stores; and much of the electrical machinery used in industry, such as conveyor systems, and manufacturing machinery such as weaving machines, paper rolling machines or industrial pumps.

Voltages over 600 volts can rupture human skin, greatly reducing the resistance of the human body, allowing more current to flow and causing greater damage to internal organs. The most common high voltages are transmission voltages (typically over 13,900 volts) and distribution voltages (typically under 13,900 volts). The latter are the voltages transferred from the power generation plants to homes, offices and manufacturing plants.

Standard utilization voltages produce currents passing through a human body in the milliampere (mA) range (1,000 mA= 1Amp). Estimated effects of 60 Hz AC currents which pass through the chest are shown in Table 1.

Table 1. Estimated Effects of 60 Hz AC Currents

1 mA	Barely perceptible
16 mA	maximum current an average man can grasp and "let go"
20 mA	Paralysis of respiratory muscles
100 mA	Ventricular fibrillation threshold
2 Amps	Cardiac standstill and internal organ damage
15/20 Amps	Common fuse or breaker opens circuit*

* Contact with 20 miliamps of current can be fatal. As a frame of reference, a common household circuit breaker may be rated at 15, 20 or 30 amps.

When current greater than 16 mA "let go current" passes through the forearm, it stimulated involuntary contraction of both flexor and extensor muscles. When the stronger flexors dominate, victims may be unable to release the energized object they have grasped as long as the current flows. If current exceeding 20 mA continues to pass through the chest for an extended time, death could occur from respiratory paralysis. Currents of 10 MA or more, up to 2 Amps, may cause ventricular fibrillation, probably the most common cause of death from electrical shock.[11] Ventricular fibrillation is the uneven pumping of the heart due to the uncoordinated, asynchronous contraction of the ventricular muscle fibers of the heart that leads quickly to death from lack of oxygen to the brain. Ventricular fibrillation is terminated by the use of a defibrillation, which provides a pulse shock to the chest to restore the heart rhythm. Cardiopulmonary resuscitation (CPR) is used as a temporary care measure to provide the circulation of some oxygenated blood to the brain until a defibrillator can be used.[23]

The spread with which resuscitative measures are initiated has been found to be critical. Immediate defibrillation would be ideal; however, for victims of cardiopulmonary arrest, resusciation has the greatest rate of success if CPR is initiated within 4 minutes and advanced cardiac life support is initiated within 8 minutes (National Conference on CPR and ECC, 1986).[6]

The presence of moisture from environmental conditions such as standing water, wet clothing, high humidity, or perspiration increases the possibility of a low-voltage electrocution. The level of current passing through the human body is directly related to the resistance of its path through the body. Under dry conditions, the resistance offered by the human body may be as high as 100,000 Ohms. Wet or broken skin may drop the body's resistance to 1,000 Ohms. The following illustrations of Ohm's law demonstrates how moisture affects low-voltage electrocutions. Under dry conditions, Current=Volts/Ohms = 120/100,000 = 1 mA, a barely perceptible level of current. Under wet conditions, Current=Volts/Ohms = 120/1,000 = 120 mA, sufficient current to cause ventricular fibrillation. Wet conditions are common during low-voltage (text illegible)

High voltage electrical energy quickly breaks down human skin, reducing the human body's resistance to 500 Ohms. Once the skin is punctured, the lowered resistance results in massive current flow, measured in Amps. Again, Ohm's law is used to demonstrate the action. For example, at 1,000 volts, Current = Volts/Ohms = 1000/500 = 2 Amps, which can cause cardiac standstill and serious damage to internal organs.

Conclusions:

Electrical hazards represent a serous, widespread occupational danger; practically all members of the workforce are exposed to electrical energy during the performance of their daily duties, and electrocutions occur to workers in various job categories. Many workers are unaware of the potential electrical hazards present in their work environment, which makes them more vulnerable to the danger of electrocution.

The Occupational Safety and Health Administration (OSHA) addresses electrical safety in Subpart S 29 CFR 1910.302 through 1910.399 of the General Industry Safety and Health Standards.[3] The standards contain requirements that apply to all electrical installations and utilization equipment, regardless of when they were designed or installed. Subpart K of 29 CFR 1926.402 through 1926.408 of the OSHA Construction Safety and Health Standards[4] contains installation safety requirements for electrical equipment

and installations used to provide electric power and light at the jobsite. These sections apply to both temporary and permanent installations on the jobsite.

Additionally, the National Electrical Code (NEC)[5] and the National Electrical Safety Code (NESC)[6] comprehensively address electrical safety regulations. The purpose of the NEC is the practical safeguarding of persons and property from hazards arising from the use of electricity. The NEC contains provisions considered necessary for safety and applies to the installation of electric conductors and equipment within or on public or private buildings or other structures, including mobile homes, recreational vehicles, and floating buildings; and other premises such as yards; carnival, parking, and other lots; and industrial substations.

The NEC serves as the basis for electrical building codes across the United States.

The NESC contains rules necessary for the practical safeguarding of person during the installation, operation, or maintenance of electric supply and communication lines and associated equipment. These rules contain the basic provisions that are considered necessary for the safety of employees and the public under the specified conditions. Unlike the NEC, the NESC contains work rules in addition to installation requirements.

Preventing Electrocution of Workers in Fast Food Restaurants

NIOSH Alert: December 1984

DHHS (NIOSH) Publication No. 85-104

Background:

On June 30, 1984, an 18-year-old male worker in a fast food restaurant dies by electrocution on the job. The worker, who had 15 months' work experience at this restaurant, was electrocuted while kneeling to insert the plug of a portable electric toaster into a 110/120V/20 amp outlet on a floor which had recently been (text missing)
receptacle box. Another worker who attempted to "take the pulse" of the victim received an electrical shock but was not injured.

When the assistant manager saw what was happening, he went to the breaker box to shut off the current but was unable to locate the appropriate breaker. The emergency rescue squad was called, and before they arrived, the proper circuit breaker was located and thrown. By that time, the victim had been in contact with the electricity for three to eight minutes. Attempts at cardiopulmonary resuscitation (CPR) by fellow workers and members of the emergency rescue squad were unsuccessful; the victim was pronounced dead on arrival at a nearby hospital.

The specific events that resulted in this electrocution could not be defined with absolute precision. However, investigators from NIOSH concluded that while the victim was inserting the plug of the toaster into the receptacle with his right hand and holding open the grounded metal receptacle cover with his left hand, the index finger of his right hand touched an energized prong of the plug and he received an electrical shock across the chest.

Recommendations by NIOSH

Because one-tenth (0.1) amp of electricity flowing through the human body for two seconds can cause death any active electrical circuit can pose a potentially lethal hazard.

Electrical hazards in the kitchens of commercial restaurants are particular concern because of the variety of electrical appliances in use. However, safeguards and safe work practices can eliminate most of these hazards NIOSH recommends that:

1. Ground fault circuit interrupters (GFCIs) of the breaker or receptacle type be installed in situations where electricity and wetness coexist. GFCIs will interrupt the electrical circuit before current sufficient to cause death or serous injury has passed through the body. GFCIs are inexpensive ($50.00-$85.00 for breaker type, $25.00-$45.00 for receptacle type) and a qualified electrician can install them in existing electrical circuits with relative ease;
2. Exposed receptacle boxes be made of nonconductive material so that contact with the box will not constitute "a ground";
3. Plugs and receptacles be designed to prevent energization until insertion is complete;
4. All circuit breaker or fuse boxes bear a label for each circuit breaker or fuse which clearly identifies its corresponding outlets and fixtures. Also, breaker switches should not be used for on-off switches;
5. All workers, when hired, be made aware of electrical hazards and of safe work practices by which to avoid these hazards. Workers should be informed that, in the event of an electrical injury, no contact should be made with the victim or the electrical apparatus causing the injury until the current has been shut off; and that
6. Workers in the restaurant be encouraged to train in CPR.

We are requesting that editors of appropriate trade journals, health officials, and especially food service inspectors institute and bring these recommendations to the attention of restaurant managers and owners and potential victims. Suggestions, requests for additional information on control practices, or questions related to this announcement should be directed to Mr. John Moran, Director, Division of Safety Research, National Institute for Occupational Safety and Health, 944 Chestnut Ridge Road, Morgantown, West Virginia 26505, Telephone (304) 291-4595.

We greatly appreciate your assistance. J. Donald Millar, M.D., D.T.P.H. (Lond.), Assistant Surgeon General, Director, National Institute for Occupational Safety and Health, Center for Disease Control

PANEL ACTION: Accept in Principle in Part.
PANEL STATEMENT: See panel action and statement on Comment 2-13.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #1672)

2- 15 - (210-8(a)(2)): Reject
SUBMITTER: William J. Richert, Lansing, MI
COMMENT ON PROPOSAL NO: 2-41
RECOMMENDATION: Change reject to accept and make the following correction:
Change "supplies" to supplied.
SUBSTANTIATION: If supplied from a dwelling and used for residential equipment then it shall meet this rule. If it is powered from another building and not used for storage of residential equipment then it should not meet this rule. If the building is located between a commercial building and dwelling, there will be misinterpretation as to whether the rule should apply as the section is presently written.
PANEL ACTION: Reject.
PANEL STATEMENT: The classification of accessory buildings should be based on the usage of the facility as determined by the authority having jurisdiction.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #286)

2- 16 - (210-8(a)(3)): Reject
SUBMITTER: Peter Romano, Hawkeye Home Inspections Inc.
COMMENT ON PROPOSAL NO: 2-32
RECOMMENDATION: Accept Proposal 2-32.
SUBSTANTIATION: As a home inspector and state licensed electrical inspector I find many (as much as 50 percent) of the GFCI receptacles and (unreadable word) malfunction must remain on after tripping and do not respond to testing. This leaves numerous households without proper protection.

This reminds me of the (name deleted) tire problem. What will it take? Numerous accidents or deaths?

We need to change the code as intended to save lives, property damage and the like.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Comment 2-42.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #296)

2- 17 - (210-8(a)(3)): Reject
SUBMITTER: Bernard Jacovitz, Professional Res. Inspection Services Inc.
COMMENT ON PROPOSAL NO: 2-44
RECOMMENDATION: Accept Proposal 2-44.
SUBSTANTIATION: The chief engineer of the US CPSC made a recommendation to require an added safety feature to all GFCIs. This code proposal is needed now as further study will only add to the need which was previously reported and based on ASHI inspector data. As a working home inspector, I see nonoperational GFCIs every day. I urge the panel to reconsider and accept the original proposal.

PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Comment 2-42.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #297)

2- 18 - (210-8(a)(3)): Reject
SUBMITTER: Bernard Jacovitz, Professional Res. Inspection Services Inc.
COMMENT ON PROPOSAL NO: 2-32
RECOMMENDATION: Accept Proposal 2-32.
SUBSTANTIATION: As a working home inspector, I see circuit breaker and receptacle GFCIs that do not work when I test them. This change to the NEC is needed now. It will add safety and save lives. Municipal inspectors do not see old homes as much as I do. GFCIs do go bad and this proposal would encourage the replacement of nonworking GFCIs. The actual reason that they go bad is secondary, and can be developed later. By changing the code this will require all GFCIs that fail the test button, not to provide power. I also see many GFCIs that are wired backwards. This proposal would also prevent that problem. I have seen a GFCI that eliminates this proposal as well.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Comment 2-42.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #452)

2- 19 - (210-8(a)(3)): Reject
SUBMITTER: R. L. Coltor, Weston, FL
COMMENT ON PROPOSAL NO: 2-32
RECOMMENDATION: Accept Proposal 2-32.
SUBSTANTIATION: During the home inspection of my home, the inspector did find one or more GFCIs that had malfunctioned. The disturbing part of this is that one is given a false sense of security. These defects could have not only injured but could have caused death. I understand there is a GFCI that doesn't reset when there is a malfunction. Please change the code and protect the public.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Comment 2-42.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #521)

2- 20 - (210-8(a)(3)): Reject
SUBMITTER: William Coull, Coull Engineering
COMMENT ON PROPOSAL NO: 2-44
RECOMMENDATION: Accept Proposal 2-44.
SUBSTANTIATION: We have inspected over 2,000 houses for buyers and test all GFCI as per ASHI standards. Our experience is that 20 percent of the GFCIs do not connect the power when they trip or will not trip when tested. Another 10 percent to 15 percent are found to be wired backwards. This is a very high failure rate and the device must be made so that it always will fail off, not on.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Comment 2-42.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #523)

2- 21 - (210-8(a)(3)): Reject
SUBMITTER: John R. Nelson, Nelson Inspection Services, Inc.
COMMENT ON PROPOSAL NO: 2-44
RECOMMENDATION: Accept Proposal 2-44.
SUBSTANTIATION: I am an ASHI and FABI home inspector. I have inspected over 10,000 homes in my 13 years in Central Florida. I see too many GFCIs that have been miswired or have failed. This leaves unknowing homeowners in a position thinking that they and their loved ones are protected, when in actuality, they are in the same position that they were pre-1978 before they were required. I would estimate that a good 20 percent of the homes I have inspected have bad GFCIs. In some cases, all GFCIs (3 to 6) are inoperative, perhaps due to a power surge or lightning strike. Years ago I thought...Why aren't they made to fail in the off position so that a person could know they have a problem rather than finding it out by accident. Now they're here. Please incorporate them into the code...accept Proposal 2-44.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Comment 2-42.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #524)

2- 22 - (210-8(a)(3)): Reject
SUBMITTER: John R. Nelson, Nelson Inspection Services, Inc.
COMMENT ON PROPOSAL NO: 2-32
RECOMMENDATION: Accept Proposal 2-32.
SUBSTANTIATION: I am an ASHI and FABI home inspector. I have inspected over 10,000 homes in my 13 years in Central Florida. I see too many GFCIs that have been miswired or have failed. This leaves unknowing homeowners in a position thinking that they and their loved ones are protected, when in actuality, they are in the same position that they were pre-1978 before they were required. I would estimate that a good 20 percent of the homes I have inspected have bad GFCIs. In some cases, all GFCIs (3 to 6) are inoperative, perhaps due to a power surge or lightning strike. Years ago I thought...Why aren't they made to fail in the off position so that a person could know they have a problem rather than finding it out by accident. Now they're here. Please incorporate them into the code...accept Proposal 2-44.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Comment 2-42.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #531)

2- 23 - (210-8(a)(3)): Reject
SUBMITTER: Dan M. Christensen, Hawkeye Inspection Services, Inc.
COMMENT ON PROPOSAL NO: 2-44
RECOMMENDATION: Accept Proposal 2-44.
SUBSTANTIATION: The chief engineer of the U.S. CPSC made a recommendation to require an added safety feature to all GFCIs. This code proposal is needed now as further study will only add to the need which was previously reported and based on ASHI inspector data. As a working home inspector, I see nonoperational GFCIs every day. I urge the panel to reconsider and accept the original proposal.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Comment 2-42.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #532)

2- 24 - (210-8(a)(3)): Reject
SUBMITTER: Dan M. Christensen, Hawkeye Inspection Services, Inc.
COMMENT ON PROPOSAL NO: 2-32
RECOMMENDATION: Accept Proposal 2-32.
SUBSTANTIATION: As a working home inspector, I see circuit breaker and receptacle GFCIs that do not work when I test them. This change to the NEC is needed now. It will add safety and save lives. Municipal inspectors do not see old homes as much as I do. GFCIs do go bad and this proposal would encourage the replacement of nonworking GFCIs. The actual reason that they go bad is secondary, and can be developed later. By changing the code, this will require all GFCIs that fail the test button, not to provide power.
I also see many GFCIs that are wired backwards. This proposal would also prevent that problem. I have seen a GFCI that eliminates this problem as well.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Comment 2-42.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #538)

2- 25 - (210-8(a)(3)): Reject
SUBMITTER: Bernard Jacovitz, Professional Res. Inspection Services Inc.
COMMENT ON PROPOSAL NO: 2-32 and 2-44
RECOMMENDATION: Accept Proposal 2-32.
Accept Proposal 2-44.
SUBSTANTIATION: As a working home inspector, I see circuit breakers and receptacle GFCIs that do not work when I test them. This change to the NEC is needed now. It will add safety and save lives. Municipal inspectors do not see homes as much as I do. GFCIs do go bad and this proposal would encourage the replacement of nonworking GFCIs. The actual reason that they go bad is secondary, and can be developed later. By changing the code this will require all GFCIs that fail the test button, not provide power. I also see many GFCIs that are wired backwards. This proposal would also prevent that problem. I have seen a GFCI that eliminates this problem as well.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Comment 2-42.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #539)

2- 26 - (210-8(a)(3)): Reject
SUBMITTER: S.R. Sliwka, Amerisearch, Inc.
COMMENT ON PROPOSAL NO: 2-44
RECOMMENDATION: Accept Proposal 2-44.
SUBSTANTIATION: The chief engineer of the U.S. CPSC made a recommendation to require an added safety feature to all GFCIs. This code proposal is needed now as further study will only add to the need which was previously reported and based on ASHI inspector data. As a working home inspector, I see nonoperational GFCIs every day. I urge the panel to reconsider and accept the original proposal.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Comment 2-42.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #540)

2- 27 - (210-8(a)(3)): Reject
SUBMITTER: S.R. Sliwka, Amerisearch, Inc.
COMMENT ON PROPOSAL NO: 2-32
RECOMMENDATION: Accept Proposal 2-32.
SUBSTANTIATION: As a working home inspector, I see circuit breaker and receptacle GFCIs that do not work when I test them. This change to the NEC is needed now. It will add safety and save lives. Municipal inspectors do not see old homes as much as I do. GFCIs do go bad and this proposal would encourage the replacement of nonworking GFCIs. The actual reason that they go bad is secondary, and can be developed later. By changing the code this will require all GFCIs that fail the test button, not to provide power.
I also see many GFCIs that are wired backwards. This proposal would also prevent that problem. I have seen a GFCI that eliminates this problem as well.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Comment 2-42.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #541)

2- 28 - (210-8(a)(3)): Reject
SUBMITTER: John L. Good, Property Inspection Consultants, Inc.
COMMENT ON PROPOSAL NO: 2-44
RECOMMENDATION: Accept Proposal 2-44.
SUBSTANTIATION: As a home and building inspector, I have seen many inoperative GFCIs in both residential and commercial settings. I consider these as safety hazards and I urge the adoption of this proposal.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Comment 2-42.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #550)

2- 29 - (210-8(a)(3)): Reject
SUBMITTER: Robert M. Jernigan, Jr., HomeSpec, Certified Home Inspections Inc.
COMMENT ON PROPOSAL NO: 2-32
RECOMMENDATION: Accept Proposal 2-32.
SUBSTANTIATION: I am a home inspector in Southeast Florida. Frequently, I find GFI outlets/breakers that do not trip when tested. The proposed change to the NEC is needed and will save lives.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Comment 2-42.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #552)

2- 30 - (210-8(a)(3)): Reject
SUBMITTER: Forrest Sutherland, Protection Home Inspection
COMMENT ON PROPOSAL NO: 2-32
RECOMMENDATION: Please accept Proposal 2-32.
SUBSTANTIATION: We (I) recommend that it is required to add a safety feature to all GFCIs. As a home inspector, I check all GFCIs. As a result, we find on an average:
A. 1 GFCI per month, that supplies electric "after" being tripped.
B. 5-6 a month that won't trip using a "grounding" type tester (No ground).
C. 4-5 a month reverse wired.
This proposal should eliminate these problems. I do 15-20 home inspections a month.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Comment 2-42. The panel notes that some of the items noted in the submitter's substantiation are not improperly operating GFCIs, but are indications of improper testing.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #553)

2- 31 - (210-8(a)(3)): Reject
SUBMITTER: Volney H. Ford, Multitech Inspection Services
COMMENT ON PROPOSAL NO: 2-44
RECOMMENDATION: Proposal 2-44 should be accepted A.S.A.P. without prolonged study. The problem is very obvious and becoming more extensive by the day. The homeowner is following the self test procedure, in many cases, and it assures them that a fault device/circuit is safe.
SUBSTANTIATION: As a working, ASHI-certified home inspector, I have found hundreds of the following:
a) GFCIs that self-test "ok", but will not trip on external test.
b) GFCIs installed on ungrounded circuits, and yet self-test "ok".
c) GFCIs wired incorrectly, affecting downstream outlets, but self-tests "ok".
d) GFCIs that always remain powered, even though GFCI function has "died".
Homeowners routinely install their own GFCI outlets, or replace defective ones, and have no idea how to wire them. The device must be designed to a fail safe wire up and test format, if it is to assure safety.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Comment 2-42. The panel notes that some of the items noted in the submitter's substantiation are not improperly operating GFCIs, but are indications of improper testing.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #577)

2- 32 - (210-8(a)(3)): Reject
SUBMITTER: Donald D. Fogelberg, Homebuyers Inspection Service
COMMENT ON PROPOSAL NO: 2-44
RECOMMENDATION: Accept Proposal 2-44.
SUBSTANTIATION: As a private home inspector, I often see energized, unsafe GFCI's. These receptacles are potentially life threatening. Changing the National Electrical Code now is of the utmost importance.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Comment 2-42.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #578)

2- 33 - (210-8(a)(3)): Reject
SUBMITTER: Donald D. Fogelberg, Homebuyers Inspection Service
COMMENT ON PROPOSAL NO: 2-32
RECOMMENDATION: Accept Proposal 2-32.
SUBSTANTIATION: As a private home inspector I often see energized, unsafe GFCIs. These receptacles are potentially life threatening. Changing the NEC now is of the utmost importance.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Comment 2-42.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #607)

2- 34 - (210-8(a)(3)): Reject
SUBMITTER: Leonard Lepine, Building Inspection Services
COMMENT ON PROPOSAL NO: 2-32
RECOMMENDATION: Accept Proposal 2-32.
SUBSTANTIATION: I have identified numerous inoperable GFCI receptacles and circuit breakers during the course of inspecting over 8,000 homes in the past 16 years. I am concerned that a resident has no way of knowing when a GFCI is inoperable. The risk of relying on an inoperable GFCI is well documented.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Comment 2-42.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #608)

2- 35 - (210-8(a)(3)): Reject
SUBMITTER: Robert Zenorini, AAR Zenorini, Inc.
COMMENT ON PROPOSAL NO: 2-32
RECOMMENDATION: Accept Proposal 2-32.
SUBSTANTIATION: As a home inspector (ASHI member), I frequently see defective GFCIs which still provide electric current. This new type of GFCI would be safer.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Comment 2-42.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #619)

2- 36 - (210-8(a)(3)): Reject
SUBMITTER: Bryan Y. Weight, BW Inspection Engineers
COMMENT ON PROPOSAL NO: 2-44
RECOMMENDATION: Please accept Proposal 2-44.
SUBSTANTIATION: As a home inspector, I have seen numerous GFCIs that do not work. Consumers should not be lead to believe that they have GFCI protection when they do not.
The code should be revised now.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Comment 2-42.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #785)

2- 37 - (210-8(a)(3)): Reject
SUBMITTER: Stephen A. Giesen, Home Survey, Inc.
COMMENT ON PROPOSAL NO: 2-44
RECOMMENDATION: Accept Proposal 2-44.
SUBSTANTIATION: As a professional home inspector, I routinely find GFCIs that do not operate as designed. This code proposal submitted by the Chief Engineer of the U.S. CPSC is right on the mark and is needed now. I strongly urge the panel to reconsider and accept the original proposal.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Comment 2-42.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #786)

2- 38 - (210-8(a)(3)): Reject
SUBMITTER: Stephen A. Giesen, Home Survey, Inc.
COMMENT ON PROPOSAL NO: 2-32
RECOMMENDATION: Accept Proposal 2-32.
SUBSTANTIATION: I inspect residential properties 6 days a week, both new construction and existing homes. I find broken GFCIs every month (i.e., wont trip, trip but power stays on, wired backwards). The above change should be approved immediately to provide a measure of safety to the public. It will safe human life! This proposal will encourage the replacement of bad GFCIs. A change to the code will require that if a GFCI goes bad, it will no longer provide power so there will be little, if any, chance of electrocution.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Comment 2-42.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #810)

2- 39 - (210-8(a)(3)): Reject
SUBMITTER: David Swartos, Wright Home Inspection
COMMENT ON PROPOSAL NO: 2-32
RECOMMENDATION: Accept Proposal 2-32.
SUBSTANTIATION: The problem is substandard/nonworking GFCI electrical outlets. I understand that there is a design which does work and if it fails, it shuts down. I am an ASHI home inspector and only yesterday, found 4 nonfunctioning GFCI outlets in a home which had 5. That's a 80 percent failure rate. That is also very dangerous when families think they are safe.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Comment 2-42.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #918)

2- 40 - (210-8(a)(3)): Reject
SUBMITTER: Harley Hernandez, Home Buyers Inspection Co.
COMMENT ON PROPOSAL NO: 2-32
RECOMMENDATION: Accept proposed 2-32.
SUBSTANTIATION: As a home inspector, I see many GFCIs that do not work when tested. This proposal would add safety. I see many older homes with GFCI added. I very often see GFCIs wired backwards and daisy chained to other supposedly "protected" circuits.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Comment 2-42.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #995)

2- 41 - (210-8(a)(3)): Reject
SUBMITTER: James N. Pearse, Leviton Manufacturing Co., Inc.
COMMENT ON PROPOSAL NO: 2-44
RECOMMENDATION: Accept the original Proposal 2-44.
SUBSTANTIATION: The original proposal reported many installed GFCIs were incapable of providing protection though they provide power. While additional studies were promised for CMP-2's review, it is unlikely that any further studies will contradict the first.

This is confirmed in a European study of the reliability of Residual Current Devices. that I have provided. This study is based on 21,147 product evaluations and reports (on page 27 of the report) an overall defect rate of 8.3 percent on commercial devices and 7.1 percent defective on residential devices. The report categorized the data in many ways and points to several environmental conditions to which the defects are attributed. Certainly, the lack of periodic testing may influence the overall percentage.

The report confirms that many external factors can cause an RCD to no longer provide protection, just as in the original survey (previously provided). Inoperable protection devices have now been shown to be global in nature. The survey I have provided affirms the original survey's premise and conclusion and minimized the need for the panel to wait on yet another study (from NEMA). How many studies are needed to show that GFCIs and similar safety devices eventually break down and no longer provide the protection one expects? By requiring outdoor GFCI's not to supply power if they cannot pass the internal test, would go a long way in increasing electrical safety.

Note: Supporting material available for review upon request at NFPA headquarters.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Comment 2-42. The RCD study supplied with this comment does not provide data relevant to the issue at hand. The study covers electromechanical RCDs which are not used in the United States, have different applications in Europe, and have very different failure parameters than the GFCI.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #996)

2- 42 - (210-8(a)(3)): Reject
SUBMITTER: Steve Campolo, Leviton Manufacturing Co., Inc.
COMMENT ON PROPOSAL NO: 2-32
RECOMMENDATION: Accept the original Proposal 2-32.
SUBSTANTIATION: The original proposal recommended that Listed GFCI's (incorporating a certain Listed feature) be required at outdoor locations, which is the responsibility of Code-Making Panel 2. This action will resolve the problem of providing power without protection, at outdoor locations.

Mr. Nissen made an affirmative comment that encouraged advancements in technology and indicated that product requirements belong in the UL standard and not the NEC. For the most part, we agree. However, the (optional) specific product requirements have been established by UL. UL has Listed a GFCI that incorporates the above mentioned features, and has applied those requirements long ago. Since UL applied certain additional requirements upon this type of GFCI, it is expected that these additional (optional) requirements will be published in the UL Standard by the normal standards process. There seems to be reluctance to require this feature on Listed GFCIs, perhaps due to external pressures. This comment recognizes that fact and points out that the proposal recommends a UL Listed product be utilized in a specific installation location, which is well within the jurisdiction of the NEC. Without an NEC requirement for this feature, there will be little utilization of this type GFCI. This has been recognized by Code-Making Panel 2 when it was required to use a circuit breaker containing certain added features in bedroom circuits.

There is an additional benefit of requiring this UL Listed product at outdoor locations. The ongoing NEMA study has reaffirmed that many GFCIs are wired incorrectly, usually as Line/Load reversal. In fact, the UL Standard requires a label covering the Load terminals. This label is often removed and the GFCI is miswired anyway. Miswired GFCIs (with UL label) have been seen in the NEMA study. A Listed GFCI incorporating these features has the added benefit of preventing itself from being reset if wired with a Line/Load reversal. This important feature is mentioned in the third paragraph of a letter from the US CPSC.

By accepting the original proposal, the NEC will recognize these advancements in GFCI technology and help to insure that when a GFCI supplies power to outdoor receptacles, life saving personnel protection is also provided.

Note: Supporting material available for review upon request at NFPA headquarters.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel has established requirements for GFCI protection in various locations of electrical installations. The performance of that GFCI is established by UL 943 - Standard for Safety of Ground-Fault Circuit Interrupters. If changes are needed to GFCIs to address specific identified issues, requirements for these changes should be incorporated into the GFCI standard.

Although, the submitter has proposed a specific feature on a GFCI, it does not address the issue of some GFCIs not functioning in the field. Commentors have claimed that homeowners do not test their GFCIs (see for example, comment 2-44). The submitter's solution would only "lock-out" a GFCI after a test was attempted by pushing the test button. Code-Making Panel 2 would expect the GFCI industry to address the cause of the failure and design future GFCIs to be more robust. No data has been submitted to indicate that a GFCI has been appropriately tested by the user, found not to function properly, and then left in service. As such, the "lock-out" solution does not support resolution of the issue.

The panel understands that UL is actively engaged with industry to look at not only numbers of inoperative GFCIs, but also the root cause of the inoperative condition. Code-Making Panel 2 would expect UL and industry to then address those root cause issues in the product standard.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #997)

2- 43 - (210-8(a)(3)): Reject
SUBMITTER: Aaron Chase, Leviton Mfg. Co. Inc.
COMMENT ON PROPOSAL NO: 2-44
RECOMMENDATION: Accept the original Proposal 2-44.
SUBSTANTIATION: The problem that will be resolved by the above recommendation is that there will be far less GFCIs providing power without protection, in outdoor locations. In the previously provided substantiation from UL (which was Leviton data generated by home inspectors) and CPSC, frighteningly large percentages of inoperative GFCIs (no protection) were protected. These percentages were reconfirmed by additional studies of home inspection reports. The Nema study, which was promised to Code-Making Panel 2 for consideration in this cycle, has not been completed as yet. At the time of this writing that study is about 50 percent complete and indicates very similar percentages of inoperative GFCIs.

A review of the raw data indicated that out of the 1155 (actually 1209) GFCI receptacles inspected to date 9.5 percent did not provide protection. The 9.5 percent only takes into account those designated 'as no trip or trip on or no reset'. For the 83 (actually 89) GFCI breakers inspected, 12 percent also did not provide protection. All of these were no trip. These percentages are dramatically similar to the percentages from the first study. Also, the important, high lightening, areas have not been fully incorporated into the NEMA study. When they are, the percentages are sure to rise.

The panel statement on proposal number 2-32 indicates prudence in waiting for the final analysis of the study. As a NEMA company member and active participant in the study, I can inform the panel that the study will not be finished in time to be acted upon this cycle. Also, a review of the data and returned samples reconfirms lightening and voltage surges are the main (not only) culprit in GFCI inoperability. Increasing a GFCIs surge resistance will only extend the useful life without solving the problem.

If Listed GFCI's equipped with this feature as described above are required at outdoor locations, instances of unprotected power supplied by GFCIs would be far reduced.

Note: Supporting material available for review upon request at NFPA headquarters.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Comment 2-42.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #1034)

2- 44 - (210-8(a)(3)): Reject
SUBMITTER: Thomas J. D'Agostino, Islandwide Home Inspection Service, Inc.
COMMENT ON PROPOSAL NO: 2-32
RECOMMENDATION: Accept proposal 2-32.
SUBSTANTIATION: Statement of Problem:

Ground Fault circuit interrupter (GFCI) electrical outlets and circuit breakers are not reliable electrical products. For years, the electrical industry, CPSC and UL have been aware of the less than adequate reliability that exists with GFCIs now installed in our homes.

The results of the 1999 Leviton GFCI research project clearly revealed a major electrical safety problem exists in our homes. The significant percentage of non-performing GFCI devices, i.e., 19% outlets, 15.5% circuit breakers, when viewed in the context of the larger population of GFCI devices that are now installed in our homes indicates that we are now knowingly exposing our families to an increased risk of electrical shock.

Over the past years, the GFCI no doubt has saved many lives. However, industry, CPSC and UL must do better. Common sense tells us that the GFCI must work 100 percent of the time when called on to do so.

Substantiation:

Since the 1999 Leviton Research Project was completed, I've conducted approximately 700 pre-purchase home inspections and continue to see "non-performing" GFCI devices, and particularly GFCI outlets. In the past month, I inspected four devices that would not protect a homeowner if called on to do so:

1. An inoperative GFCI outlet adjacent to a kitchen sink. Use of an external UL listed GFCI outlet circuit tester ("OCT") revealed "correct wiring". When the test button on the "OCT" was depressed, the test button on the GFCI outlet was not activated. The "Test/Reset" buttons on the GFCI outlet were "manually" inoperative; and the buttons/face of the GFCI outlet showed signs of having been painted over and "cleaned" by the homeowner.
2. An inoperative GFCI outlet in a shed. Use of the GFCI "OCT" revealed "correct wiring". When the test button on the "OCT" was depressed, the test button on the GFCI outlet was not activated. The "test/reset" buttons on the GFCI outlet were "manually" inoperative.
3. An inoperative GFCI outlet in the bathroom. The use of the GFCI "OCT" revealed "incorrect wiring" - "reverse polarity". When the test button on the "OCT" was depressed, the test button on the GFCI outlet was not activated. The "test/reset" buttons were "manually" operative.
4. An inoperative GFCI outlet at "pool" side. Use of the GFCI "OCT" revealed "correct wiring". When the test button on the "OCT" was depressed, the test button on the GFCI outlet was not activated. "Test/reset" buttons on the GFCI outlet were "manually" inoperative**.

**In this case, the homeowner indicated that the pool/electrical wiring was installed in 1992 and that no change in wiring was done since that time. The homeowner also stated that he never once tested the GFCI outlet.

I have conducted approximately 7000 professional home inspections (and electrical inspections beyond "ASHI" standards to the scope/intent of NFPA 73 and electrical problems with GFCIs found in our homes seem to be increasing, not decreasing).

The proposed change to NEC, Section 210.8(a)(3), should be accepted by the NFPA Panel 2 committee. The proposed wording clearly reflects a safety requirement for an electrical installation which is the stated purpose of the NEC. I view the requirement to mean that only a GFCI device that "fails safe" shall be installed. This proposed revision will prompt each GFCI manufacturer to upgrade their GFCI circuit design to achieve this higher level of safety.

Acceptance of the proposed NEC revision by the NFPA Panel 2 committee will also result in less dependence being placed on the two "human factor" components that are equally important in the equation for achieving a safe electrical installation, i.e., items 2 and 3 below.

Reliable and Safe use of a GFCI is a function of:

1. Fail safe GFCI product design in compliance with reliability test/marking requirements of UL standards ....by the manufacturer/UL.
2. Proper use of installation instructions provided with each GFCI product ...by manufacturer/UL/homeowner.
3. 1/month test of device and maintenance of a test log .... by the homeowner.

When all GFCI devices are redesigned to meet the intent of the proposed revision of NEC Section 210.8(a)(3), and UL standards are revised to assure product compliance, the expressed concern by CPSC chairman Ann brown (in a 1994 speech) that "GFCIs should be useful only when they work" will become a reality. In the future, at any time that a GFCI installed in our home is unable to perform as intended, the GFCI must automatically become de-energized.

Note: Supporting material is available for review at NFPA Headquarters.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Comment 2-42.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #1035)

2- 45 - (210-8(a)(3)): Reject
SUBMITTER: Thomas J. D'Agostino, Islandwide Home Inspection Service, Inc.
COMMENT ON PROPOSAL NO: 2-44
RECOMMENDATION: Accept proposal 2-44.
SUBSTANTIATION: Statement of Problem:

Ground Fault circuit interrupter (GFCI) electrical outlets and circuit breakers are not reliable electrical products. For years, the electrical industry, CPSC and UL have been aware of the less than adequate reliability that exists with GFCIs now installed in our homes.

The results of the 1999 Leviton GFCI research project clearly revealed a major electrical safety problem exists in our homes. The significant percentage of non-performing GFCI devices, i.e., 19% outlets, 15.5% circuit breakers, when viewed in the context of the larger population of GFCI devices that are now installed in our

homes indicates that we are now knowingly exposing our families to an increased risk of electrical shock.

Over the past years, the GFCI no doubt has saved many lives. However, industry, CPSC and UL must do better. Common sense tells us that the GFCI must work 100 percent of the time when called on to do so.

Substantiation:

Since the 1999 Leviton Research Project was completed, I've conducted approximately 700 pre-purchase home inspections and continue to see "non-performing" GFCI devices, and particularly GFCI outlets. In the past month, I inspected four devices that would not protect a homeowner if called on to do so:

1. An inoperative GFCI outlet adjacent to a kitchen sink. Use of an external UL listed GFCI outlet circuit tester ("OCT") revealed "correct wiring". When the test button on the "OCT" was depressed, the test button on the GFCI outlet was not activated. The "Test/Reset" buttons on the GFCI outlet were "manually" inoperative; and the buttons/face of the GFCI outlet showed signs of having been painted over and "cleaned" by the homeowner.
2. An inoperative GFCI outlet in a shed. Use of the GFCI "OCT" revealed "correct wiring". When the test button on the "OCT" was depressed, the test button on the GFCI outlet was not activated. The "test/reset" buttons on the GFCI outlet were "manually" inoperative.
3. An inoperative GFCI outlet in the bathroom. The use of the GFCI "OCT" revealed "incorrect wiring" - "reverse polarity". When the test button on the "OCT" was depressed, the test button on the GFCI outlet was not activated. The "test/reset" buttons were "manually" operative.
4. An inoperative GFCI outlet at "pool" side. Use of the GFCI "OCT" revealed "correct wiring". When the test button on the "OCT" was depressed, the test button on the GFCI outlet was not activated. "Test/reset" buttons on the GFCI outlet were "manually" inoperative**.

**In this case, the homeowner indicated that the pool/electrical wiring was installed in 1992 and that no change in wiring was done since that time. The homeowner also stated that he never once tested the GFCI outlet.

I have conducted approximately 7000 professional home inspections (and electrical inspections beyond "ASHI" standards to the scope/intent of NFPA 73 and electrical problems with GFCIs found in our homes seem to be increasing, not decreasing).

The proposed change to NEC, Section 210.8(a)(3), should be accepted by the NFPA Panel 2 committee. The proposed wording clearly reflects a safety requirement for an electrical installation which is the stated purpose of the NEC. I view the requirement to mean that only a GFCI device that "fails safe" shall be installed. This proposed revision will prompt each GFCI manufacturer to upgrade their GFCI circuit design to achieve this higher level of safety.

Acceptance of the proposed NEC revision by the NFPA Panel 2 committee will also result in less dependence being placed on the two "human factor" components that are equally important in the equation for achieving a safe electrical installation, i.e., items 2 and 3 below.

Reliable and Safe use of a GFCI is a function of:

1. Fail safe GFCI product design in compliance with reliability test/marking requirements of UL standards ....by the manufacturer/UL.
2. Proper use of installation instructions provided with each GFCI product ...by manufacturer/UL/homeowner.
3. 1/month test of device and maintenance of a test log .... by the homeowner.

When all GFCI devices are redesigned to meet the intent of the proposed revision of NEC Section 210.8(a)(3), and UL standards are revised to assure product compliance, the expressed concern by CPSC chairman Ann brown (in a 1994 speech) that "GFCIs should be useful only when they work" will become a reality. In the future, at any time that a GFCI installed in our home is unable to perform as intended, the GFCI must automatically become de-energized.

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

PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Comment 2-42.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #1183)

2- 46 - (210-8(a)(3)): Reject
SUBMITTER: Graham W. Bailey, Affordable Home Inspection, Inc.
COMMENT ON PROPOSAL NO: 2-32
RECOMMENDATION: Accept Proposal 2-32.
SUBSTANTIATION: As a pre-purchase home inspector, I encounter non-operable GFCI outlets and circuit breakers on a regular basis. This change to the NEC is needed as it will add the safety that many people think they have with the installed GFCI outlets and breakers but in fact do not, if the outlet/breaker is bad. Failure of GFCI circuits over a year old is very common.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Comment 2-42.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #1325)

2- 47 - (210-8(a)(3)): Reject
SUBMITTER: William H. King, Jr., U.S. Consumer Product Safety Commission
COMMENT ON PROPOSAL NO: 2-44
RECOMMENDATION: I request reconsideration of Proposal 2-44 which requested that Section 210-8 be revised as follows:

210-8. Ground-Fault Circuit-Interrupter Protection for Personnel.

(a) Dwelling Units...

(3) Outdoor. The device(s) providing ground-fault circuit-interrupter protection for personnel shall remove the power normally available for the loads as protected receptacles, and not restore this power, if the protection device fails to operate as intended in the test mode.

SUBSTANTIATION: Proposal 2-44 should be accepted based on new information developed after the proposal received consideration during the ROP stage. Early reports from a survey that found approximately 10% not to be in working order have now been largely confirmed in the latest survey, with some areas reporting much higher failure rates. While this supports the need to upgrade the product standard with the addition of new performance requirements, it also supports immediate recognition in the 2002 edition of the NEC of a listed GFCI that already addresses safety consequences of a non-working GFCI. There exists in the marketplace this new class of GFCI that does not permit resetting the device if it does not test okay. Requiring this class of device (especially for outdoor receptacle protection where the risk of electrocution is generally the highest) would permanently take out of service a malfunctioning GFCI as soon as the test button is pushed, require replacement of the device, and thus provide effective shock protection for saving lives.

There is no justification to wait three years to reconsider such action during the next code cycle when the heightened risk of electrocution with nonoperational GFCIs is known to exist.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Comment 2-42. The panel also notes that a revision to the product standard would not have to wait until the next code cycle, and can be implemented in a timeframe indicated by the standards developer.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #1657)

2- 48 - (210-8(a)(3)): Accept
SUBMITTER: Jack Wells, Pass & Seymour/Legrand
COMMENT ON PROPOSAL NO: 2-44
RECOMMENDATION: The Panel should continue to reject this proposal.
SUBSTANTIATION: This comment supports the action of the Panel to reject the proposal. Likewise, we support the Panel statement and the affirmative comment of Mr. Nissen on Proposal 2-32.

Unfortunately, the survey mentioned in the Panel statement has taken longer than anticipated. The stated objective of the survey is "…to obtain statistically valid data to identify, define and quantify long term operation of GFCIs in the installed infrastructure. For suspected field failures, both the installation and the product must

be analyzed and data compiled to enable clear definition (including conditions of use and environment) and mode of failure (e,g, SCR failure, test button failure) sufficient to define remedial action(s) if required.,"

The statistical model developed for this survey has been reviewed and confirmed by CPSC as appropriate. UL is fully involved in the collection, tabulation and analysis of the data as it comes in.

Because the data is incomplete, unanalyzed and lacks peer review it would be inappropriate for NEMA to release it at this time.

Even if the survey supports some remedial action, the Panel and Mr. Nissen are correct in stating that such action should involve the product safety standard, not the installation code.

PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #1801)

2- 49 - (210-8(a)(3)): Accept
SUBMITTER: William J. Murphy, Cutler-Hammer, Inc.
COMMENT ON PROPOSAL NO: 2-32
RECOMMENDATION: Continue to reject the proposal.
SUBSTANTIATION: Cutler-Hammer supports the panel action to reject the proposal. In line with the affirmative comments of the Underwriters Laboratories Code-Making Panel 2 Representative, Mr. Nissen, Cutler-Hammer considers that any additional product requirements appropriately belong in the product safety standards and not in the NEC. If shown to be necessary, these additional product requirements might include features such as improved surge suppression or conformal coatings. Any additional product requirements would also need to take into account consumer practice relative to manufacturers' requests for the periodic testing of GFCIs. Unfortunately, many consumers do not test their GFCIs on a regular basis. Such testing needs to be encouraged. However, the provision of a lock-out feature, with the possibility of immediate loss of power at the GFCI and associated feed-through receptacles, could actually prove to be a disincentive for performing the test. A further concern is that consumers faced with a loss of power, could use extension cords to service outdoor areas that are normally associated with GFCI protected receptacles. This could prove hazardous.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #1802)

2- 50 - (210-8(a)(3)): Accept
SUBMITTER: William J. Murphy, Cutler-Hammer, Inc.
COMMENT ON PROPOSAL NO: 2-43
RECOMMENDATION: Continue to reject the proposal.
SUBSTANTIATION: Cutler-Hammer supports the panel action to reject the proposal. In line with the affirmative comments of the Underwriters Laboratories Code-Making Panel 2 Representative, Mr. Nissen, Cutler-Hammer considers that any additional product requirements appropriately belong in the product safety standards and not in the NEC. If shown to be necessary, these additional product requirements might include features such as improved surge suppression or conformal coatings. Any additional product requirements would also need to take into account consumer practice relative to manufacturers' requests for the periodic testing of GFCIs. Unfortunately, many consumers do not test their GFCIs on a regular basis. Such testing needs to be encouraged. However, the provision of a lock-out feature, with the possibility of immediate loss of power at the GFCI and associated feed-through receptacles, could actually prove to be a disincentive for performing the test. A further concern is that consumers faced with a loss of power, could use extension cords to service outdoor areas that are normally associated with GFCI protected receptacles. This could prove hazardous.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #1803)

2- 51 - (210-8(a)(3)): Accept
SUBMITTER: William J. Murphy, Cutler-Hammer, Inc.
COMMENT ON PROPOSAL NO: 2-44
RECOMMENDATION: Continue to reject the proposal.
SUBSTANTIATION: Cutler-Hammer supports the panel action to reject the proposal. In line with the affirmative comments of the Underwriters Laboratories Code-Making Panel 2 Representative, Mr. Nissen, Cutler-Hammer considers that any additional product requirements appropriately belong in the product safety standards and not in the NEC. If shown to be necessary, these additional product requirements might include features such as improved surge suppression or conformal coatings. Any additional product requirements would also need to take into account consumer practice relative to manufacturers' requests for the periodic testing of GFCIs. Unfortunately, many consumers do not test their GFCIs on a regular basis. Such testing needs to be encouraged. However, the provision of a lock-out feature, with the possibility of immediate loss of power at the GFCI and associated feed-through receptacles, could actually prove to be a disincentive for performing the test. A further concern is that consumers faced with a loss of power, could use extension cords to service outdoor areas that are normally associated with GFCI protected receptacles. This could prove hazardous.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #1820)

2- 52 - (210-8(a)(3)): Reject
SUBMITTER: Steve Campolo, Leviton Manufacturing Co., Inc.
COMMENT ON PROPOSAL NO: 2-44
RECOMMENDATION: Accept the original Proposal 2-44.
SUBSTANTIATION: The original proposal reported many installed GFCIs were incapable of providing protection though they provide power. While additional studies were promised for Code-Making Panel 2's review, it is unlikely that any further studies will contradict the first. I have provided four recent, additional studies that were conducted by members of the American Society of Home Inspectors. As suspected, these new studies are in agreement with the original data.

The data is summarized for convenience. The raw data is made available as well.

From Inspector Jones of Colorado:
14.6 percent of Circuit Breaker GFCIs did not trip when tested.
1.0 percent of Receptacle GFCIs did not trip when tested.
From Inspector Baca, PE, of Arizona:
12.5 percent of Circuit Breaker GFCIs did not trip when tested.
8.57 percent of Receptacle GFCIs did not trip when tested.
From Inspector Johnson of Utah:
12.1 percent of Circuit Breaker GFCIs did not trip when tested.
9 percent of Receptacle GFCIs did not trip when tested.
From Inspector Hodgden of Missouri:
* 40 percent of Circuit Breaker GFCIs did not trip when tested.
14.42 percent of Receptacle GFCIs did not trip when tested.

Inspector Hodgden's comments are also included with the material I have provided.

Once again, data is provided which further supports the need for GFCIs that will not provide power when they are incapable of completing the built-in test function. No matter how robust any GFCI product is made, the continual bombardment of voltage surges will eventually damage the electronics. This change, for outdoor GFCIs will assure that when a GFCI reaches its end-of-life, unprotected power will not be supplied.

Note: Supporting material available for review upon request at NFPA headquarters.

PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Comment 2-42.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #1884)

2- 53 - (210-8(a)(3)): Accept
SUBMITTER: Howard S. Leopold, Cooper Wiring Devices
COMMENT ON PROPOSAL NO: 2-32
RECOMMENDATION: This comment supports the rejection of this proposal.
SUBSTANTIATION: This writer agrees with the committee statement and the comment of Mr. Nissen on the vote.
Until the GFCI manufacturers of NEMA complete the field study of installed GFCIs, with the collection of the requisite quantities of samples, inspected and analyzed, no statistically valid conclusions can be drawn. Without such conclusions, no valid "fix" can be proposed. In any case, the product safety standard would be the place to put new operational requirements for the product, not the NEC.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #1885)

2- 54 - (210-8(a)(3)): Accept
SUBMITTER: Howard S. Leopold, Cooper Wiring Devices
COMMENT ON PROPOSAL NO: 2-43
RECOMMENDATION: This comment supports the rejection of this proposal.
SUBSTANTIATION: This writer agrees with the committee statement and the comment of Mr. Nissen on the vote.
Until the GFCI manufacturers of NEMA complete the field study of installed GFCIs, with the collection of the requisite quantities of samples, inspected and analyzed, no statistically valid conclusions can be drawn. Without such conclusions, no valid "fix" can be proposed. In any case, the product safety standard would be the place to put new operational requirements for the product, not the NEC.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #1886)

2- 55 - (210-8(a)(3)): Accept
SUBMITTER: Howard S. Leopold, Cooper Wiring Devices
COMMENT ON PROPOSAL NO: 2-44
RECOMMENDATION: This comment supports the rejection of this proposal.
SUBSTANTIATION: This writer agrees with the committee statement and the comment of Mr. Nissen on the vote.
Until the GFCI manufacturers of NEMA complete the field study of installed GFCIs, with the collection of the requisite quantities of samples, inspected and analyzed, no statistically valid conclusions can be drawn. Without such conclusions, no valid "fix" can be proposed. In any case, the product safety standard would be the place to put new operational requirements for the product, not the NEC.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #2078)

2- 56 - (210-8(a)(3)): Reject
SUBMITTER: Melvin Jacobs, Southeastern Michigan House Inspectors
COMMENT ON PROPOSAL NO: 2-32
RECOMMENDATION: Accept Proposal 2-32.
SUBSTANTIATION: I find many GFCI receptacles that do not work when I test them. Either defective, or wired backwards. This proposal would eliminate this problem. As a home inspector this is one of the most frequent items that I call out. I consider a defective GFCI more of a hazard than when an outlet is provided without protection as occupants believe they are protected when they are not. This proposal would encourage replacement, saving lives.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Comment 2-42.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #2394)

2- 57 - (210-8(a)(3)): Reject
SUBMITTER: M. R. Kramer, Del Ray Beach, FL
COMMENT ON PROPOSAL NO: 2-32
RECOMMENDATION: Accept Proposal 2-32.
SUBSTANTIATION: During the home inspection of my home, the inspector did find one or more GFCIs that had malfunctioned. The disturbing part of this is that given the false sense of security. These defects could have not only injured, but could have caused DEATH. I understand there is a GFCI that doesn't reset when there is a malfunction. Please change the code and protect the public.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Comment 2-42.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #1992)

2- 58 - (210-8(a)(5) Exception No. 3): Accept in Principle
SUBMITTER: William F. Laidler, Rep. Massachusetts Electrical Code Advisory Committee
COMMENT ON PROPOSAL NO: 2-48
RECOMMENDATION: This proposal should be accepted as written.
SUBSTANTIATION: It is to be noted that there was an apparent lack of correlation between proposal 2-48 [Section 210-8(a)(5) Exception No. 3] that was rejected and companion proposal 16-121 (Section 760-21 and 16-130) (Section 760-41) that were accepted.
The Code arrangement is such that chapter 2 [210-8(a)(5) Exception No. 3] applies generally, and that Chapter 7 (760-21 and 760-41) may supplement or modify Chapter 2. The NEC Technical Correlating Committee is aware of this issue and must determine the outcome.
PANEL ACTION: Accept in Principle.
Revise the wording in the proposal to read as follows:
"Exception No. 3: A receptacle supplying only a permanently installed fire alarm or burglar alarm system shall not be required to have ground-fault circuit-interrupter protection."
PANEL STATEMENT: The revised wording meets the intent of the submitter and complies with the NEC Style Manual.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #1370)

2- 59 - (210-8(b)): Accept
SUBMITTER: Kari Barrett, American Chemistry Council
COMMENT ON PROPOSAL NO: 2-33
RECOMMENDATION: Continue to reject this proposal.
SUBSTANTIATION: Ground-fault protection for personnel using outdoor receptacles in nondwelling unit applications is already addressed by 305-6. It does appropriately allow the use of "cord sets or devices incorporating listed ground-fault circuit interrupter protection" as a means to meet the requirement.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #1725)

2- 60 - (210-8(b)): Reject
SUBMITTER: Don Ganiere, Ottawa, IL
COMMENT ON PROPOSAL NO: 2-64
RECOMMENDATION: The proposal should be accepted.
SUBSTANTIATION: I would like to get a hold of this magic wand that Code-Making Panel 2 uses to make the same conditions that are unsafe at dwelling units safe in all other occupancies. Most of the work done outside at these other occupancies falls under

"maintenance or repair" and 305-6 would require the use of GFCI protection. Why not require it when the receptacles are installed?
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter has not provided any additional data that would justify using the dwelling unit GFCI requirements for other than dwelling units.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
PAULEY: See my Explanation of Negative on Comment 2-63.

(Log #1249)

2- 61 - (210-8(b)(2)): Reject
SUBMITTER: Dann Strube, Lanesville, IN
COMMENT ON PROPOSAL NO: 2-69
RECOMMENDATION: The proposal should have been accepted.
SUBSTANTIATION: The Code Making Panel 2 statement refers to the original substantiation for the rooftop requirement that was added to the code in 1993. The original proposal can be found in the 1992 TCR, page 60, proposal 2-118. Substantiation at that time was "Because of the additional hazard from standing water on roofs the additional protection afforded by a ground fault circuit interrupter should be required."
The substantiation for the many proposals for GFCI protection of outdoor receptacles at other than dwellings cite the same conditions and many are much stronger. If this proposal continues as rejected, one of those requesting GFCI protection for outdoor receptacles must be accepted. This is a companion comment to my comment on Proposal 2-64.
Note: Supporting Material is available for review at NFPA Headquarters.
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter has not provided sufficient substantiation that would justify deleting the requirement for GFCI protection of receptacles on rooftops.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #1250)

2- 62 - (210-8(b)(2)): Reject
SUBMITTER: Dann Strube, Lanesville, IN
COMMENT ON PROPOSAL NO: 2-64
RECOMMENDATION: The proposal should have been accepted.
SUBSTANTIATION: The original proposal for GFCI protection on rooftops can be found in the 1992 TCR, page 60, proposal 2-118. The substantiation at that time was "Because of the additional hazard from standing water on roofs that additional protection afforded by a ground fault circuit interrupter should be required." Substantiation for this proposal and the numerous other proposals is as strong if not stronger than that given for rooftop GFCI protection.
If proposal 2-64 continues as rejected, then Proposal 2-69 must be accepted. This a companion comment to my comment on Proposal 2-69.
Note: Supporting Material is available for review at NFPA Headquarters.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Comment 2-60.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #1993)

2- 63 - (210-8(b)(3)): Reject
SUBMITTER: William F. Laidler, Rep. Massachusetts Electrical Code Advisory Committee
COMMENT ON PROPOSAL NO: 2-80
RECOMMENDATION: This proposal should be accepted as written.
SUBSTANTIATION: The substantiation used to introduce GFCI protection for receptacles located on rooftops to serve HACR equipment for the 1993 NEC was, because of the additional hazard of standing water on roofs, the additional protection afforded by a GFCI should be required. Generally there are drains on rooftops, hence the water hazard becomes more severe in the vicinity of HACR equipment located at ground levels.
The panel statement to see panel statement on proposal 2-33 is not really adequate and is misleading as proposal 2-33 addresses GFCI protection for all outdoor receptacles, not just those to service HACR equipment as recommended in proposal 2-80.
Apply the very same reasoning for personal protection, as was used for rooftops, to the much more severe shock hazards that may be present at ground levels.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel reaffirms its action and statement on Proposal 2-80. The submitter did not provide any substantiation of a standing water hazard in the vicintiy of HACR equipment located at ground levels.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NEGATIVE: 2
EXPLANATION OF NEGATIVE:
NISSEN: I am changing my vote to negative as I agree with Mr. Pauley's statements. Comment 2-63 should have been "Accept."
PAULEY: I am voting negative on the panel action. With the panel action on Comment 2-120 to add a required receptacle within 25 feet of all heating, air conditioning and refrigeration equipment, this comment should be accepted. It is clear that this required receptacle is intended for use by personnel to service the equipment. This will be done in a variety of environmental conditions including rain, snow, etc. Since the use of the receptacle is specifically known to be for personnel, GFCI protection is justified. The requirement could have been limited to this receptacle by adding a new item (4) to 210-8(b) to read: "(4) Outdoor receptacles installed to meet the requirements of 210-63.

(Log #2367)

2- 64 - (210-8(b)(3)): Reject
SUBMITTER: Monte R. Ewing, State of Wisconsin
COMMENT ON PROPOSAL NO: 2-81
RECOMMENDATION: Revise text as follows:
Commercial Repair Garages - where self-propelled motor vehicles are serviced or repaired.
SUBSTANTIATION: The original proposal was misunderstood as an application of residential rules to a commercial application. What my proposal was intended to do was move Section 511-10 into 210-8(b) as a general rule. I propose this because the original intent of 511-10 had nothing to do with hazardous location wiring. It was for electrical shock protection of the repair mechanic. The drawback is that 511 only applies where volatile flammable are used and does not apply to combustible fuel or electric fuel cell powered vehicle repair garages.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel reaffirms its action and statement on Proposal 2-81. There is no supporting data which would justify the GFCI requirement for commercial garages in Section 210-8(b). Commercial garages are defined only in Article 511.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #445)

2- 65 - (210-11(b)): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
COMMENT ON PROPOSAL NO: 2-85
RECOMMENDATION: Accept in principle revised:
(b) Load evenly proportioned among branch circuits~~. Where the load is computed on a volt amperes/square foot (0.093m^2) basis the~~ The wiring systems up to and including the branch-circuit panelboard(s) shall be provided to serve not less than the computed ~~calculated~~ load. This load shall be evenly proportioned insofar as practicable among ~~multiwire~~ branch circuits within the panelboard(s). Branch-circuit overcurrent devices ~~and circuits~~ shall ~~need~~ only be required to be installed ~~to serve the connected load~~ for circuits installed.
SUBSTANTIATION: My proposal substantiation was unclear re: VA per circuit loads such as small appliance circuits, laundry circuits, sign circuits to be included with the va/sq. ft. load. The

intent is to indicate they should be included in the evenly proportioned requirement. The requirements in the present text are limited to circuits covered by the second sentence. The requirement for adequate systems should not be limited to loads computed on a va/sq. ft. basis. This should apply to those computed on a va per circuit and nameplate loads. Why does the text require balanced load only for multioutlet circuits? This should apply to single outlet circuits also.

Branch-circuit overcurrent devices should only be required to be installed where circuits are installed whether there is a "connected" load or a "computed" load.

PANEL ACTION: Reject.

PANEL STATEMENT: The present code rule expresses the intent of the panel. When the load is computed on a VA per square foot basis, the wiring system must be sized to serve that computed load.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

Note: The sequence no. 2-66 was not used.

(Log #12)

17- 3 - (210-12): Accept

SUBMITTER: Technical Correlating Committee National Electrical Code

COMMENT ON PROPOSAL NO: 2-102

RECOMMENDATION: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 17 for further consideration in Article 517. This will be considered as a public comment.

SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.

PANEL ACTION: Accept.

PANEL STATEMENT: The panel accepts the direction of the Technical Correlating Committee to consider the portion of Proposal 2-102 relating to limited care facilities. Refer to the panel action and statement on Comment 17-16.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:

AFFIRMATIVE: 15

(Log #13)

17- 4 - (210-12): Accept

SUBMITTER: Technical Correlating Committee National Electrical Code

COMMENT ON PROPOSAL NO: 2-103

RECOMMENDATION: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 17 for further consideration in Article 517. This will be considered as a Public Comment.

SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.

PANEL ACTION: Accept.

PANEL STATEMENT: The panel accepts the direction of the Technical Correlating Committee to consider the portion of Proposal 2-103 relating to limited care facilities. Refer to the panel action and statement on Comment 17-16.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:

AFFIRMATIVE: 15

Note: The sequence nos. 17-5 and 17-6 were not used.

(Log #1800)

17- 7 - (210-12): Reject

SUBMITTER: Robert J. Clarey, Cutler-Hammer, Inc.

COMMENT ON PROPOSAL NO: 2-102

RECOMMENDATION: This section of this proposal dealing with Limited Care Facility Bedrooms should be accepted by Code Making Panel 17.

SUBSTANTIATION: Proposals 2-102, 2-103, and 2-114 contain a paragraph dealing with enhanced safety protection for the branch circuits of Limited Care Facility Bedrooms. The action of the Technical Correlating Committee has been to refer these proposals to Code Making Panel 17 to be considered as a public comment. Cutler-Hammer supports the proposal in 2-102, 2-103 and 2-114 that all branch circuits that supply 125-volt, single-phase, 15- and 20-ampere outlets installed in limited care facility bedrooms shall be protected by an arc-fault circuit interrupter(s). The substantiation is found in the proposals.

PANEL ACTION: Reject.

PANEL STATEMENT: Refer to the panel action and statement on Comment 17-16.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:

AFFIRMATIVE: 15

Note: The sequence nos. 17-8, 17-9 and 17-10 were not used.

(Log #811)

2- 67 - (210-12): Reject

SUBMITTER: Bernard A. Schwartz, Schwartz Fire Specialists

COMMENT ON PROPOSAL NO: 2-104

RECOMMENDATION: After "...January 1, 2002" insert:

"or purposes of this section, the installation of an arc-fault circuit interrupter at the receptacle with all receptacles in the bedroom supplied through that protected receptacle shall be deemed compliant".

The original proposal should be accepted.

SUBSTANTIATION: 1. Available fire data indicate that although electrical fires do represent a significant part of the total fire problem, fires occurring along the straight run of wire from the load center to the receptacle represent only a minuscule percentage of that total. The receptacle device is designed to provide a much higher level of protection than the load center device for items that are connected to the receptacle and would therefore provide a higher level of protection and prevent the occurrence of a significantly larger amount of fires. The Underwriters Laboratories Inc. Standard for Safety for Arc Fault Circuit Interrupters (UL 1699) currently recognized four types of AFCI devices (Branch Feeder, Cord, Outlet Circuit and Portable). The NEC panel only recognizes the Branch Feeder ARC-Fault Circuit Interrupter.

2. The arc fault detection tests are listed in Table 50.2 of UL 1699. This table indicated that the branch feeder AFCI is to be subjected to:

U.L. section # 56.2 Carbonized path arc ignition test
56.3 Carbonized path arc interruption test
56.5 Point contact arc test, unwanted tripping tests, load
57 Unwanted tripping tests
58 Operation inhibition

3. The receptacle type AFCI is tested to all of the same tests to which the branch feeder AFCI is tested plus the Carbonized path arc clearing time test (U.L. section #56.4). It is important to note that the carbonized path arc interruption test is conducted at a current rating of 5 amperes while the point contact arc test is conducted at currents that range from 75 to 300 ampere. The sensitivity of the receptacle type device to detect electrical faults in connected devices such as a television is much greater, because the impedance of (text missing).

4. Restricting the way in which the hazard may be addressed also acts as a restraint of trade and discourages new products from entering the marketplace while making the entire NFPA process appear to be a manipulative tool of a particular group of manufacturers.

PANEL ACTION: Reject.

PANEL STATEMENT: The requirement in Section 210-12 expresses the intent of the panel, which is that the entire branch-circuit be provided with AFCI protection.

Also, see panel action and statement on Comment 2-78.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

(Log #1326)

2- 68 - (210-12): Reject

SUBMITTER: William H. King, Jr., U.S. Consumer Product Safety Commission

COMMENT ON PROPOSAL NO: 2-119

RECOMMENDATION: I request reconsideration of Proposal 2-119 which included a new subsection (c) to be added to Section 210-12. Arc-Fault Circuit-Interrupter Protection as follows:

(c) Lighting and Appliance Branch Circuits. Each existing 125-volt, single-phase, 15- and 20-ampere lighting and appliance branch circuit shall be individually protected by an arc-fault circuit interrupter when the service equipment is replaced.

SUBSTANTIATION: In the panel statement accompanying rejection of Proposal 2-119, Panel 2 indicates that it "does not intend to expand the code to require AFCIs in existing dwellings at this time." If that statement stands, it effectively closes the door for urgently needed protection for older homes, without providing a rationale for a delay. No technical substantiation for the rejection or other reason is provided as required in Section 4-3.5.1 of the NFPA Regulations Governing Committee Projects (NFPA 2000 Directory, Part V), which states that a "reject" shall include a statement, preferably technical in nature, on the reason for the TC action. Such statement shall be sufficiently detailed so as to convey the TC's rationale for its action so that rebuttal may, if desired, be submitted during the comment period.

The availability of AFCI protection today is an outgrowth of a CPSC sponsored study by Underwriters Laboratories, Inc. entitled "Technology for Detecting and Monitoring Conditions That Could Cause Electrical Wiring System Fires", September 1995. The objective of the study was to safely permit the continued occupancy of dwellings (many of which in this country are more than 40 years old with electrical wiring system elements remaining in service beyond their original design life) without manifestation of electrical symptoms that can cause fires. According to the report, arc-fault detection is the most promising new technology especially when used in combination with conventional protection devices such as circuit breakers, fuses and GFCIs. Now that AFCIs have been thoroughly evaluated and are available in the marketplace as listed devices, existing dwellings should be among the first to receive the benefits, given the greater risk of electrical fires in older homes.

As the submitter of the proposal, and in lieu of a sustained rejection, I would accept limiting the proposal to dwelling units, and including an effective date on or before the beginning of the year for the next scheduled edition of the NEC. This would permit time for sufficient production of listed AFCIs to meet anticipated demands.

PANEL ACTION: Reject.

PANEL STATEMENT: The panel is not expanding the scope of AFCI installations at this time, pending the receipt of performance data.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

NEGATIVE: 1

EXPLANATION OF NEGATIVE:

MARSHALL: I agree with the submitter.

(Log #1660)

2- 68a - (210-12): Reject

SUBMITTER: Melvin K. Sanders, TECo., Inc.

COMMENT ON PROPOSAL NO: 2-102

RECOMMENDATION: Add the following as a new sentence:

Additional areas shall be permitted to be supplied by bedroom arc-fault circuit-interrupter(s) protected circuits unless prohibited elsewhere in this Code.

SUBSTANTIATION: Already the shopping list mentality is coming to the forefront. It appears that while all know what a bedroom and a closet are, some building codes may require a circuit separate from the bedroom circuit for the closet and will not permit them to be placed on the bedroom AFCI protected circuit. This would end up requiring an additional circuit and none is justified.

PANEL ACTION: Reject.

PANEL STATEMENT: This is not prohibited by the present text in the code.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

(Log #1673)

2- 69 - (210-12): Reject

SUBMITTER: Timothy Costigan, Lansing, MI

COMMENT ON PROPOSAL NO: 2-106

RECOMMENDATION: Delete this code section.

SUBSTANTIATION: If AFCIs have been unreliable and costly, why is this in the code? Putting products into the code before being properly tested is questionable at best. It seems that a product with a cost ten times the actual loss to society is a tremendous waste of money. Further, how many ARC faults occur in a bedroom of a dwelling? Unless an electrical cord or the wiring in the wall is pinched or exposed to conductive material, no ARC fault should occur. In the event an ARC fault did occur, it does not appear that an AFCI would actually trip in all cases.

PANEL ACTION: Reject.

PANEL STATEMENT: See panel actions and statements on Comments 2-72 and 2-73.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

NEGATIVE: 1

EXPLANATION OF NEGATIVE:

WIEHAGEN: See my Explanation of Negative vote on Comment 2-73.

(Log #1724)

2- 70 - (210-12): Reject

SUBMITTER: Don Ganiere, Ottawa, IL

COMMENT ON PROPOSAL NO: 2-106

RECOMMENDATION: Proposal should be accepted.

SUBSTANTIATION: The protection required by this section only protects the fixed branch circuit wiring. The fixed wiring accounts for less than 10% of the residential fire loss. If arc-fault protection is going to be required, then it should be of the type that provides protection for the fixed wiring, the portable wiring, and the utilization equipment.

PANEL ACTION: Reject.

PANEL STATEMENT: The information available to the panel during the 1999 Code Cycle shows a number of fires that are attributed to branch-circuit wiring. The present code rule expresses the panel's intent that the specified branch-circuits have AFCI protection.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

NEGATIVE: 1

EXPLANATION OF NEGATIVE:

WIEHAGEN: See my Explanation of Negative vote on Comment 2-73.

(Log #1797)

2- 71 - (210-12): Accept in Part

Note: The Technical Correlating Committee understands that the action on this comment is further modified by the Panel Action on Comment 2-78.

SUBMITTER: Robert J. Clarey, Cutler-Hammer, Inc.

COMMENT ON PROPOSAL NO: 2-103

RECOMMENDATION: Proposal 2-103 should be accepted in part with the changes in text as indicated below:

(b) Dwelling Unit Bedrooms. All branch circuits that supply 125-volt, single phase, 15- and 20-ampere ~~receptacle~~ outlets installed in dwelling unit bedrooms shall be protected by an arc-fault circuit interrupter(s). ~~This requirement shall become effective January 1, 2002.~~

Dwelling Unit Living Areas. All branch circuits that supply 125-volt, single-phase, 15- and 20-ampere outlets installed in dwelling unit living areas shall be protected by an arc-fault circuit interrupter(s).

FPN: A dwelling unit living area is any space, that can be normally occupied, other than bedrooms, bathrooms, toilet compartments, kitchens, closets, halls, storage, garage or utility spaces.

SUBSTANTIATION: Cutler-Hammer's Proposal 2-103 dealt with AFCI protection for bedroom outlets (item (b) above), for dwelling unit living areas (item (c) above), for guest-rooms and for Limited Care Facility Bedrooms. With respect to item (b), the panel accepted the deletion of the word "receptacle", and has deleted the last sentence of item (b) via, for example, the panel action on Proposal 2-116. The panel did not accept the proposed changes related to dwelling unit living areas or guest rooms, and referred the Limited Care Facility issue to Panel 17 for action.

Cutler-Hammer considers that the panel's action to expand AFCI protection to all bedroom outlets represents a significant step in consumer protection. Cutler-Hammer also understands the

panel's statement "The panel continues to support the introduction of this product, based on the data received and reviewed on this subject, but believes it is prudent to limit the requirement to bedrooms to gain further experience." With our present comment, Cutler-Hammer is requesting reconsideration of section (c) of our original proposal that deals with AFCI protection for dwelling unit living areas. We consider that additional experience is available, that AFCI products are also more generally available, and that consumer awareness has increased. This substantiation therefore focuses on the experience and availability of AFCIs for enhanced branch circuit protection.

First, it must be emphasized that in this section of the code we are dealing with branch circuit protection. As such, the AFCIs must protect the branch circuit wiring from the load-center to the outlets. Logically these branch/feeder AFCIs, listed to UL 1699, must be located at the origin of the branch circuit wiring; either in or adjacent to the load-center. It must be noted however, that the protection afforded by branch feeder AFCIs extends well beyond the outlets/receptacles. In fact UL 1699 (1) requires branch/feeder performance tests with both NM-B (installed wiring) and SPT-2 (appliance cords). Thus the branch/feeder AFCIs address series and parallel arcing faults in the installed wiring. This is the origin of about 35 percent (2, 3) of residential fires associated with the electrical distribution system. In addition, the branch/feeder AFCIs detect parallel arcing faults in the appliance cords and loads beyond the outlets. They also respond to all arcs to ground. Thus, the panel, in considering expansion of AFCI protection to the dwelling unit living areas, will appreciate that, while focusing on enhanced branch circuit protection, they are also gaining considerable protection for appliance cords and loads beyond the outlets.

Second, branch/feeder AFCIs are now more generally available, with Listed product being available from four of the largest circuit breaker manufacturers. These devices are completely interchangeable with those manufacturers' conventional miniature circuit breakers (MCBs). In addition, single pole MCBs are available (4, 5) that contain both UL listed AFCI and ground-fault circuit interrupter functions. Further, the AFCI function has been incorporated into two-pole Listed circuit breakers that are also classified for mitigating the effects of arcs, and which provide protection in shared neutral circuits. Third, during the past year there has been a significant increase in operating experience. Thus Cutler-Hammer alone has more than 25,000 MCBs with AFCI protection operating in the field. The total operating time is approaching 300 million hours, and during this time there have been no reports of unwanted tripping. More importantly, there have been cases of reported fire prevention (4, 6).

Fourth, the FAA and aerospace industry (7) are actively investigating AFCI technology relative to the protection of onboard electrical wiring. During the year 2000, this has even been the subject of many newspaper articles (8). It must be noted that the aircraft AFCI will be protecting against similar types of hazards encountered in dwelling units; namely the effects of arcing faults in aging and abused wiring. In both cases, safety is enhanced by the detection and rapid interruption of hazardous arcs. In both cases there must be no unwanted tripping.

Fifth, the price of AFCIs is decreasing, and will continue to decrease with increasing volume. The present price is similar to an MCB with integrated ground fault protection. Sixth, AFCI protection has been carefully considered by Code makers in Vermont and Canada. In the state of Vermont, branch/feeder AFCIs will be mandated for all branch circuits that supply 125 V, single phase, 15 and 20 ampere receptacle outlets installed in dwelling unit bedrooms and also in dwelling unit living areas. The effective date is January 1, 2001. The application of branch/feeder AFCIs to dwelling unit bedroom circuits will also be included in the Canadian Electrical Code, Part 1.

In conclusion, we understand the prudent action that the panel took in January based on the data received and reviewed at that time. However, since the time of proposal submission in November 1999, there have been significant increases in product experience and product availability. There have also been significant increases in public awareness due to papers, publications and a book-chapter on the subject, and due to consideration of AFCI protection for aircraft onboard electrical wiring. As a consequence of these increases in experience, availability, and public awareness, we are recommending that the panel extend AFCI protection to the branch circuits of dwelling unit living areas. This will reduce the electrical fire hazards associated with the fixed wiring associated with dwelling unit living areas and, as discussed in item one, will automatically reduce the electrical fire hazards associated with the appliance wires and loads connected to those living area branch circuits.

References

1. "Arc-Fault Circuit Interrupters", UL 1699 Standard for Safety, First Edition, February 28, 1999.
2. "What Causes Wiring Fires in Residences?", L. Smith, and D. McCoskrie, Fire Journal, pp. 19-24, January/February 1990.
3. The U.S. Home Product Report, 1992-1996, (Appliances and Equipment), K.Rohr, NFPA Fire Analysis and Research Division, February 1999.
4. "Arc-Fault Circuit Interrupters: The New Residential Electrical-Safety Technology", C. W. Kimblin, J.C. Engel and R. J. Clarey, IAEI News, pp. 26-31, July/August 2000.
5. "Overcurrents and Undercurrents: All About GFCIs and AFCIs", Chapter 16, edited by E. W. Roberts, published by Reptec, 2000.
6. "AFCIs Target Residential Electrical Fires", G. D. Gregory, NFPA Journal, pp. 69-71, March/April 2000.
7. "Arc-Fault Circuit Interrupters", J. McCormick, M.Walz, J. Engel, P. Thiesen and E. Hetzmannseder, Proceedings of the Conference on Advances in Aviation Safety, Paper 2000-1-2121, Daytona Beach, Florida, April 2000.
8. "Team of Aircraft Wiring Experts Find Frequent Flaws in Jetliners", Matthew L. Wald, New York Times, October 12, 2000.

PANEL ACTION: Accept in Part.

In the wording of the comment, the panel accepts the deletion of the word "receptacle" and the deletion of the sentence stating: "This requirement shall become effective January 1, 2002".

The panel rejects the remainder of the Comment.

PANEL STATEMENT: The panel reaffirms its prior position and statement on Proposal 2-103. The panel is awaiting experience data for review on this subject.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

NEGATIVE: 1

EXPLANATION OF NEGATIVE:

WIEHAGEN: The collective experience with AFCI technology is extremely limited. Because of this, the committee has consistently rejected expanding the application of AFCI technology to other circuits. The reference to bedroom receptacles should not be eliminated.

(Log #1882)

2- 72 - (210-12): Reject

SUBMITTER: Ronald G. Nickson, Bernard A. Schwartz, National Multi Housing Council & Schwartz Fire Specialists

COMMENT ON PROPOSAL NO: 2-106

RECOMMENDATION: The original proposal to delete section 210-12 in its entirety should be accepted.

SUBSTANTIATION: There are several reasons why the requirement for mandatory installation of an AFCI should be removed from the NEC. These reasons can be grouped into general categories:

a. FIRE DATA – The available fire data does not support the need for a device that will protect against fires started by arcing.

b. TRAINING – Fire incident reports provide questionable data because investigators are inadequately trained in separating arcing faults from high resistance faults.

c. DEVICE LIMITATIONS – The device mandated is not the best available method for detection of electrical fires in the portions of the wiring system where they predominately occur.

d. PROBLEM NOT CORRECTED – The UL report and available loss data indicate most incidents are occurring in older installations using technology not permitted by today's NEC. Installation in new residence will not address the problem.

e. COST – No cost/benefit analysis data exists.

f. RESTRICTIVE REQUIREMENT – Other types of equal or better equipment are not permitted.

g. LIMITED EXPERIENCE – Limited field data is available to demonstrate the effectiveness of the device over time.

FIRE DATA

1 – The most statistically valid, fire data collection for the United States is the National Fire Incident Reporting System (NFIRS). The system is in use in over 40 states by more than 14,000 fire departments and accumulates over 1 million fire reports annually. No other fire data system approximates these numbers.

2 – The data does show that electrical fires represent a significant portion of the overall fire problem, however fires occurring along the run of wire from the load center to the receptacle represent a minuscule percentage of the total. There is no data showing what portion of the problem will be addressed by the use of an AFCI or that the AFCI will resolve electrical problems with the fixtures attached to the building fixed wiring.

3 – By definition, an AFCI detects the presence of an arc. It will not detect the presence of overheating caused by high resistance. The NFIRS fire data collection system does not include a data code for overheating caused by high resistance. The number of electrical incidents that occur at the end of a conductor (terminal screw, binding post, etc.) is a strong indicator that most electrical incidents are in fact resistance failures and not arcing failures. This combined with the normally brief duration of an electrical arc and the inability of brief periods of arcing to ignite common combustibles[1] strongly supports the belief that arcing failures represents a very small portion of the electrical fire problem. Once a fire is initiated, the fire may cause arcing to occur, but shutting off the electricity after the fire has started will not resolve the problem.

TRAINING

1 – The NFIRS fire loss data is accumulated one incident at a time by having the responding fire department complete what is called an Incident Form. This form is filled out on every call, no matter how big or small the incident may be. The person filling out the form is normally one of the senior persons present at the incident. Since most fires are not major events and in many instances may be responded to by a single fire truck, the person filling out the form is a firefighter and not a fire investigator. In larger instances, many departments will have specially trained persons (investigators) who will respond and conduct a more intensive investigation.

2 – Fire investigators are normally well trained in determining the area of origin – the place where the fire originated. For electrical fires, they are normally not qualified to determine the specific reason why or how an electrical failure occurred. It is beyond the scope of most fire investigators to determine if a fire resulted from an arcing failure or a high resistance connection. Since the coding manual does not even include a category for resistance failures, this absence, combined with the limited understanding of electrical theory results in resistance failures being coded as an arcing failure.

Summary – Training

The majority of fire incident reports are filled out by persons lacking the electrical skills needed to understand the difference between an arcing fault and a high resistance fault. Presently available fire data is inadequate to correctly define the multiple subsets of types of electrical fires, but any survey of fire investigators will quickly reveal that the occurrence of a fire originating along a straight run of electrical conductor is extremely rare.

DEVICE LIMITATIONS

1 – The Consumer Product Safety Commission contracted with Underwriters Laboratories (UL) to evaluate presently available fire incident data and to prepare appropriate test methods which would address the failure modes identified. The 1995 UL report[2] identified 14 separate test methods which it believed would address the electrical problems identified. Subsequently, UL developed a standard to evaluate the AFCI. Many of the original test criteria included in the CPSC report were eliminated from the final standard.

2 - The UL work was experimental and as experience was gained and products improved, some changes are to be expected. The test methods proposed in the standard do not exactly duplicate the test protocols used in the original studies. It is possible to break down the original test methods into categories of hazard which the test method was designed to simulate. The fourteen original test methods simulated:

1 – A short circuit
2 – A carbonized electrical path
3 – Sustained arcing (several seconds)
4 – Resistance heating
5 – Operation inhibition
6 – Unwanted tripping tests

Short Circuit

This test concept was PARTIALLY included in the UL standard. A short circuit by cutting across two conductors is included in the test. The test which simulated a short as two stranded conductors are shorted end to end was eliminated. Stranded conductors are found on appliances connected to the branch circuit wiring and are not normally permitted in the branch circuit itself. Most electrical fires occur in devices into branch circuits, not in the branch circuit wiring.

Carbonization

This test concept was PARTIALLY included in the UL standard. The CPSC report included several tests to simulate various types of carbonization which can then lead to arcing. The UL standard incorporates versions of these tests except for the wet track fault which simulates conditions that occur in wet and damp locations.

Sustained Arcing

This test concept was NOT incorporated into the UL standard. This test produces a continuous arc for a few seconds. No explanation was given for why this test was eliminated. Many of the devices tested did not meet the test criteria when tested.

Resistance Heating

This test was NOT incorporated into the UL standard. Resistance heating is normally associated with electrical fires originating at connection points such as under terminal screws, at loose wire nut connections, wire crimps, corroded conductors, etc. This type of failure will not be detected by an AFCI.

Operation Inhibition

The concept was included in the UL standard.

Unwanted Tripping

This concept was included in the UL standard.

Summary – Devise Limitations

The present UL standard addresses only a portion of the causes of electrical fires as identified in the UL report to CPSC. Although it is possible that a AFCI may operate for items for which it is not specifically tested, it must be understood that the UL standard does not test the AFCI for such commonly encountered electrical fire causes as:

1 – A loose wire nut
2 – A loose screw on the side of a receptacle
3 – Carbonization (tracking) that occurs as a result of water
4 – Arcing resulting from make/break, end to end, stranded wire contact

In summarizing, the UL testing for CPSC, the report notes[3] "In order to fulfill the potential of AFD (sic AFCI) technology, further development is needed in order to detect and respond to a wider variety of arcing fault conditions."

Summary – Device Limitations

The presently available AFCI addresses only a small portion of the electrical hazards identified by CPSC and UL.

PROBLEM NOT CORRECTED

1 – The UL report (concerning AFCI protection) to CPSC includes an analysis[4] of the available fire data and states:

"The disproportionately high incidence of fire in the electrical systems of older homes can usually be attributed to one or more of the following factors:

Inadequately and overburdened electrical systems
Thermally re-insulated walls and ceilings burying wiring
Defeated or compromised over current protection
Misuse of extension cords and makeshift circuit extensions
Worn-out wiring devices not being replaced
Poorly done electrical repairs
Socioeconomic considerations resulting in unsafe installations"

This statement recognizes that the primary electrical problem is with older installations and none of the factors noted will be addressed by installation of an AFCI in new installations. The UL analysis later states: "Eventually these factors can lead to electrical overheating and/or arcing faults that cause fires". This statement is recognition that electrical overheating can result without the occurrence of arcing. This overheating is known as resistance heating, which is not addressed in the current UL criteria for listing of an AFCI. It is interesting to note that at no point did UL or CPSC attempt to address the number and/or the percentage of fires that are caused by arcing as compared to resistance heating. Nor does the report attempt to define the number of fires that occur in straight runs of wire or behind walls which is the primary area that the AFCI is designed to protect.

2 – Wiring and wiring installation methods used today are vastly improved over that of several years ago. Even if the simple fact that very few electrical fires originate in the straight run portion of an electrical conductor is ignored, the statistical data clearly shows that electrical problems are largely a factor in older installations. The CPSC data specifically notes that "…the frequency of wiring system fires is disproportionally high in homes more than 40 years old." AFCI technology may someday be modified to become useful for detecting problems in older installations, but installing AFCIs in new installations will do nothing to reduce the loses in older buildings. In the last 40 plus years, NEC mandated changes have included the requirement of a grounded conductor, increased ground conductor size, improved electrical insulation and other changes which will (and apparently have) affected the possibility that an electrical fire can occur.

3 – The UL study report to CPSC appears to recognize that newer installations may not require modification. The report clearly states "The purpose of the project reported here was to conduct an in-depth study of technologies to detect and monitor precursory conditions that could lead to or directly cause fires in residential wiring systems in general, and how these technologies could be applied to older residential wiring systems in particular."

Summary – Problem Not Corrected

The statistical data shows that the problems with wiring systems is apparently related to buildings 40 years and older. Mandated changes to new construction will not alleviate this problem.

COST TO THE CONSUMER

1 – In mandating the requirement for AFCI protection in residential bedrooms, the NEC panel was unaware of the actual cost of this requirement. A cost/benefit analysis was not possible because the cost of the AFCI (which did not even exist in commercial form at the time) was unknown as was the number of incidents that would be prevented by the installation of such a device. Now that the device is available, the advertised cost of such a 15 ampere, (name deleted), AFCI (Washington D. C. area) is approximately $150. The potential benefits from installing the device remain totally undefined. As indicated by the comments submitted to the NEC, there will be an increasing demand to expand the use of these devices, with a proportional increase in cost to the consumer, but a questionable increase in the protection provided.

Summary – Cost to the Consumer

Although the current requirement is limited to one or two devices, with the use limited to the bedroom areas, well meaning but ill informed persons are certain to expand their use, increasing the cost with minimal real benefit to the consumer.

RESTRICTIVE REQUIREMENT

1 – In the panel recommended rejection of Proposal 2-104, it was made clear that the receptacle type AFCI would not be permitted to be substituted to provide the required protection of bedroom circuits. The Underwriters Laboratories Inc. Standard for Safety for Arc Fault Circuit Interrupters (UL 1699) currently recognizes four types of AFCI devices (Branch Feeder, Cord, Outlet Circuit and Portable). The NEC panel only recognized the Branch Feeder Arc-Fault Circuit Interrupter.

2 – The arc fault detection tests are listed in Table 50.2 of UL 1699. This table indicates that the branch feeder AFCI is to be subjected to:

56.2 Carbonized path arc ignition test
56.3 Carbonized path arc interruption test
56.5 Point contact arc test, unwanted tripping tests, load
57 Unwanted tripping tests
58 Operation inhibition

3 – The receptacle type AFCI is tested to all of the same tests to which the branch feeder AFCI is tested plus the Carbonized path arc clearing time test. It is important to note that the carbonized path arc interruption test is conducted at a current rating of 75 amperes while the point contact arc test is conducted at currents as low as 5 ampere. The sensitivity of the receptacle type device to detect electrical faults in connected devices such as a television is much greater, because the impedance of the appliance cord will reduce the available current.

4 – The prohibition of the receptacle type AFCI detector will act as a restraint of trade. Prohibiting the use of this device to protect against the same type of hazard as the branch feeder AFCI will discourage the adoption of new technology and present the appearance that NFPA is mandating a particular requirement strictly for the benefit of a particular company or group of companies.

Summary – Restrictive Requirement

The current code requirement requires a specific device and does not recognize devices that provide an equal or higher level of protection to the consumer.

LIMITED EXPERIENCE

The AFCI utilizes a miniature computer to analyze the sine wave signal generated by electricity. This technology is new and experience is limited. The consumer is being forced to purchase this new device and become a real time test subject so the industry can gain the experience it needs to produce a safe, effective device. A limited comparison can be made with the GFCI. The GFCI uses miniaturized circuitry to detect unbalanced currents. After 20 years of experience, there are now strong indicators that these devices have some serious design flaws and for the last 20 years consumers have been provided with a false sense of protection. With such limited real world testing, the potential for this occurring with the AFCI is very high.

Summary – Limited Experience

The effectiveness of the AFCI is unknown. Also unknown is the reliability of the device over time. The consumer is being required to purchase this device and become the unwilling test subject of the manufacturer.

[1]NFPA 921, Guide for Fire and Explosion Investigations – 1998, section 14-11.5

[2]Technology for Detecting and Monitoring Conditions That Could Cause Electrical Wiring System Fires, UL Project #NC233, 94ME78760, page vi and 1

[3]Page viii of UL Project #NC233, 94ME78760

[4]Technology for Detecting and Monitoring Conditions That Could Cause Electrical Wiring System Fires, UL Project #NC233, 94ME78760, page 1

PANEL ACTION: Reject.

PANEL STATEMENT: a. The panel reviewed both written data and data provided verbally via presentations during the 1999 NEC Code Cycle and arrived at the conclusion that there were past fires that could have been addressed and prevented by AFCI.

b. The panel has no ability to improve the "training" of fire investigators. However, the more detailed information from other sources as well as detailed investigations by the Consumer Product Safety Commission support the need for the device.

c. The code requirement is for an AFCI that provides protection for the entire branch circuit. UL 1699 has established those parameters. During the development of UL 1699, it was established that there are two basic forms of arcing, point-contact and carbonized-path arcing. The testing protocols developed address these arcing occurences.

d. New installations age and are modified in fashions that introduce the hazards addressed by AFCI. Adding the protection at installation, will help reduce the fires caused by aging and modification.

e. The cost figures stated by the submitter are inaccurate. Devices are available for significantly less than quoted. This is substantiated by comments from the observers and presenters at the ROP meeting of Code-Making Panel 2.

f. The requirement is not restrictive. The code language states that the branch circuit must be provided with AFCI protection. This would include the entire branch circuit.

g. The panel disagrees with the submitter's anecdotal analysis of the technology. The standard sets forth very explicit and significant requirements for an AFCI. The panel does not agree with the submitter's statements about GFCIs and notes that GFCIs can be attributed with saving countless numbers of lives.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

NEGATIVE: 1

EXPLANATION OF NEGATIVE:

WIEHAGEN: The application of AFCI technology to new housing is one of the issues raised in this comment. The life expectancy of the AFCI breaker has not been demonstrated. The expectation that the breaker will continue to protect the home following modifications or even as the home ages is of yet unfounded. As far as is known, the breaker may suffer to its internal electronic components rendering it incapable of detecting arc faults, without any indication whatsoever. Also, refer to my explanation of negative vote on comment 2-73.

(Log #2071)

2- 73 - (210-12): Reject

SUBMITTER: Lawrence Brown, National Association of Home Builders (NAHB)

COMMENT ON PROPOSAL NO: 2-106

RECOMMENDATION: Delete Section 210-12 in its entirety.

SUBSTANTIATION: The panel's actions on AFCIs, (the original acceptance of this requirement for the 1999 NEC, and the panel's rejection of Proposal 2-106 for the 2002 NEC) is clearly insupportable by the false and misleading documentation submitted by the manufacturer's of this device. Underwriters Laboratories (UL) presentation to the panel at the last ROP meeting shows that the devices will not detect all arc-faults as was insinuated by the manufacturer's during the last ROC meeting. In fact UL stated that no determination can be made of the the number of arc-faults the device will detect and in turn disconnect the power to an outlet.

This alone clearly demonstrates that the mandatory installation of these devices is not cost-effective and will be of no cost-benefit to society. The list price of these devices on October 27, 2000 is: General Electric Model THQL 1150AFP - $170.00; Cutler-Hammer Model CH150AF - $155.00; and Square-D Model QO115AFI - $160.00. Claims by manufacturers that the "price will eventually come down", or that the "wholesale cost is lower", is not a practical basis for the total expense incurred by the end user of the product. With labor and profit margin by the sellers taken into consideration, the list price is a reliable basis for the total expense.

The ineffectiveness of this mandate on society can be determined. 1.667 million new dwelling units (single-family homes and multifamily units) were constructed in 1999. Additionally, 348,000 manufactured homes were built last year. Using NFPA and FEMA's U.S. Fire Administration's National Fire Incident Reporting System (NFIRS) data, the 1999 NEC requirements for bedroom

receptacles, and a single device with a list price of $155.00 installed in each dwelling, the misuse of available monies for fire and safety to a community is clear. If the devices were 100% reliable, consumers would spend $312,325,000 to cover losses of only $30,900,000. Well over ten (10) times the total losses. If this product would be expanded to include all circuits in a dwelling (based on 15 breakers), the public would spend over 4,684,875,000 to prevent losses of $253,600,000. This is approximately 18.5 times the actual loss. Furthermore, this is based on the devices being 100% effective. A claim that cannot be determined by the manufacturers or UL.

The panel's lack of concern as to the effectiveness and the cost to society, as shown in the panel's statement on this Proposal, should be of great concern to the end user of the NEC. Almost all laws enacted at the Federal and state levels need to be supported by a cost-benefit analysis. The mandate of this product lacks any true benefit to the end user. To find those that will benefit, all one needs to do is follow the money. Look at all of the Proposals and Comments submitted for the 1999 and the 2002 NEC. It has been the manufacturers pushing for this product requirement in the NEC. The manufacturers stand to make billions off of society by mandating through law a product that cannot be proved reliable or effective. Just follow the money.

If the manufacturers' claims that they want to help protect society from the loss-of-life and property from fire, they should team up with the nation's fire departments and provide the devices to communities free of charge as is now the practice for smoke detectors.

I urge the panel to remove the requirements for mandatory AFCI protection. Furthermore, I encourage jurisdictions that are considering the adoption of the NEC to delete Section 210-12 by ordinance.

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

PANEL ACTION: Reject.

PANEL STATEMENT: The panel does not agree with the submitter's cost analysis estimates and notes that this is not supported by the comments made during the 2002 NEC ROP meeting by both presenters and observers.

Also, see panel action and statement on Comment 2-72.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

NEGATIVE: 1

EXPLANATION OF NEGATIVE:

WIEHAGEN: 1. The need for arc fault circuit breakers has not been adequately demonstrated. The AFCI is purported to protect against fires in distribution systems, yet the number of electrical problems leading to fires that the AFCI can be expected to detect remains undefined.

2. Through the many committee discussions there has been no substantiation to show that arc fault problems with the wiring between the breaker and the first outlet is of such magnitude that it warrants a new protective device. This data has not been provided for any homes at all, and especially for new homes where the code requirement will be implemented.

3. Product testing has also indicated that series arc faults in connected wiring and equipment will not be detected by the AFCI breaker devices, making this code requirement even less likely to resolve the problem it seeks to address.

4. The cost impact of the code requirement for arc fault breakers has not been adequately evaluated. The high cost increase over current technology has not been evaluated in the context of the problem it is intended to remedy.

(Log #2128)

2- 73a - (210-12): Reject

SUBMITTER: Lawrence Brown, National Association of Home Builders (NAHB)

COMMENT ON PROPOSAL NO: 2-102

RECOMMENDATION: Reject the revised text to the Committee Action to Accept in Principle. Do not delete the term "receptacle".

SUBSTANTIATION: During an emergency situation, or nuisance tripping of the AFCI device, one would want this type of bedroom lighting to be available to rectify any problems. This is the same logic used when connecting bathroom lighting before any GFCI outlet protection. Furthermore, the submitter of the proposal did not provide any documentation showing a fire hazard exists in residential bedrooms associated with the permanently installed lighting outlet. It is more likely that accidents and the costs associated with these accidents could occur with the loss of area lighting in a bedroom under this new requirement.

PANEL ACTION: Reject.

PANEL STATEMENT: The submitter indicates that installing lighting on the same circuit as the receptacles in a bedroom presents a hazard. The panel notes that this practice is not presently prohibited in dwellings and that loss of lighting can occur because of overload, short circuits, or ground-faults. AFCI should be treated no differently.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

NEGATIVE: 1

EXPLANATION OF NEGATIVE:

WIEHAGEN: The collective experience with AFCI technology is extremely limited. Because of this, the committee has consistently rejected expanding the application of AFCI technology to other circuits. The reference to bedroom receptacles should not be eliminated.

(Log #2129)

2- 74 - (210-12): Reject

SUBMITTER: Lawrence Brown, National Association of Home Builders (NAHB)

COMMENT ON PROPOSAL NO: 2-103

RECOMMENDATION: Reject the revised text to the Committee Action to Accept in Principle. Do not delete the term "receptacle".

SUBSTANTIATION: During an emergency situation, or nuisance tripping of the AFCI device, one would want this type of bedroom lighting to be available to rectify any problems. This is the same logic used when connecting bathroom lighting before any GFCI outlet protection. Furthermore, the submitter of the proposal did not provide any documentation showing a fire hazard exists in residential bedrooms associated with the permanently installed lighting outlet. It is more likely that accidents and the costs associated with these accidents could occur with the loss of area lighting in a bedroom under this new requirement.

PANEL ACTION: Reject.

PANEL STATEMENT: The submitter indicates that installing lighting on the same circuit as the receptacles in a bedroom presents a hazard. The panel notes that this practice is not presently prohibited in dwellings and that loss of lighting can occur because of overload, short circuits, or ground-faults. AFCI should be treated no differently.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

NEGATIVE: 1

EXPLANATION OF NEGATIVE:

WIEHAGEN: The collective experience with AFCI technology is extremely limited. Because of this, the committee has consistently rejected expanding the application of AFCI technology to other circuits. The reference to bedroom receptacles should not be eliminated.

(Log #1875)

2- 74a - (210-12, Exception): Reject

SUBMITTER: David G. Foreman, The Foreman's Inc.

COMMENT ON PROPOSAL NO: 2-102

RECOMMENDATION: Add text to read as follows:

Exception: Smoke detection and/or alarm equipment shall not be supplied by any circuit protected by arc-fault circuit interrupter(s).

SUBSTANTIATION: As I pointed out at the September 2000 IAEI Northwest Section meeting, allowing smoke detectors to be installed on arc-fault protected circuits creates an additional hazard to the resident due to the possibility of deactivation of the alarm without the knowledge of the resident. Units with battery back-up (which still don't exist in a majority of residences) provide no level of safety when batteries are routinely removed and not replaced by residents. The bedroom circuit has always been the natural point of connection for residential smoke detectors, as it exists closest to the load supplied and doesn't impose any significant load upon the existing circuit. This is true in both retrofit and new construction.

PANEL ACTION: Reject.

Removed from agenda

PANEL STATEMENT: See panel statement on Comment 2-77 (Log #571).

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

(Log #14)

2- 75 - (210-12(a)): Accept

Note: The Technical Correlating Committee accepts the action on this Comment as recommended by the Panel and notes correlation with the Code-Making Panel 3 action on Comment 3-70.

SUBMITTER: Technical Correlating Committee National Electrical Code

COMMENT ON PROPOSAL NO: 2-107

RECOMMENDATION: It was the action of the Technical Correlating Committee that this Proposal be reconsidered and correlated with the action on Proposal 3-124. This action will be considered by the Panel as a Public Comment.

SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.

PANEL ACTION: Accept.

The panel accepts the action of the Technical Correlating Committee. The panel concludes that the definition should remain in Section 210-12.

PANEL STATEMENT: Given the importance of the definition to the primary requirement in Section 210-12, the panel recommends to the Technical Correlating Committee that the definition remain in Section 210-12(a).

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

(Log #721)

2- 76 - (210-12(a) and (b)): Reject

SUBMITTER: W. Creighton Schwan, Hayward, CA

COMMENT ON PROPOSAL NO: 2-108

RECOMMENDATION: Reconsider, and accept this proposal.

SUBSTANTIATION: It is important that the type of arc fault interrupter which protects cords and other wiring beyond the outlet, be recognized. The Consumer Product Safety Commission states that over 50% of fires occur in the cord wiring beyond the outlet, and less than 20% occur on the permanent wiring between the overcurrent protection and the outlet. Lighting should not be included, because light may be needed when the device operates and cord wiring extends from receptacle outlets, not from lighting outlets.

PANEL ACTION: Reject.

PANEL STATEMENT: The panel reiterates that the branch-circuits must be protected with an arc-fault circuit-interrupter. See panel action and statement on Comment 2-74 relative to the inclusion of lighting outlets.

In addition, the submitter's substantiation does not support his recommendation.

The panel notes that the UL Standard does require some tests for all types of AFCIs on cord sets and power supply cords.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

(Log #15)

17- 11 - (210-12(b)): Accept

SUBMITTER: Technical Correlating Committee National Electrical Code

COMMENT ON PROPOSAL NO: 2-114

RECOMMENDATION: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 17 for action. This will considered as a public comment.

SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.

PANEL ACTION: Accept.

PANEL STATEMENT: The panel accepts the direction of the Technical Correlating Committee to consider the portion of Proposal 2-114 relating to limited care facilities. Refer to the panel action and statement on Comment 17-16.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:

AFFIRMATIVE: 15

Note: The sequence no. 17-12 was not used.

(Log #571)

2- 77 - (210-12(b)): Reject

SUBMITTER: Robert A. McCullough, Ocean County Construction Insp. Dept., NJ

COMMENT ON PROPOSAL NO: 2-103

RECOMMENDATION: Revise (b) as follows:

210-12(b) Dwelling Unit Bedrooms. All branch circuits that supply 125-volt, single-phase, 15- and 20-ampere outlets, other than those provided for smoke detectors, installed in dwelling unit bedrooms shall be protected by an arc-fault circuit interrupter(s).

SUBSTANTIATION: NFPA 72 as well as model building codes require the installation of smoke detectors in dwelling unit bedrooms for new construction. These are defined as outlets and would be required to be installed on the load side of an arc-fault circuit interrupter by this section. NFPA 72 at 2-3.2.4 does not allow a smoke detector to be supplied by a GFCI unless that GFCI serves all electrical circuits within the household. The same concerns that prompted this rule should be applied to AFCIs as well with regard to smoke detectors.

PANEL ACTION: Reject.

PANEL STATEMENT: The panel reaffirms the requirement for AFCI protection in dwelling unit bedrooms, including smoke detector outlets. There has been no data submitted substantiating why smoke detectors should be deleted from the AFCI requirement.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

NEGATIVE: 1

EXPLANATION OF NEGATIVE:

WIEHAGEN: The field application of AFCI breakers is yet to be widely tested. The requirement that AFCI breakers be installed on smoke detector circuits in bedrooms is unwarranted. NFPA 72 includes this prohibition of GFCI on smoke detector circuits and does not differentiate from those units that have battery back-up. AFCI technology should be considered in the same way at this point in time.

(Log #1658)

2- 78 - (210-12(b)): Accept in Principle

SUBMITTER: Jack Wells, Pass & Seymour/Legrand

COMMENT ON PROPOSAL NO: 2-108

RECOMMENDATION: Accept in Principal proposal 2-108 revised as follows:

1. Reject the proposed addition to the definition in section 210-12(a).

2. Accept in Principal the proposed change to section 210-12(b) revised as follows:

(b) Dwelling Unit Bedrooms All branch circuits that supply 125-volt, single-phase, 15- and 20-ampere outlets installed in dwelling unit bedrooms shall be protected by an arc-fault circuit interrupter(s). The arc-fault circuit interrupter(s) shall be of the Branch/Feeder type installed at the origin of the branch circuit, or shall be of the Outlet Branch Circuit type installed at the first outlet in the branch circuit.

SUBSTANTIATION:

The panel rejected the original proposal with the statement that "The panel rejects the expansion of AFCI's beyond the bedroom branch circuits at this time. The panel continues to support the introduction of AFCI's but intends at this time to limit the requirement to bedroom branch circuits until further data can be obtained and evaluated."

The intent of the proposal and of this comment is not to extend AFCI protection beyond the bedroom branch circuit but to clarify that there are alternative means of providing this protection. Likewise, it is not the intent of the proposal or this comment to require more than one AFCI to accomplish the required protection.

Since submittal of the original proposal, a new "type" of AFCI has been listed by Underwriters Laboratories, Inc. This new type of AFCI is called an "Outlet Branch Circuit AFCI" and the proposed UL definition follows:

> "**Outlet Branch Circuit AFCI – A device intended to be installed as the first outlet in a branch circuit. It is intended to provide protection to downstream branch circuit wiring, cord sets and power-supply cords against the unwanted effects of arcing. This device also provides protection to upstream branch circuit wiring."**

A copy of the UL Guide Card and a Fact-Finding Report prepared by UL are provided.

Understanding that the panel does not consider it appropriate to expand the AFCI protection beyond the bedroom branch circuit at this time, this comment modifies the proposal to merely communicate that there are two different types of AFCI's that have been defined and listed by UL as providing branch circuit protection.

The two types of AFCI are identified as a Branch/Feeder AFCI and an Outlet Branch Circuit AFCI. The Branch/Feeder AFCI is typically a circuit breaker device installed at the panel and the Outlet Branch Circuit AFCI is a receptacle type device.

With the advent of the Outlet Branch Circuit AFCI a choice of type of AFCI is available. Since both types are listed by UL as providing branch circuit protection, both meet the requirements of Section 210-12. This enables the homeowner or contractor to select the type of AFCI based on ease of installation, convenience of use and ancillary protection beyond that required by the NEC (such as protection on 2-wire circuits or the degree of protection of cords). The table below illustrates the types of arc scenarios for which the UL testing procedures verify the ability of the two types of AFCI to mitigate arcs.

At the time the proposal was submitted there was no clear definition of the branch circuit protection provided by the receptacle type AFCI, other than the submitters assertion that this protection is provided. The substantiation with the original proposal contained the statement: "…the nature of series arcs and the technology used in the design of the UL listed receptacle type Combination AFCI results in the ability of this type AFCI to clear series arcs both upstream and downstream…" Since that time a fact-finding study has been conducted by UL which verifies the branch circuit arc-fault protection afforded by the Outlet Branch Circuit AFCI. Because the newly defined Outlet Branch Circuit AFCI will be added to the product standard, the originally proposed change to the definition in 210-12(a) is not necessary.

For the purpose of this comment, the important element in the UL definition is that the Outlet Branch Circuit AFCI is defined as providing branch circuit protection both downstream and upstream when installed at the first outlet.

		Type of AFCI	
Arcing Event	**Type of Arc**	Branch Feeder	Outlet Branch Circuit
Panel to 1st Outlet;			
Arcing Screw Termination @ Panel	Series	NO	YES
Nail Severs LINE/NEUTRAL Conductor(3-Wire NM-B)	Series	YES*	YES
Nail Severs LINE/NEUTRAL Conductor(2-Wire NM-B)	Series	NO	YES
Staple Shorts NM-B	Parallel	YES	NO
Loose Wire Termination	Series	NO	YES
1st Outlet through downstream Branch Circuit;			
Arcing Screw Termination	Series	NO	YES
Nail Severs LINE/NEUTRAL Conductor(3-Wire NM-B)	Series	YES*	YES
Nail Severs LINE/NEUTRAL Conductor(2-Wire NM-B)	Series	NO	YES
Staple Shorts NM-B	Parallel	YES	YES
Loose Wire Termination	Series	NO	YES
Outlet to Extension/Power Supply Cord;			
Arcing Screw Termination @ Plug	Series	NO	YES
Severed Conductor(SPT-2)	Series	NO	YES
Shorted Conductors(SPT-2)	Parallel	YES	YES

*NOTE – Branch Feeder AFCI typically detects an arc that starts as a series arc but progresses to a parallel arc to the grounding conductor

The UL Fact- Finding Report also identifies other significant forms of arc-fault protection provided by the Outlet Branch Circuit AFCI, such as series arc protection of two wire branch circuits, extension cords and power supply cords as well as arcing faults that may occur at loose wire binding screws, push in connections and twist on wire connectors. Although the panel does not wish to expand AFCI protection beyond the bedroom branch circuit, these additional forms of protection are important collateral benefits that will be obtained by permitting the installation of the Outlet Branch Circuit AFCI for protection of the branch circuit. This seems to be in keeping with the panels' objective of supporting the introduction of innovative AFCI technology while not forcing the expansion of requirements beyond bedroom branch circuits.

Clearly indicating in the Code that either type of AFCI complies with the NEC will enable the installer or user to select the method of compliance. It is necessary to specifically identify the Outlet Branch Circuit AFCI in the requirement to insure that it is understood that this type of receptacle outlet AFCI is acceptable for providing upstream protection of the branch circuit conductors. Otherwise, it is likely to be confused with the similar looking GFCI receptacle that is well known as providing downstream protection only.

A copy of the UL Fact-Finding Report is provided with this comment. The UL Fact-Finding Report will also provide information for consideration of revisions to the UL1699, the Arc-Fault Circuit Interrupter Standard, as they are processed through the normal UL standards procedure. It is important to note that the UL fact-finding study was designed to provide technical data and facts concerning the capability of the Outlet Branch Circuit AFCI to provide branch circuit arc fault protection in accordance with the NEC requirement.

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

PANEL ACTION: Accept in Principle.

Revise Section 210.12(B), as shown in the Proposal, to read as follows:

(B) Dwelling Unit Bedrooms. All branch circuits that supply 125-volt, single-phase, 15- and 20-ampere outlets installed in dwelling unit bedrooms shall be protected by an arc-fault circuit interrupter listed to provide protection of the entire branch circuit.

PANEL STATEMENT: The panel has revised the requirement from the ROP to make it clear that the AFCI must be "listed" to protect the entire branch circuit. The submitter's recommended wording to indicate specific types of AFCIs is not accepted and is not necessary, since the objective of the the NEC requirement is to indicate that the branch circuit be provided with AFCI protection.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

(Log #1883)

2- 79 - (210-12(b)): Accept in Principle

SUBMITTER: Howard S. Leopold, Cooper Wiring Devices

COMMENT ON PROPOSAL NO: 2-108

RECOMMENDATION: Revise to read as follows:

210-12(b) Dwelling Unit Bedrooms. All branch circuits that supply 125-volt, single phase, 15 and 20-ampere receptacle outlets installed in dwelling unit bedrooms shall be protected by an arc-fault circuit-interrupter(s) <u>of the Branch/Feeder type or a receptacle type recognized for protecting entire branch circuits.</u>

SUBSTANTIATION: 210-12(b) presently states that all branch circuits that supply 125V, single phase, 15 and 20 ampere receptacle outlets in dwelling bedrooms be protected by an arc fault circuit interrupter(s). The problem with this wording is that it does not explicitly state the type of AFCI device and is thus likely to be interpreted to mean that only the "Branch/Feeder" type must be used. This writer has heard of the introduction of a new type of receptacle AFCI which is UL listed as suitable to protect the <u>entire</u> branch circuit, even though it would be installed as the first receptacle in the branch circuit, downstream of the panelboard. Revising the wording as suggested above would avoid the exclusion of this new device (by misinterpretation) as an alternate to the Branch/Feeder type. No expansion of the required areas of protection would be made by this revision.

PANEL ACTION: Accept in Principle.

PANEL STATEMENT: See panel action and statement on Comment 2-78.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

(Log #2116)

2- 80 - (210-12(b)): Accept

SUBMITTER: George Gregory, Square D Company

COMMENT ON PROPOSAL NO: 2-108

RECOMMENDATION: Continue to reject Proposal 2-108.

SUBSTANTIATION: The appropriate revision is in the panel action on Proposal 2-110 as recorded in the ROP.

This proposal (2-108) would allow AFCI protection by either of two alternative devices: (1) the Branch/Feeder AFCI or (2) the Outlet Circuit AFCI. Both the performance and the location in the circuit of the two devices are different. Therefore, the two devices should not be considered equivalent or alternatives for each other.

A device located at the outlet such as the Outlet Circuit AFCI or even a device with combination performance (Outlet Branch Circuit AFCI) located at the outlet would have insurmountable limitations in protecting the fixed wiring circuit against hazardous arcing. Consider these points:

- In order to open the branch circuit and protect the branch circuit wiring, the device must open the circuit at the source of the branch, not at the outlet.
- A device located at the outlet could interrupt the current flow of a series arc on its supply side. However, such a device could not clear a line-to-ground or line-neutral fault. Series faults in fixed wiring are rare in comparison to line-to-ground or line-to-neutral faults. As a series fault progresses it becomes a line-to-ground or line-to-neutral fault. Therefore, if a series fault is not isolated from the supply, it may continue as a line-to-ground or line-to neutral fault.
- A device located at the outlet and sensing back toward the supply would sense arcing not only in the branch in which it is located, it would also sense arcing in adjacent circuits, at the service and possibly on the supply side of the service.

On the other hand, a Branch/Feeder AFCI located at the source of the branch protects against arcing fire causes in fixed wiring and provides "limited" protection to extension wiring and appliances. The limit is that the B/F AFCI is not required to provide low level, series protection in 2-wire circuits such as extension cords and appliance wiring. The 2-wire protection does not seem so limited when we consider this fact from "The U.S. Home Product Report, 1992-1996 (Appliances and Equipment) by Kimberly Rohr of NFPA. On Page 7, it clarifies that "The leading cause of cord and plug fires was short circuits and ground faults, which accounted for half or more of these fires, injuries and direct property damage. Fires caused by short circuits and ground faults also accounted for 38 percent of civilian fire deaths." The Branch/Feeder AFCIs are intended and tested for detecting these arcing short circuits and ground faults. That degree of protection extends to cords and plugs and appliances.

PANEL ACTION: Accept.

PANEL STATEMENT: See panel action and statement on Comment 2-78.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

(Log #2117)

2- 81 - (210-12(b)): Accept

SUBMITTER: George Gregory, Square D Company

COMMENT ON PROPOSAL NO: 2-109

RECOMMENDATION: Continue to reject Proposal 2-109.

SUBSTANTIATION: The appropriate revision is in the panel action on Proposal 2-110 as recorded in the ROP.

This comment supports the addition of the AFCI at the branch to provide protection to the fixed wiring and protection to extension and appliance wiring. UL 1699, The Standard for Safety for Arc-Fault Circuit Interrupters, notes that the Branch/Feeder AFCI provides protection against the unwanted effects of arcing in branch circuits and limited protection to branch circuit extension wiring. The limited protection is that the B/F AFCI is not required to provide low level, series protection in 2-wire circuits such as extension cords and appliance wiring. This 2-wire protection does not seem so limited when we consider this fact from "The U.S. Home Product Report, 1992-1996 (Appliances and Equipment) by Kimberly Rohr of NFPA. On Page 7, it clarifies that "The leading cause of cord and plug fires was short circuits and ground faults, which accounted for half or more of these fires,

injuries in direct property damage. Fires caused by shot circuits and ground faults also accounted for 38 percent of civilian fire deaths." The Branch/Feeder AFCIs are intended and tested for detecting these arcing short circuits and ground faults. That degree of protection extends to cords and plugs and appliances.

The addition of an Outlet Circuit AFCI at the receptacle location would add the lower level, series protection for 2-wire circuits. It would enhance the protection brought by the Branch/Feeder AFCI.

Care must be taken when considering a combination AFCI. A combination AFCI located at the source of the branch would provide protection of the Branch/Feeder and Outlet Circuit AFCI all in one location. However, a combination performance AFCI (Outlet Branch Circuit AFCI) located at the outlet would have insurmountable limitations in protecting the fixed wiring circuit against hazardous arcing. Consider these points:

- In order to open the branch circuit and protect the branch circuit wiring, the device must open the circuit at the source of the branch, not at the outlet.
- A device located at the outlet could interrupt the current flow of a series arc on its supply side. However, such a device could not clear a line-to-ground or line-to-neutral fault. Series faults in fixed wiring are rare in comparison to line-to-ground or line-to-neutral faults. As a series fault progresses, it becomes a line-to-ground or line-to-neutral fault. Therefore, if a series fault is not isolated from the supply, it may continue as a line-to-ground or line-to neutral fault.
- A device located at the outlet and sensing back toward the supply would sense arcing not only in the branch in which it is located, it would also sense arcing in adjacent circuits, at the service and possibly on the supply side of the service.

PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #2118)

2- 82 - (210-12(b)): Accept in Principle
SUBMITTER: George Gregory, Square D Company
COMMENT ON PROPOSAL NO: 2-110
RECOMMENDATION: Continue to accept the proposal as modified by Panel 2 according to the ROP.
SUBSTANTIATION: The addition of AFCI protection for the branch circuit will reduce the advent of fires from arcing causes. Since this protection will protect fixed wiring, it makes good sense to incorporate protection for all outlets in bedrooms and not limit protection to receptacle outlets. Also, since the Branch/Feeder AFCI that is applied at the branch provides arcing short-circuit and arcing ground-fault protection for appliance and extension wiring, a significant degree of protection is provided beyond the fixed wiring system.

As is also noted in Proposal 2-111, an additional degree of protection would be added for extension and appliance wiring by additionally requiring Outlet Circuit AFCIs (receptacle type) at the receptacle. The added protection is series arc detection at the 5-ampere level, which can be important especially in 2-wire cords. The panel should carefully consider this added protection in future revision cycles, as the devices become available.

There are several points made by Mr. Brown in Proposal 2-106 and explanation of his vote on it for this same section that deserve comment. He is probably correct that the percentage of losses from electrical arcing fires is small compared to all residential property losses including natural disasters such as floods, earthquakes, wind and hail that contractors must consider. It is even relatively small when compared to all fire causes including arson, smoking, cooking and other causes. These comparisons do not make arcing-fault related losses insignificant. The panel has the ability to act on reducing arcing-fault causes.

As Mr. Brown points out, the preponderance of fires from arcing causes are in older homes. However, as the 1987 report "Residential Electrical Distribution System Fires?" by Smith and McCoskrie of CPSC points out, the majority of these fires are related to improper installation or modification and improper use of electricity. An AFCI installed on such circuits would do much to reduce arcing related fires. We must remember that not all systems are installed or modified by trained and qualified contractors.

The Standard for Safety for Arc-Fault Circuit Interrupters, UL 1699, is a comprehensive standard. Mr. Brown notes that instead of the 14 tests that he counted in the 1994 CPSC report evaluating a variety of devices that may help reduce electrical fires in residences, he counted only four tests in UL 1699. During development of UL 1699, it was determined that two basic forms of arcing occur in residences: point-contact and carbonized-path arcing. These two forms envelop a variety of methods of applying arcs. They do not ignore any of the tests reported on in the CPSC report. UL 1699 has 10 tests for arc fault detection and another 14 for detection under conditions that would inhibit the arc from detection. There are also 33 tests for unwanted tripping (nuisance avoidance). Beyond these basic detection tests are a number of tests including abnormal operation, overvoltage, dielectric, voltage surge, environmental sequence, leakage current, humidity conditioning and others that are required for Listing.

Regarding price, Mr. Brown is correct that some of the early units were purchased for $85 or possibly even more. This price is one indication of the value of this newly available technology. However, that early price is no indication of the price that will exist in the marketplace as the product becomes more common, competition becomes stronger and manufactured volumes increase. Already there have also been units purchased for considerably less than half the price indicated by Mr. Brown. Those lower prices are probably a closer indicator of the direction that price will go.

PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Comment 2-78.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #2102)

2- 83 - (210-19(a)): Reject
SUBMITTER: Truman C. Surbrook, Michigan State University
COMMENT ON PROPOSAL NO: 2-126
RECOMMENDATION: Change to Accept in Part to Accept.
SUBSTANTIATION: The phrase "before the application of any adjustment or correction factors" needs to be deleted, or rewritten to make the meaning clear. Hundreds of electrical contractors and inspectors are confused by this phrase. "PLEASE" make the meaning clear. See the following example:

Assume a branch circuit is wired with copper conductors with 90°C insulation. Assume all terminations in the circuit are rated 75°C. The load on the circuit consists of 10 amperes continuous and 6 amperes noncontinuous. Assume there are 9 current carrying conductors in raceway including these circuit conductors. This raceway runs through an area where the ambient temperature is 120°F, and there are no terminations in this area or within 10 feet of the boundary of this area. Assume the overcurrent device is rated 20 amperes (1.25 x 10 A + 6 A = 18.5 A). The question here is what is the minimum permitted size of conductor?

The phrase "before the application of any adjustment or correction factors" seems to be telling me that I must find a conductor in Table 310-16 in this case 75°C column (because of terminations) that has an allowable ampacity of 18.5 amperes (1.25 x 10 A + 6 A = 18.5 A). This is an AWG #12 taking Section 240-3(d) into consideration.

Section 210-19(a) does not require the allowable ampacity to be compared to 1.25 times the continuous load "after the adjustment and correction factors" have been applied. So the adjusted and corrected allowable ampacity of the conductor must not be less than 10 amperes continuous plus 6 amperes noncontinuous for a total of 16 amperes. The insulation is 90°C rated in the area where the raceway contains 9 conductors and is exposed to 120°F ambient temperature. Applying the adjustment and correction factors to the allowable ampacity of an AWG #12 copper 90°C conductor results in an allowable ampacity of 17.2 amperes under these conditions (30 A x 0.7 x 0.82 = 17.2 A). Since the rule in Section 210-19(a) does not apply after the application of adjustment and correction factors, the allowable ampacity of 17.2 amperes is compared to 16 amperes of load. The conclusion is that an AWG #12 conductor is acceptable for this circuit.

If this analysis is correct, then reject my comment and leave the section in its present form. If my analysis is wrong, please do me the courtesy of explaining how the conductor should be sized and reword the section so the meaning is clear. By removing the phrase "before the application of any adjustment or correction factors", the allowable ampacity of the conductors must be not less than 1.25 times the continuous load plus the noncontinuous load, which in this case is 18.5 amperes and an AWG #12 conductor is too small for this circuit. An AWG #10 conductor is required (40 A x 0.7 x 0.82 = 23 A).

PANEL ACTION: Reject.
PANEL STATEMENT: The present code text reflects the intent of the requirement. The minimum conductor size that can be used based on continuous loads at 125 percent and noncontinuous loads at 100 percent is established by this section. Other calculations for the number of conductors in a raceway or ambient adjustment may be required by Section 310-15 and those adjustments can take advantage of the higher temperature values of the conductor's insulation.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #2138)

2- 84 - (210-19(a)): Accept in Principle
SUBMITTER: J. Pat Roche, Celanese Acetate
COMMENT ON PROPOSAL NO: 4-40b
RECOMMENDATION: Revise first paragraph of 210-19(a) to read as follows:

(a) Branch-Circuits of Not More Than 600 Volts. Branch-circuit conductors shall have an ampacity not less than the maximum load to be served. Where a branch circuit of not more than 600 volts supplies continuous loads or any combination of continuous loads and noncontinuous loads, the minimum branch-circuit conductor size, before application of any adjustment or correction factors, shall have an allowable ampacity equal to or greater than the noncontinuous load plus 125 percent of the continuous load.

SUBSTANTIATION: Comment to address Technical Correlating Committee referral of Proposal 4-40b to Code Making Panel 2 for inclusion of the material in Articles 210 and 215 to cover over 600 volt branch-circuits, feeders, and supervised installations, in general. See companion comments on new 210-19(b), 215(2)(a), and new 215-2(e).
PANEL ACTION: Accept in Principle.
Create a new 210.19(A) titled: "Branch Circuits Not More Than 600 Volts."
Move Section 210-19(a), (b), (c), and (d) to become Section 210.19(A) (1), (2), (3), and (4), respectively.
PANEL STATEMENT: The panel action meets the intent of the submitter and provides further clarity.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

Note: The sequence no. 2-85 was not used.

(Log #2012)

2- 86 - (210-19(a), Exception): Accept in Principle
SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc.
COMMENT ON PROPOSAL NO: 2-130
RECOMMENDATION: Reject the proposal.
SUBSTANTIATION: The proposal submitter does not adequately understand why the requirement exists in the first place. Conductor ampacity is defined in terms of the ability to carry load continuously. The requirement to upsize conductors was never imposed to protect conductors; instead, it had to do with providing a heat sink for conventional devices subjected to continuous loading. That NEMA sponsored revision avoided a likely UL standards revision that would have cost the industry untold millions of dollars in reengineering and testing of end use equipment, but had not basis in conductor ampacity.

Therefore the present rule is correct even though, as correctly noted in the substantiation, they could be in two different wire sizes required to serve the same 130A continuous load. The conventional device requires 2/0 (and 175A protection) and the 100% device requires No. 1 (and 150A protection) for the same load. Each wire will be protected by the installed circuit protection per 240.3, and the conventional device will be assured that the conductor has some phantom load capacity so it will perform as a heat sink under the stipulated load profile. Devices listed for 100% operation have the heat dissipation issues addressed though other engineering approaches implicitly evaluated in the listing process.
PANEL ACTION: Accept in Principle.
In the proposal, retain the use of the word "allowable" in the first sentence, and delete the last sentence.
PANEL STATEMENT: The action taken meets the intent of the submitter and retains the use of the term "allowable" in the proposal.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #2103)

2- 87 - (210-19(a), Exception): Reject
SUBMITTER: Truman C. Surbrook, Michigan State University
COMMENT ON PROPOSAL NO: 2-130
RECOMMENDATION: Agree with the Panel's action to Accept in Principle, but with the deletion of the words "permitted to be" in the exception.
SUBSTANTIATION: The words "permitted to be" are not needed and they are confusing to Code users. This exception sets a minimum allowable ampacity of the circuit conductors and the words "not less than" are clear as to the meaning.

The Panel has approved a new last sentence as follows: "In no case shall the ampacity be less than the rating of the overcurrent device." I agree with the Panel's action here, and as a point of clarification, I assume the Panel means by this statement that Section 240-3(b) does not apply.
PANEL ACTION: Reject.
PANEL STATEMENT: Use of the term "shall be permitted" makes it clear that this is a permissive exception and not a mandatory requirement. The exception reads clearly with this text included.

In addition, the submitter is directed to Comment 2-86 relative to the last sentence of the exception.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #2343)

2- 88 - (210-19(b) (New)): Accept in Principle
Note: See Technical Correlating Committee action on Comment 4-36.
SUBMITTER: J. Pat Roche, Celanese Acetate
COMMENT ON PROPOSAL NO: 4-40b
RECOMMENDATION: New 210-19(b) to read as follows:

(b) Branch-Circuits Over 600 Volts. Branch-circuit conductors over 600 volts shall be sized in accordance with (1) or (2):

(1) The ampacity of branch circuit conductors shall not be less than 125 percent of the designed potential load of utilization equipment that will be operated simultaneously.

(2) For supervised installations branch-circuit conductor sizing shall be permitted to be determined by qualified persons under engineering supervision. Supervised installations are defined as those portions of a facility where all of the following conditions are met:
a. Conditions of design, and installation are provided under engineering supervision.
b. Qualified persons with documented training and experience in over 600 volt systems, provide maintenance, monitoring and servicing of the system.

The ampacity of conductors shall be in accordance with Section 310-15 and Section 310-60 as applicable.
SUBSTANTIATION: Comment to address Technical Correlating Committee referral of proposal 4-40b to Code-Making Panel 2 for inclusion of the material in Articles 210 and 215 to cover over 600 volt branch-circuits, feeders, and supervised installations, in general. See companion comments on 210-19(a), 215-2(a), and new 215-2(e).
PANEL ACTION: Accept in Principle.
In the wording of the comment, include the following titles:
"(1) General.
(2) Supervised Installations."
Also, move the last sentence of the Comment to become the first sentence of (B), after the title.
PANEL STATEMENT: The panel action provides titles in accordance with the NEC Style Manual. The last sentence was moved to (B) to provide clarity.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #446)

2- 89 - (210-21(b)): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
COMMENT ON PROPOSAL NO: 2-137a
RECOMMENDATION: Accept in principle revised:
(2) Delete text and table.
SUBSTANTIATION: Cord- and plug-connected with a nameplate rating of over 12 to 15 amperes, over 16 to 20 amperes, and over 24 to 30 amperes normally have plugs rated 15, 20, and 30 amperes, respectively. A majority of cord- and plug-connected equipment may be movable or portable, or not present at time of inspection and unknown to the authority having jurisdiction, which makes this section virtually unenforceable.

Since a 15, 20, or 30 ampere plug and receptacle are rated for these values, what is the safety hazard for a duplex receptacle compared to a single receptacle on an individual branch circuit where the full rating may be used? Overload protection is provided by the branch-circuit overcurrent device. This section appears to be a design consideration rather than safety related.

This section should not permit a single lighting outlet (180 va) and a single 15 ampere receptacle supplying a 13 ampere load, on the same 20 ampere circuit which complies with 210-23(a). It doesn't permit two single receptacles with loads exceeding the values in the table where the receptacles are controlled by a selector switch which energize only one receptacle at a time.

The perceived intent to allow for additional load is better provided for in 210-23.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel disagrees with the submitter. This section does establish the basic limits intended for branch circuits.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #1327)

2- 90 - (210-23): Reject
SUBMITTER: William H. King, Jr., U.S. Consumer Product Safety Commission
COMMENT ON PROPOSAL NO: 2-143
RECOMMENDATION: I support the panel action to "Accept in Principle" Proposal 2-143 with the revisions to Section 210-23 which were accepted under Proposal 2-142a. Section 210-23 in the 2002 NEC would then read as shown in Proposal 2-142a.
SUBSTANTIATION: The current wording of Section 210-23 clearly states that the rating of any one cord- and plug- connected utilization equipment shall not exceed 80 percent of the branch-circuit ampere rating for 15- and 20-ampere branch circuits, unless the load is supplied by an individual branch circuit. However, this long-standing code requirement has been abused by listing organizations over the years by certifying products exceeding the 80% rule and likely to be used on general purpose branch circuits. One rationale given is that the rule only applies to continuous loads. The NEC makes no such allowance. Noncontinuous loads can stress branch circuits, resulting in dangerous overheating at connection points: that is why current-cycling tests are conducted to qualify electrical wiring splice and termination devices.

The CPSC staff proposal to correct this safety issue during the previous code cycle was not accepted, but garnered considerable support (ref: Proposal 20-52, NFPA 70-A98 ROP). This resulted in the formation of a task group representing all interested parties to determine the proper course of action to resolve the matter. Proposal 2-143 in this code cycle reflects the outcome recommended by the task group. Compromises on all sides were necessary to result in Proposal 2-143, and the change will begin to correct the situation. Panel 2 is urged to adopt the proposal as reflected in Proposal 2-142a, and resist continuing to permit the abuses of the past, which will further stress already-stressed branch circuits. While the explanation offered by Mr. Carpenter for his negative note has merit, listing organizations did not address the problem and the issue was brought before the broader electrical community represented by the NEC Committee. The revised language sought for Section 210-23 will guide both listing organizations and appliance manufacturers. In some cases, appliances will be designed in the future to operate within the 80 percent limit. In others, appliances will be equipment with higher rated 20-ampere plugs to assure connection to the appropriate branch circuit. As a minimum, an appliance with a rating that exceeds the 80 percent limit will have information for users to consider with regard to the appropriate outlet for connecting the appliance.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Comment 2-91.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #318)

2- 91 - (210-23(a)): Accept
SUBMITTER: Alan H. Nadon, City of Elkhart, IN
COMMENT ON PROPOSAL NO: 2-143
RECOMMENDATION: Reject this proposal.
SUBSTANTIATION: The existing code which limits cord connected appliances to 80 percent of the branch circuit design has provided the cushion of safety for weak points in the branch circuit particularly joints and terminations, loading branch circuits to 100 percent at frequent intervals but, not continuously will stress the circuit, and may lead to a failure, and fire.
PANEL ACTION: Accept.
PANEL STATEMENT: The panel notes that by accepting this proposal, they are removing the wording from Section 210-23(a)(1) in the 2002 NEC ROP, and its original intent is maintained. Sections 210-21(b) and 210-23(a)(1) limit the application of any one cord- and plug-connected utilization equipment to 80 percent of the branch-circuit rating, regardless of whether the load is continuous or noncontinuous.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
COMMENT ON AFFIRMATIVE:
NISSEN: I agree with the panel action on Comment 2-91, as the net effect of this action is to revert back to the original wording in 210-23(a). However, I do not agree with the submitter's substantiation or the panel statement.

Section 210-23 permits an individual branch circuit to supply any load for which it is rated. For multi-outlet branch circuits, use of noncontinuous appliances rated at 100 percent of the branch circuit does not result in a hazard. All branch circuit components, such as the receptacles, branch circuit wiring, and the overcurrent devices, when used for supplying noncontinuous loads, are evaluated for service at 100 percent of their full rating.

(Log #320)

2- 92 - (210-23(a)): Accept
SUBMITTER: Alan H. Nadon, City of Elkhart, IN
COMMENT ON PROPOSAL NO: 2-143
RECOMMENDATION: Revise as follows:
"... shall not exceed 80 percent of the branch-circuit ampere rating ~~unless listed and marked to inform the user of the necessity for providing an individual branch circuit.~~
SUBSTANTIATION: Article 210 deals with branch circuits. Proposals to load branch circuits at 100 percent of their rated value based on the lack of damage to the load, does not address the problem of possible damage to the branch circuit.
PANEL ACTION: Accept.
PANEL STATEMENT: See panel action and statement on Comment 2-91.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #321)

2- 93 - (210-23(a)): Accept
SUBMITTER: Alan H. Nadon, City of Elkhart, IN
COMMENT ON PROPOSAL NO: 2-143
RECOMMENDATION: Revise as follows:
"... shall not exceed 80 percent of the branch-circuit ampere rating. ~~unless listed and marked to inform the user of the necessity for providing an individual branch circuit.~~
SUBSTANTIATION: Many cord connected appliances operate at 100 percent of their rated value without damage to themselves. However, the stressing of the total branch circuit from overcurrent device to the wire, splices, terminations and the receptacle outlet must be considered. Labeling the equipment to require a dedicated branch circuit is impractical, unenforceable, and merely shifts the blame for failure of the branch circuit wiring on the user.

PANEL ACTION: Accept.
PANEL STATEMENT: See panel action and statement on Comment 2-91.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #380)

2- 94 - (210-23(a)): Accept
SUBMITTER: Dan Leaf, Palmdale, CA
COMMENT ON PROPOSAL NO: 2-143
RECOMMENDATION: Reject proposal.
SUBSTANTIATION: Section 210-23 specifies that (a) covers branch circuits that supply two or more outlets. The proposal refers to equipment listed and marked to require an individual branch circuit, which precludes connection to a multi- outlet circuit.
PANEL ACTION: Accept.
PANEL STATEMENT: See panel action and statement on Comment 2-91.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #611)

2- 95 - (210-23(a)(1)): Accept
SUBMITTER: Glenn W. Zieseniss, Crown Point, IN
COMMENT ON PROPOSAL NO: 2-142a
RECOMMENDATION: Place a period after the "ampere rating" and then delete the rest of the sentence.
SUBSTANTIATION: I agree with Mr. Carpenter's negative vote and comment.
PANEL ACTION: Accept.
PANEL STATEMENT: See panel action and statement on Comment 2-91.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #1006)

2- 96 - (210-23(a)(1)): Accept
SUBMITTER: Michael P. O'Quinn, MOGO Enterprises, Inc.
COMMENT ON PROPOSAL NO: 2-143
RECOMMENDATION: Revise as follows:
"The rating of any one cord- and plug-connected utilization equipment shall not exceed 80 percent of the branch-circuit ampere rating ~~unless listed and marked to inform the user of the necessity for providing an individual branch circuit.~~"
SUBSTANTIATION: Section 110.3 states that "Listed or labeled equipment shall be installed and used in accordance with any instructions included in the listing and labeling."
The intent of the proposal is already covered in Section 110.3(B), in that if an individual branch circuit requirement would be included in the listing, it would be followed by the installer.
PANEL ACTION: Accept.
PANEL STATEMENT: See panel action and statement on Comment 2-91.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #1452)

2- 97 - (210-23(a)(1)): Reject
SUBMITTER: Eric Stromberg, The Dow Chemical Company
COMMENT ON PROPOSAL NO: 2-143
RECOMMENDATION: Add new text as follows:
210-23(a)(1) Listed portable devices that exceed 80% of the branch circuit rating, and are intended for temporary connection to the branch circuit during use, shall be permitted to be connected to the receptacle type for which they are listed.
SUBSTANTIATION: Currently, the connection of cord-connected devices with a load of more than 80% of the branch circuit OCP is not permitted. The practical outworking of this is that 120V equipment rated at more than 12 amps (but less than 16) should have a 20 amp plug. There are devices that are UL listed (my circular saw, for example) that draw more than 12 amps, yet have a plug on them that allow connection to a 15 amp circuit. Connection of this device to a 15 amp circuit is in violation of 210-23(a).
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Comment 2-91.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #2225)

2- 98 - (210-26): Accept
SUBMITTER: Robert H. Keis, Dover, DE
COMMENT ON PROPOSAL NO: 2-150
RECOMMENDATION: This proposal should remain rejected per the panel action.
SUBSTANTIATION: The panel statement is correct. This proposal would put an unnecessary burden on dwelling unit wiring, and add nothing toward safety.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #386)

2- 99 - (210-52, (210-60(a))): Accept in Part
SUBMITTER: Dan Leaf, Palmdale, CA
COMMENT ON PROPOSAL NO: 2-155
RECOMMENDATION: Accept in principle, revise panel action as follows: 210-60(a) GENERAL. Guest rooms in hotels, motels, and similar occupancies, <u>whether or not defined as a dwelling unit,</u> shall have receptacle outlets installed in accordance with 210-52(a) and 210-52(d). Guest rooms meeting the definition of a dwelling unit shall have receptacle outlets installed <u>in accordance with</u> ~~using~~ all the applicable rules in 210-52.
SUBSTANTIATION: Sections 210-52(a) and (d) are requirements for guest rooms that qualify as a dwelling unit. The last sentence makes a clear distinction between guest rooms which do or do not meet the definition of a dwelling unit. The last sentence is revised to conform to a many times used phrase in the Code.
PANEL ACTION: Accept in Part.
The panel rejects the revision to the first sentence.
The panel accepts the submitter's revision to the last sentence.
PANEL STATEMENT: The submitter's revision in the first sentence is redundant.
The last sentence clearly states that all applicable rules must be used if the room meets the definition of a dwelling unit.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #2226)

2- 100 - (210-52): Accept
SUBMITTER: Robert H. Keis, Dover, DE
COMMENT ON PROPOSAL NO: 2-154
RECOMMENDATION: The proposal should remain rejected per the panel action.
SUBSTANTIATION: I have been hearing the argument about things dropping onto the exposed blades of a connected load for many, many years. As a rebuttal, I have seen more exposed blades when the ground prong is up. These shiny prongs could be very enticing to a child. As for the plates dropping off and contacting the prongs, just how many times has this happened? Residentially there are a whole lot more nonmetallic receptacle plates than there are metal plates. In fact, if a survey where conducted I believe you would find that 99.9 percent of the plates in a dwelling unit are nonmetallic. Furthermore, almost all cord-caps have the ground prong "down". As such, when these are plugged into a receptacle where the ground prong is "up" the weight of the cord tends to pull

the cord-cap out of the outlet which in turn exposes as much as 1/4 in. of the hot blades and also damages the cord where it is attached to the cap. Also, when the cord is removed, the ground prong is the first thing out of the outlet. When the ground prong is installed "down" the cord hangs in a natural position and stays in the receptacle outlet. I am not advocating a rule the ground is to be down. Just leave it alone and let it be a design consideration.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #1765)

2- 101 - (210-52(a)(1)): Accept
SUBMITTER: Jim Pauley, Square D Company
COMMENT ON PROPOSAL NO: 2-157
RECOMMENDATION: Revise (1) from the 1999 NEC to read as follows:
"(1) Spacing. Receptacles shall be installed so that no point measured horizontally along the floor line in any wall space is more than 1.8m (6 ft) from a receptacle outlet."
SUBSTANTIATION: The wording as accepted by the panel can be interpreted to require that outlets be spaced 6' apart. The proposed revision included in this comment will make it clear that there should be no point along a floor line that is more than 6 feet away from a receptacle.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #909)

2- 102 - (210-52(a)(2)a): Reject
SUBMITTER: David A. Kerr, Jr., Friendsville, PA
COMMENT ON PROPOSAL NO: 2-162
RECOMMENDATION: Accept.
SUBSTANTIATION: Two foot walls are nonsense. Three or four is sensible. This would also remove the idiotic and dangerous requirement to put a receptacle behind a door. The best place is one to two feet from the open door side, not six feet, so plugs and cords are less likely to be damaged by big furniture. People think I'm crazy when I quote these code rules to them. I have better ways of wasting my time than enforcing nonsense.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel confirms its previous panel statement that the two foot dimension defines a wall space for the application of the code rules. The panel does not agree with the submitter's assertion that the placement of a receptacle in the space behind a door creates a hazard. Frequently, this is the only receptacle accessible to plug in portable devices such as vacuum cleaners.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #1675)

2- 103 - (210-52(b)): Accept
SUBMITTER: Matthew Bell, Albion, MI
COMMENT ON PROPOSAL NO: 2-185
RECOMMENDATION: Agree with code panel action to reject. Section (b) needs to be clarified to include all open wall spaces including space covered by the opening of a door.
SUBSTANTIATION: The inspectors have never questioned about the 6 foot rule.
PANEL ACTION: Accept.
PANEL STATEMENT: The panel notes that the Code does not contain, nor is it intended to contain, any language that exempts the wall space behind a door from the six foot measurement for receptacles.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #16)

2- 104 - (210-52(c)(5)): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 2-171
RECOMMENDATION: The Technical Correlating Committee directs that the panel provide the appropriate metric values. This action will be considered by the Panel as a Public Comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
Revise "20 in." to "500 mm (20 in.)".
PANEL STATEMENT: The panel has added the metric dimension.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #322)

2- 105 - (210-52(c)(5)): Reject
SUBMITTER: Alan H. Nadon, City of Elkhart, IN
COMMENT ON PROPOSAL NO: 2-172
RECOMMENDATION: Revise as follows:
"...fastened in place, <u>appliance garages,</u> or appliances...". This change should be rejected.
SUBSTANTIATION: Many contractors now try to have the receptacle in the appliance garage excluded from the requirements for GFI protection because they are not readily accessible, even though they are close to the kitchen sink. Not counting this outlet as the required outlets will exacerbate the condition and reduce safety.
PANEL ACTION: Reject.
PANEL STATEMENT: The addition of "appliance garage" will make it clear that a receptacle included in the appliance garage is not included when calculating the receptacle placement in accordance with Section 210-52(c).
Section 210-8 requires GFCI protection for all receptacles in a kitchen that serve the countertop suface. A receptacle installed in the appliance garage still serves the countertop and would be required to have GFCI protection.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #519)

2- 106 - (210-52(c)(5), Exception): Accept
SUBMITTER: David A. Kerr, Jr., Friendsville, PA
COMMENT ON PROPOSAL NO: 2-175
RECOMMENDATION: Reject.
SUBSTANTIATION: I agree with Carpenter and Roche.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #612)

2- 107 - (210-52(c)(5), Exception): Accept
SUBMITTER: Glenn W. Zieseniss, Crown Point, IN
COMMENT ON PROPOSAL NO: 2-175
RECOMMENDATION: This proposal should be "reject."
SUBSTANTIATION: I agree with the comments of Mr. Carpenter, Mr. Nissen and Mr Roche vote of negative and comments.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #722)

2- 108 - (210-52(c)(5), Exception): Accept
SUBMITTER: W. Creighton Schwan, Hayward, CA
COMMENT ON PROPOSAL NO: 2-175
RECOMMENDATION: Reconsider, and Reject this proposal.
SUBSTANTIATION: I do not intend to fight this battle again, but receptacles should never have been permitted below the counter top in the first place. This proposed extension of the practice is not in the interest of safety. The proposed location is a place for stools and knees, not for receptacles, plugs and cords.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #1065)

2- 109 - (210-52(c)(5), Exception): Accept
SUBMITTER: Lanny McMahill, Rep. IAEI SW Section
COMMENT ON PROPOSAL NO: 2-175
RECOMMENDATION: Reject this proposal.
SUBSTANTIATION: It is not a safe practice to locate receptacle outlets on the bottom side of countertop spaces. The receptacle outlets and inserted cord-caps will be subjected to potential damage. Agree with negative comments by panel members Mr. Carpenter, Mr. Nissen and Mr. Roche.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #1537)

2- 110 - (210-52(c)(5), Exception):
Note: The Technical Correlating Committee directs that Comment 2-110 be reported as "Accept in Part", and that the first sentence of the Submitter's substantiation is considered part of the Recommendation.
SUBMITTER: Michael J. Johnston, International Association of Electrical Inspectors
COMMENT ON PROPOSAL NO: 2-175
RECOMMENDATION: Revise exception to read as follows:
Exception: To comply with the conditions as specified in (a) or (b), receptacle outlets shall be permitted to be mounted not more than 12 in. (305 mm) below the countertop. Receptacles mounted below the countertop in accordance with this exception shall not be located where the receptacle countertop extends more than 6 in. (153 mm) beyond the edge of the countertop measured horizontally its support base.
SUBSTANTIATION: Comment to recommend rejecting this proposal. It is not a safe practice to locate receptacle outlets on the bottom side of countertop spaces. The receptacle outlets and inserted cord caps will be subject to potential damage. I agree with negative comments by panel members, Mr. Carpenter, Mr. Nissen and Mr. Roche to reject this proposal. This does not add safety to the code, but serves to add information in an exception to a main rule intended in some part to help limit the amount of accidents due to cords draped down in the reach of children. This would increase the risk of crock pots, coffee pots, etc. being pulled off of countertops and resulting in burns to children.
PANEL ACTION: Accept in Principle in Part.
The panel accepts the submitter's recommendation to reject Proposal 2-175, but does not accept the revisions to the paragraph as shown in the recommendation of the comment.
PANEL STATEMENT: The submitter's revision to the exception does not add clarity.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #400)

2- 111 - (210-52(d)): Hold
SUBMITTER: Dan Leaf, Palmdale, CA
COMMENT ON PROPOSAL NO: 2-179
RECOMMENDATION: Accept in Principle revised:
"(b) GUEST ROOMS. At least one wall switch-controlled lighting outlet shall be installed in bathrooms, and at least one wall switch-controlled receptacle shall be installed in guest rooms or hotels, motels, and similar occupancies.
SUBSTANTIATION: Section 210-70(a) specifically requires a wall switch-controlled lighting outlet in bathrooms of dwelling units. Many hotels and motels do not meet the definition of dwelling units and there is no requirement for a bathroom lighting outlet, though the need is just the same. Though a lighting is normally installed, a requirement is needed as much as the one for (habitable) guest rooms.
PANEL ACTION: Hold.
PANEL STATEMENT: The submitter's recommendation does not relate to the proposal and contains material that has not been subjected to public review.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #1661)

2- 112 - (210-52(d)): Accept in Principle in Part
SUBMITTER: Melvin K. Sanders, TECo., Inc.
COMMENT ON PROPOSAL NO: 2-3
RECOMMENDATION: Revise as follows:
(D) Bathrooms. In dwelling units, at least one wall receptacle outlet shall be installed in bathrooms within 900 mm (3 ft) of the nearest outside edge of each basin as measured to the adjacent wall or partition. The receptacle outlet shall be located on a wall or partition that is adjacent to the basin location. A single multiple outlet located between adjacent basins shall be considered as meeting the intent of this section.
SUBSTANTIATION: This clarifies it is the wall adjacent to and next to the basin, and not the edge nearest the individual, where the measurement is to be taken.
The addition of "partition" recognizes that bathroom basins may be mounted on other than countertops, and that partitions less than room height may be involved. The additional sentence recognizes the use of a single duplex receptacle for double basin lavatories, as it provides the necessary number of receptacle outlets and two duplex receptacles are not required. Obviously more attachment points can be added but that should be a design issue.
At present, some areas allow the proposed practice and others require two duplex receptacles to be installed, sometimes placed in a two-gang box, and the subtlety of the definition of single and multiple receptacles in Article 100 is missed. Since there is this confusion, it would be a shame to miss this rewrite opportunity to clarify this issue.
PANEL ACTION: Accept in Principle in Part.
The panel does not accept the revision to the first sentence of the comment.
The panel accepts the addition of the words "or partition" by its action on Comment 2-114.
The panel does not accept the addition of the last sentence.
PANEL STATEMENT: The revision of the first sentence does not add any clarity. The measurement can be taken from any outside edge of the basin.
The last sentence is rejected because it only covers one scenario of basin and receptacle placement.
If a receptacle outlet can be placed so that it meets the requirements outlined in the first two sentences, it can qualify for more than one basin.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #1677)

2- 113 - (210-52(d)): Reject
SUBMITTER: Todd Cramer, JW Electric
COMMENT ON PROPOSAL NO: 2-186
RECOMMENDATION: Change Reject to Accept in Principle. Reword the last sentence by adding the following words at the end of the sentence: "or at any point within 300 mm (12 in.) of the counter top."
SUBSTANTIATION: This section is confusing to many contractors and inspectors. The word "adjacent" is interpreted differently by different contractors and inspectors. This proposal with the following addition will help the contractor and inspector understand the meaning of adjacent wall and still not allow a

receptacle to be installed behind a person standing in front of a basin.
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter's revised wording does not add clarity. See panel action and statement on Comment 2-114 for clarification of basin countertops.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #1704)

2- 114 - (210-52(d)): Accept in Principle
SUBMITTER: Mike Kietzman, Jr., Flint, MI
COMMENT ON PROPOSAL NO: 2-181
RECOMMENDATION: At the end of the second sentence of Section 210-52(d) add the word "countertop". The section will read "...adjacent to the basin countertop."
SUBSTANTIATION: Inspectors often rule that the wall behind the basin is the only adjacent wall. Frequently, a wall at the end of a counter in which the basin is installed is the more appropriate wall for mounting the receptacle outlet.
PANEL ACTION: Accept in Principle.
Revise the last sentence of Section 210.52(D) in the 2002 NEC ROP to read as follows:
"The receptacle outlet shall be located on a wall or partition that is adjacent to the basin or basin countertop."
PANEL STATEMENT: The panel has accepted the submitter's recommendation in principle and revised the wording to provide clarity.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #1707)

2- 115 - (210-52(d)): Reject
SUBMITTER: Marc Johns, Flint, MI
COMMENT ON PROPOSAL NO: 2-180
RECOMMENDATION: Change Reject to Accept in Principle and revise the second sentence as follows: delete the end of the sentence after the word "that" and add in the new words "borders the basin counter." The sentence will then read: "The receptacle shall be located on a wall that ~~is adjacent to the basin location~~ borders the basin counter."
SUBSTANTIATION: There is still confusion about the word adjacent leading to different interpretations by inspectors and contractors in the field.
PANEL ACTION: Reject.
PANEL STATEMENT: The use of the word "adjacent" is clear and preferred over the word "border". The dictionary defines "adjacent" as "next to".
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #2265)

2- 116 - (210-60(a)): Reject
SUBMITTER: Lawrence Brown, National Association of Home Builders (NAHB)
COMMENT ON PROPOSAL NO: 2-155
RECOMMENDATION: Revise the proposed text revision of 210-60 as follows:
(a) General. Guest rooms in hotels, motels, and similar occupancies shall have receptacle outlets installed in accordance with ~~210.52(a) and 210.52(d). Guest rooms meeting the definition of a dwelling unit, shall have receptacle outlets installed using~~ all of the applicable rules ~~in~~ of 210-52.
To read:
(a) General. Guest rooms in hotels, motels, and similar occupancies shall have receptacle outlets installed in accordance with all of the applicable rules of 210-52.
SUBSTANTIATION: The revised text clearly indicates the panel's intent that outlet receptacles in guest rooms and guest suites in hotels meet the same criteria as those found in a residential dwelling occupancy. The main reason for striking the words "guest rooms meeting the definition of a dwelling unit, ..." is due to the fact that the residential occupancies of a dwelling unit (a one-family, two-family or multifamily dwelling) are separated in the NEC, NFPA 101 Life Safety Code, and the model building codes from the residential occupancy of a guest room or guest suite located in a hotel. This is the same as if you made requirements for a Manufactured Home, a Day Care or Residential Board and Care occupancy located in what would appear to be a single-family home. Each of these occupancies must be specifically addressed, not grouped together because of appearance. This same train-of-thought is already used throughout Chapter Two when dealing with specific requirements for these different occupancies. Upon reading the text of NFPA 101 Chapters 28 and 29, there is no use of the term "dwelling unit". The proposed revised wording of this section also achieves conformity with the NFPA 101 Life Safety Code and the NFPA 5000 Building Code.
PANEL ACTION: Reject.
PANEL STATEMENT: The use of the term "dwelling unit" is not inconsistent in the context of the NEC. Article 100 has a clear definition of "dwelling unit" for the application of rules in the NEC. Utilizing the term in this section does not make the guest room a dwelling unit, nor does it change any of the rules from the building or Life Safety Code, it simply states that a guest room that meets the definition set forth in Article 100 must have receptacles placed by all the applicable rules in Section 210-52.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #304)

2- 117 - (210-60(b)): Reject
SUBMITTER: Veronica M. Westfall, Topaz Publications
COMMENT ON PROPOSAL NO: 2-202
RECOMMENDATION: Revise as follows:
At least two receptacle outlets with tamper-resistant covers shall be readily accessible.
SUBSTANTIATION: This is good if you're a business traveler and want to plug in your laptop without having to move any furniture, but I am guessing that these receptacles were originally hidden to limit the hotel's liability for exposing some children to unprotected devices. The code requires tamper-resistant covers for pediatric areas in hospitals, why not here? Actually requiring two accessible outlets seems dangerous to me, particularly since most parents don't travel with outlet covers.
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter has not provided any substantiation to support the claim that receptacles in guest rooms need to have tamper resistant covers.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #1654)

2- 118 - (210-61 (New)): Reject
SUBMITTER: Jack Wells, Pass & Seymour/Legrand
COMMENT ON PROPOSAL NO: 2-205
RECOMMENDATION: Accept in principal and revise the proposal as follows:
210-61 Child care. In child care areas such as day care centers, preschools, elementary schools and similar areas where children have access to receptacles, all 15- and 20 ampere, 125-volt receptacles shall be listed tamper resistant receptacles or shall employ a listed tamper resistant cover.
SUBSTANTIATION: The proposal has been revised to include the tamper resistant covers referred to in the panel statement. The panel statement also refers to inserts. The inserts are not included in the comment because they do not afford the same level of protection as tamper resistant receptacles and covers. The tamper resistant receptacles and covers are the means of protection required by 517-18(c) for pediatric locations.
The panel also states that proper child supervision is also necessary. This is also true in pediatric care locations but 517-18(c) recognizes that even with proper supervision there is still the hazard of children inserting conductive objects into receptacles. This hazard may be even greater in the locations cited in the proposal because there are likely to be a greater number of children per adult supervisor than in a pediatric care location.

PANEL ACTION: Reject.
PANEL STATEMENT: The submitter has not supplied data to support the addition of tamper resistant receptacles in locations specified.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #263)

2- 119 - (210-63): Accept in Principle
SUBMITTER: Ronald Deering, City of Portage
COMMENT ON PROPOSAL NO: 2-210
RECOMMENDATION: Revise as follows:
A 125-volt, single phase, 15 or 20-ampere-rated receptacle outlet shall be installed at an accessible location for the servicing of heating, air-conditioning, and refrigeration equipment on rooftops, (at grade level adjacent to buildings), in attics, and crawl spaces, etc....
Exception: Rooftop and grade level equipment on one and two-family dwellings.
SUBSTANTIATION: In small business/office building installations, extension cords must be brought in through doorways to service equipment.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Comment 2-120.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #588)

2- 120 - (210-63): Accept in Principle
SUBMITTER: Michael L. Simmons, Simmons Electric Co.
COMMENT ON PROPOSAL NO: 2-209
RECOMMENDATION: I respectfully request the Committee to consider the following change:
"210-63. Heating, Air-Conditioning, and Refrigeration Equipment Outlet. A 125-
volt, single-phase, 15- or 20- ampere-rated receptacle outlet shall be installed at an accessible location for the servicing of heating, air-conditioning, and refrigeration ~~equipment on rooftops and in attics and crawl spaces~~. The receptacle shall be located on
the same level and within 25 feet (7.62m) of the heating, air-conditioning, and
refrigeration equipment. The receptacle outlet shall not be connected to the load side of the equipment disconnecting means.
~~Exception: Rooftop equipment on one and two-family dwellings.~~
FPN: See Section 210-8 for ground-fault circuit-interrupter requirements."
SUBSTANTIATION: Background: A very hazardous situation exists in the servicing of heating, air-conditioning, and refrigeration equipment. The current paragraph 210-63 requirements are not uniform in the safety protection provided for various applications. Paragraph 210-63 currently requires that a receptacle outlet be located within 25 feet of heating, air-conditioning, and refrigeration equipment; but the paragraph excludes coverage for all ground-level equipment and rooftop equipment in one and two family dwellings. HVAC (heating, ventilating, and air-conditioning) servicemen, who are not fully qualified electricians, service the equipment covered by paragraph 210-63. Although the existing code 210-52(e) requires an outlet on the back of the dwelling, air conditioning equipment is often located on the side of the dwelling, where the 210-52(e) outlet is not easily accessible—for example, millions of southern homes with backyard lanai areas (porch/veranda/swimming pool) have the equipment on the side of the dwelling.
Description of the Hazard: HVAC serviceman are required to use a nearby receptacle outlet for various routine and emergency reasons. These reasons include the frequent use of HVAC refrigerant recovery machines; the use of vacuum pumps; for lighting; and for power tools. Scheduled service calls are routine, but emergency service calls are also required on HVAC equipment at all hours of the day and night, including calls during wet weather or when the ground is wet after recent rain or snow. The vast majority of these calls are made for ground-level equipment at residences. Emergency calls are often made at night when lighting is required. It is normal practice for the serviceman to plug into the nearest outlet he sees during such service calls, but quite often there is not an outlet within sight. As a result, I have seen HVAC technicians plug into a non-GFI home outlet immediately inside the house, which was the nearest outlet available to the outside ground-level air-conditioner. Others will simply put jumpers inside the disconnect box to get power, putting themselves at risk to get the job done quickly. Connecting to a non-GFI outlet or using jumpers creates an immediate electrocution hazard if the ground is wet and there is a short in the equipment or extension cord. These are clearly not acceptable servicing practices, but as a master electrician with experience in many states, I have seen them occur repeatedly, due either to ignorance of the seriousness of the hazard or due to the constant pressure on the serviceman to accomplish the job efficiently and quickly. I do not know how many injuries/fatalities this causes nationwide every year. HVAC servicemen are not fully qualified electricians.
Summary: The proposed deletions to paragraph 210-63 would have the effect of applying the same requirement to all equipment, regardless of the location of the equipment. The changes would thus extend safety protection uniformly to all equipment applications, including ground-level equipment, where the largest hazard exists. A single outlet on the back of the house will often comply with both the proposed 210-63 as well as the existing 210-52(e). However, when the air conditioner is located on the side of the dwelling, or further than 25 feet away from the 210-52(e) outlet, an additional outlet would be required. I believe this additional equipment cost is nominal compared to the increase in safety and the reduced medical cost and lost-wage cost from injuries/fatalities. An added benefit to this proposed change is that the nearby outlet will provide an additional convenience outlet to the homeowner or property maintenance personnel, who increasingly use outdoor electric appliances such as lawnmowers and weedcutters.
Note: I agree with Mr. Hartwell (Proposal Log No. 4165) and others who also recommended this change. The change would also create consistency with mechanical code requirements.
PANEL ACTION: Accept in Principle.
The panel accepts the recommendation in the Comment noting that the word "equipment" in the first sentence will remain.
PANEL STATEMENT: The panel notes that for dwelling unit applications, the receptacles required by Section 210-52(e) could also meet the requirement of Section 210-63 if one were installed within 25 feet of the equipment.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #1991)

2- 121 - (210-63): Accept in Principle
SUBMITTER: William F. Laidler, Rep. Massachusetts Electrical Code Advisory Committee
COMMENT ON PROPOSAL NO: 2-210
RECOMMENDATION: This proposal should be accepted as written.
SUBSTANTIATION: This is a companion commentlto proposal 2-80. Proposals 2-80 and 2-210 intend that a GFCI protected receptacle be located to serve HACR equipment at ground level (as is presently required for rooftop HACR equipment). This requirement would be in line with building/mechanical codes.
The panel statement to see panel statement on proposal 2-208 is really not adequate and is misleading as it addresses outdoor receptacles at dwelling units and proposals 2-80 and 2-210 clearly address GFCI protected receptacles located at other than dwelling units to service HACR equipment at ground levels.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Comment 2-120.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #314)

2- 122 - (210-70(a)(1)): Reject
SUBMITTER: Russell LeBlanc, Peterson School of Engineering
COMMENT ON PROPOSAL NO: 2-217
RECOMMENDATION: Revise as follows:
At least one switch for the required lighting outlet shall be located near at least one entrance to the habitable room or bathroom.
SUBSTANTIATION: The intent of my original proposal was to require the switch for the lighting outlet to be located near an entrance to each habitable room and bathroom. Currently the NEC only requires the switch location to be a wall. Why the wall? Which wall? The Panel's statement in the ROP says that the location of switches is a "design consideration".
Why then does the NEC require the switch location to be on the wall? A switch installed on the underneath of a cabinet, or on a countertop, or on a post would not be allowed with the current wording. The NEC requires one point of control for lighting outlets in storage and equipment spaces to be near the entrance to these spaces. Is that not a "design consideration"?
I think habitable rooms and bathrooms should have similar requirements.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel reiterates its position that the location of the wall switch is a design consideration and that the thousands of variations of rooms dwelling unit layouts make a mandated location of that switch impractical. The submitter's use of the term "near" adds no more clarity than the present requirement.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #2224)

2- 123 - (210-70(a)(1)): Accept
SUBMITTER: Robert H. Keis, Dover, DE
COMMENT ON PROPOSAL NO: 2-221
RECOMMENDATION: This proposal should remain rejected.
SUBSTANTIATION: Why put something in the code that is completely impossible to enforce or control. How is the inspector or anyone enforcing this code going to control what is plugged into a dwelling unit outlet. All this could do is result in arguments, lawsuits, and unnecessary government control. As for protecting against bumped shins, for falling, the code requires the switched outlet, but it doesn't require a switch at each entry into a room. What is the difference? There would still be times when entering a room that a light is not available, and this complies with code. Also, can anyone image the hazards created by some homeowners trying to disable the internal switching.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #2013)

2- 124 - (210-70(a)(2)): Accept in Principle
SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc.
COMMENT ON PROPOSAL NO: 2-226a
RECOMMENDATION: Relocate the exception to follow (2) and precede the lettered paragraphs.
SUBSTANTIATION: The exception applies to all of (2), not just item c.
PANEL ACTION: Accept in Principle.
Add text to the beginning of the Exception to read:
"Exception to (a), (b), and (c)".
PANEL STATEMENT: The panel action meets the intent of the submitter.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #17)

18- 3 - (210-70(a)(3)): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 2-232
RECOMMENDATION: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 18 for action in Article 410. This action will be considered by the Panel as a Public Comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
PANEL STATEMENT: The panel rejects Proposal 2-232. The intent of Proposal 2-232 is already covered in Section 410-5 of the NEC.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 10
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10

(Log #1655)

2- 125 - (210-83(3)): Accept
SUBMITTER: Jack Wells, Pass & Seymour/Legrand
COMMENT ON PROPOSAL NO: 2-32
RECOMMENDATION: The Panel should continue to reject this proposal.
SUBSTANTIATION: This comment supports the action of the Panel to reject the proposal. Likewise, we support the Panel statement and the affirmative comment of Mr. Nissen.
Unfortunately, the survey mentioned in the Panel statement has taken longer than anticipated. The stated objective of the survey is "…to obtain statistically valid data to identify, define and quantify long term operation of GFCIs in the installed infrastructure. For suspected field failures, both the installation and the product must be analyzed and data compiled to enable clear definition (including conditions of use and environment) and mode of failure (e,g, SCR failure, test button failure) sufficient to define remedial action(s) if required.,"
The statistical model developed for this survey has been reviewed and confirmed by CPSC as appropriate. UL is fully involved in the collection, tabulation and analysis of the data as it comes in.
Because the data is incomplete, unanalyzed and lacks peer review it would be inappropriate for NEMA to release it at this time.
Even if the survey supports some remedial action, the Panel and Mr. Nissen are correct in stating that such action should involve the product safety standard, not the installation code.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

ARTICLE 215 — FEEDERS

(Log #2104)

2- 126 - (215-2(a)): Reject
SUBMITTER: Truman C. Surbrook, Michigan State University
COMMENT ON PROPOSAL NO: 2-243
RECOMMENDATION: Change Accept in Part to Accept.
SUBSTANTIATION: The phrase "before the application of any adjustment or correction factors" needs to be deleted, or rewritten to make the meaning clear. Hundreds of electrical contractors and inspectors are confused by this phrase. "PLEASE" make the meaning clear. Assuming that Table 310-16 applies in a particular case, the allowable ampacity is the value given in the Table if the conditions of the Table are met. If adjustment or correction factors apply, then the allowable ampacity is the result of their application to which ever column is appropriate. If the phrase that is confusing is deleted, then the rule applies to the allowable ampacity of the conductors taking adjustment and correction factors into consideration. The following example is my interpretation of this section as presently written.

Assume a three-phase, four-wire feeder is protected with a 400 ampere circuit breaker and supplies load that consists of 110 ampere continuous and 228 ampere noncontinuous. Further, the majority of the load is nonlinear so all four conductors count as current carrying conductors and an adjustment factor of 0.8 must be applied. Assume the conductors are copper with 75°C insulation and terminations.

Before applying any adjustment factors, the minimum conductor size is 500 kcmil which has an allowable ampacity of 380 amperes. This conductor is capable of carrying 1.25 times the 110 ampere continuous load and 224 ampere noncontinuous load which adds up to 362 amperes. But after the adjustment factor of 0.8 has been applied, this section is not requiring the allowable ampacity to be compared to 362 amperes. Instead it seems to be requiring the allowable ampacity to be compared to 334 amperes (110 A + 224 A = 334 A). This requires a 600 kcmil conductor with an adjusted allowable ampacity of 336 amperes (420 A x 0.8 = 336 A).

If the intent is for the adjusted allowable ampacity of the conductor to be not less than 1.25 times the continuous load plus the noncontinuous load (362 A) than a 700 kcmil conductor is required (460 x 0.8 = 368 A). But this does not seem to be what the section is stating.

Please tell me what minimum conductor size the Panel would select for this example based upon this section, and please rewrite the section to make the meaning clear.
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter is incorrect in his statement of intent shown in the next to last paragraph of the substantiation. The intent of the requirement is to establish the minimum conductor size that can be used based on the continuous loads at 125% and non-continuous loads at 100%.

Other calculations for the number of conductors in a conduit and ambient adjustment may be required by Section 310-15 and those adjustments can take advantage of the higher insulation values of a conductor. Removing the words as requested by the submitter would eliminate the ability to take advantage of the higher temperature insulations for ambient adjustment and numbers of conductors in the raceway.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #2342)

2- 127 - (215-2(a)): Accept in Principle
SUBMITTER: J. Pat Roche, Celanese Acetate
COMMENT ON PROPOSAL NO: 4-40b
RECOMMENDATION: Revise first paragraph of 215-2(a) to read as follows:

(a) Feeders of Not More Than 600 Volts. Feeder conductors of not more than 600 volts shall have an ampacity ...
SUBSTANTIATION: Comment to address Technical Correlating Committee referral of proposal 4-40b to Code-Making Panel 2 for inclusion of the material in Articles 210 and 215 to cover over 600 volt branch-circuits, feeders, and supervised installation, in general. See companion comments on 210-19(a), new 210-19(b), and new 215-2(e).
PANEL ACTION: Accept in Principle.

Create a new Section 215.2(A) titled: "Feeders Not More Than 600 Volts."

Move 215-2(a), (b), (c) and (d) to become 215.2(A)(1), (2), (3) and (4), respectively.
PANEL STATEMENT: The panel action meets the intent of the submitter. The panel has accepted the submitter's concept, but has revised the section to add titles and provide a clearer approach to the arrangement of the text.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #1702)

2- 128 - (215-2(a), Exception): Reject
SUBMITTER: Justin Kurney, Corunna, MI
COMMENT ON PROPOSAL NO: 2-240
RECOMMENDATION: Change Reject to Accept.
SUBSTANTIATION: If the conductor is adequate to carry the load, it does not matter if the overcurrent device is sized at 100 percent of the continuous load. It makes no sense to size the conductor in one case at 100 percent of the load and in another at 125 percent of the same load. There should only be one rule for sizing conductors.
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter is incorrect. The conductor is a part of the system along with other equipment such as circuit breakers, fuses, panelboards, switches, etc. The exception recognizes that there are 100% rated circuit breakers where the conductor can be sized at 100% as well. Removal of the exception would require a 125% sized conductor on a circuit breaker sized at 100%.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #2014)

2- 129 - (215-2(a), Exception): Accept in Principle
SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc.
COMMENT ON PROPOSAL NO: 2-244
RECOMMENDATION: Reject the proposal.
SUBSTANTIATION: The proposal submitter does not adequately understand why the requirement exists in the first place. Conductor ampacity is defined in terms of the ability to carry load continuously. The requirement to upsize conductors was never imposed to protect conductors; instead, it had to do with providing a heat sink for conventional devices subjected to continuous loading. That NEMA sponsored revision avoided a likely UL standards revision that would have cost the industry untold millions of dollars in reengineering and testing of end use equipment, but had no basis in conductor ampacity.

Therefore the present rule is correct even though, as correctly noted in the substantiation, they could be in two different wire sizes required to serve the same 130A continuous load. The conventional device requires 2/0 (and 175A protection) and the 100% device requires No. 1 (and 150A protection) for the same load. Each wire will be protected by the installed circuit protection per 240.3, and the conventional device will be assured that the conductor has some phantom load capacity so it will perform as a heat sink under the stipulated load profile. Devices listed for 100% operation have the heat dissipation issues addressed though other engineering approaches implicitly evaluated in the listing process.
PANEL ACTION: Accept in Principle.

In the 2002 NEC ROP, delete the last sentence of the Exception in Section 215-2(a).
PANEL STATEMENT: The panel has deleted the last sentence, but has retained the revision in the proposal that added "allowable" in the first sentence.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #2105)

2- 130 - (215-2(a), Exception): Reject
SUBMITTER: Truman C. Surbrook, Michigan State University
COMMENT ON PROPOSAL NO: 2-244
RECOMMENDATION: Agree with the Panel's action to Accept in Principle, but with the deletion of the words "permitted to be" in the exception.
SUBSTANTIATION: The words "permitted to be" are not needed and they are confusing to Code users. This exception sets a minimum allowable ampacity of the circuit conductors and the words "not less than" are clear as to the meaning.
The Panel has approved a new last sentence as follows: "In no case shall the ampacity be less than the rating of the overcurrent device." I agree with the Panel's action here, and as a point of clarification, I assume the Panel means by this statement that Section 240-3(b) does not apply.
PANEL ACTION: Reject.
PANEL STATEMENT: The use of the term "shall be permitted" makes it clear that this is a permissive exception and not a mandatory exception. The exception reads clearly with this text included. In addition, the submitter is directed to the panel action on Comment 2-129 relative to the last sentence of the exception.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #18)

4- 3 - (215-2(d) (New)): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 2-245
RECOMMENDATION: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 4 for action in Article 225. This action will be considered by the Panel as a Public Comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
PANEL STATEMENT: Code Making Panel 4 agrees with Code Making Panel 2 to reject Proposal 2-245 because it is not necessary to establish a minimum rating for feeders supplying a dwelling unit.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #2341)

2- 131 - (215-2(e) (New)): Accept in Principle
Note: See the Technical Correlating Committee action on Comment 4-36.
SUBMITTER: J. Pat Roche, Celanese Acetate
COMMENT ON PROPOSAL NO: 4-40b
RECOMMENDATION: New 215-2(e) to read as follows:
(e) Feeders Over 600 Volts. Feeder conductors over 600 volts shall be sized in accordance with (1) or (2):
(1) The ampacity of feeder conductors shall not be less than the sum of the nameplate ratings of the transformers supplied, when only transformers are supplied. The ampacity of feeders supplying a combination of transformers and utilization equipment shall not be less than the sum of the nameplate ratings of the transformers and 125 percent of the designed potential load of the utilization equipment that will be operated simultaneously.
(2) For supervised installations feeder conductor sizing shall be permitted to be determined by qualified persons under engineering supervision. Supervised installations are defined as those portions of a facility where all of the following conditions are met:
a. Conditions of design, and installation are provided under engineering supervision.
b. Qualified persons with documented training and experience in over 600 volt systems, provide maintenance, monitoring and servicing of the system.
The ampacity of conductors shall be in accordance with Section 310-15 and Section 310-60 as applicable.
SUBSTANTIATION: Comment to address Technical Correlating Committee referral of proposal 4-40b to Code-Making Panel 2 for inclusion of the material in Articles 210 and 215 to cover over 600 volt branch-circuits, feeders, and supervised installations, in general. See companion comments on 210-19(a), new 210-19(b) and 215-2(a).
PANEL ACTION: Accept in Principle.
Revise the submitter's recommendation to read as follows:
(B) Feeders Over 600 Volts. The ampacity of conductors shall be in accordance with Section 310-15 and Section 310-60 as applicable. Feeder conductors over 600 volts shall be sized in accordance with (1), (2) or (3):
(1) Feeders Supplying Transformers. The ampacity of feeder conductors shall not be less than the sum of the nameplate ratings of the transformers supplied, when only transformers are supplied.
(2) Feeders Supplying Transformers and Utilization Equipment. The ampacity of feeders supplying a combination of transformers and utilization equipment shall not be less than the sum of the nameplate ratings of the transformers and 125 percent of the designed potential load of the utilization equipment that will be operated simultaneously.
(3) Supervised Installations. For supervised installations feeder conductor sizing shall be permitted to be determined by qualified persons under engineering supervision. Supervised installations are defined as those portions of a facility where all of the following conditions are met:
a. Conditions of design, and installation are provided under engineering supervision.
b. Qualified persons with documented training and experience in over 600 volt systems, provide maintenance, monitoring and servicing of the system.
PANEL STATEMENT: The panel has accepted the submitter's concept, but has revised the section to add titles and provide a clearer approach to the arrangement of the text.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #401)

2- 132 - (215-5): Accept
SUBMITTER: Dan Leaf, Palmdale, CA
COMMENT ON PROPOSAL NO: 2-248
RECOMMENDATION: Accept proposal.
SUBSTANTIATION: The term "connected load" may be commonly used in the Code but not technically accurate where applied to some loads which are "computed" such as VA/sq ft, VA per circuit such as small appliance circuits, laundry circuits, and sign circuits. A diagram for an installation where no load has been connected and there are no "computed" loads could indicate zero load and technically comply. Connected loads are also "computed" but some computed loads are not "connected".
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #407)

2- 133 - (215-8): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
COMMENT ON PROPOSAL NO: 2-250
RECOMMENDATION: Accept proposal.
SUBSTANTIATION: The word "secondary" basically limits the requirements to conductors supplied from a transformer and doesn't cover a feeder supplied by a generator. Present text doesn't explicitly preclude all conductors from having an orange color; it should be a distinguishing color. Present text permits tagging or other means for conductors 6 AWG and smaller. This is not permitted for the grounded or grounding conductors. Present text only requires identification where a connection is made. Many connections to a feeder may be made subsequent to time of installation and inspection when marking is less apt to be done. Grounding conductors are required to be identified where accessible.
The proposal retains the limitation to locations where the grounded conductor is present.
The requirement for marking to encircle the insulation is required for the grounded conductor of a 4-wire delta-connected circuit per 200-6(b) and will be required for the grounding conductor per Proposal 5-256.
PANEL ACTION: Reject.
PANEL STATEMENT: The identification of the high-leg of a 3 phase 4-wire system is a different issue than that for grounded conductors. The rules are not presently, nor has substantiation

been presented, that indicates similar marking rules should apply to the high-leg that apply to the grounded conductor. The submitter has not presented any field problems with the present wording.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

ARTICLE 220 — BRANCH-CIRCUIT, FEEDER, SERVICE CALCULATIONS

(Log #2313)

2- 134 - (220-1): Reject
Note: See Code-Making Panel 2's action on Comment 2-88.
SUBMITTER: William M. Lewis, Eli Lilly and Co.
COMMENT ON PROPOSAL NO: 2-258
RECOMMENDATION: In response to the Panel action I offer the following alternative: Include the wording approved by panel 4 in proposal 4-40b as optional load calculations in part C. This would become:
220-37 Optional calculations for sizing outdoor conductors over 600 volts
Outdoor circuit conductors shall be sized in accordance with (A), (B) or (C):
(A) Sizing of Conductors for Outdoor Branch Circuits. The ampacity of branch circuit conductors shall not be less than 100 percent of the designed potential load of utilization equipment that will be operated simultaneously.
(B) Sizing of Conductors for Outdoor Feeders. The ampacity of outdoor feeder conductors shall be in accordance with the following:
(1) The ampacity of feeders supplying only transformers shall not be less than the sum of the nameplate ratings of the transformers supplied by the feeder.
(2) The ampacity of feeders supplying a combination of transformers and utilization equipment shall be not less than the sum of the nameplate ratings of the transformers and 125 percent of the designed potential load of the utilization equipment that will be operated simultaneously.
(C) Sizing of Conductors in Supervised Installations. For supervised installations as defined in 225-50, branch circuit and feeder conductor sizing shall be permitted to be determined by qualified persons under engineering supervision.
SUBSTANTIATION: A task group was formed at the direction of the Technical Correlating Committee to address gaps in the NEC as it pertained to over 600 volt circuits. The proposal 3-132 was to complete the process and give guidance to inspectors for the sizing of conductors for outside feeders and branch circuits over 600 volts. There was no consideration given to feeders other than outside during the deliberations of the task group.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel actions and statements on Comments 2-84 and 2-131. This action addresses the sizing of feeder conductors in all locations and not just outdoors. Article 220 is for calculating loads and not sizing conductors. Articles 210 and 215 are the appropriate locations for the material.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #2306)

2- 135 - (Table 220-3(a)): Reject
SUBMITTER: James M. Daly, BICC General
COMMENT ON PROPOSAL NO: 2-266
RECOMMENDATION: This Proposal should be Accepted.
SUBSTANTIATION: Electricity used is based on data from the U.S. Department of Energy - Table 8.9 from the Annual Energy Review of DOEs Energy Information Administration Electric Utility Retail Sales for Residential Uses (Excludes Commercial, Industrial and Other Uses).
Housing units is based on data from the U.S. Census Bureau - Historical Census of Housing Tables - Units in Structure, which included detached (one-family), attached (rowhouses, townhouses, and duplexes), apartments, and mobile homes. The data in the tables included the number of housing units in the specified structures and not the number of residential buildings.
The increase in electricity used per housing unit from 1950 to 1990 (latest census data) is shown below. Residential usage of electricity was 1.1 trillion KWH in 1999, an additional increase of 19% from 1990.

Year	Residential Electricity Sales (billion KWH/year)	Housing Units (millions)	Electricity Usage (KWH per housing unit per year)
1950	72	46	1,565
1990	924	101	9,149

This data shows that, in spite of more energy efficient utilization equipment, electrical energy consumption per housing unit increased 485% in the 40-year period from 1950 to 1990. This tremendous increase in energy usage in dwelling units should certainly justify a very modest increase of 50% in the unit load per square foot in dwelling units of 3 volt-amperes has not been changed since at least 1968 (oldest NEC that I could reference).
PANEL ACTION: Reject.
PANEL STATEMENT: The substantiation does not show that the 3 VA/sq. ft. calculation is resulting in systems that are unsafe or have inadequate capacity. It only shows that usage of electricity has increased.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #408)

2- 136 - (220-3(b)c): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
COMMENT ON PROPOSAL NO: 2-271
RECOMMENDATION: Accept proposal.
SUBSTANTIATION: The present text is ambiguous. It assigns the computed load to (each) outlet on the branch circuit specified in 600-5(a).
PANEL ACTION: Reject.
PANEL STATEMENT: The present code text is clear that it assigns the 1200VA to each required branch circuit in Section 600-5(a).
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #CC200)

2- 136a - (220-3(b)(7) Item (2)): Accept
SUBMITTER: CMP 2
COMMENT ON PROPOSAL NO: 2-3
RECOMMENDATION: In the wording of the 2002 NEC ROP, add the metric dimension to the section to read as follows:
"300 mm (1 ft.)"
SUBSTANTIATION: The panel has added the metric dimension to this section to be consistent with the changes throughout the rest of the article.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #19)

2- 137 - (220-12(b)): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 2-276
RECOMMENDATION: The Technical Correlating Committee directs that the panel clarify the action on the proposal, specifying where the new sentence is to be located. This action will be considered by the Panel as a Public Comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
Add the following sentence as a new last sentence to Section 220.12(B):
"Where multi-circuit track is installed, the load shall be considered to be divided equally between the track circuits."
PANEL STATEMENT: The panel action addresses the issue raised by the Technical Correlating Committee.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #723)

2- 138 - (Table 220-18): Accept

Note: To clarify how to calculate the demand factor, it was the action of the Technical Correlating Committee that the following revisions be made Table 220-18 in Proposal 2-282.

The demand factors for 12-22 dryers should read: "0/0%=47 - [number of dryers minus 11]". The demand factors for 24-42 dryers should read: "0/0%=35 – (0.5 x [number of dryers minus 23])"..

SUBMITTER: W. Creighton Schwan, Hayward, CA
COMMENT ON PROPOSAL NO: 2-282
RECOMMENDATION: Reconsider, and Accept this proposal.
SUBSTANTIATION: This simple change will correct the situation where added connected load results in a lower calculated demand factor. Defending the Code containing such illogical material makes it difficult to support when facing detractors. The panel statement that the 1999 Table is easier to use is correct, but the difference is inconsequential, as are the slight differences in calculated load.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #2015)

2- 139 - (Table 220-18): Accept
SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc.
COMMENT ON PROPOSAL NO: 2-282
RECOMMENDATION: Accept the proposal.
SUBSTANTIATION: The proposed table is almost as easy to use as the present table, certainly at significant improvement in technical merit. The higher demand factors are adequately accounted for in the proposal substantiation. In every instance they occur on the upper cusp of an existing load bracket, where they fall below the required load when an additional dryer is connected. For example, at present 19 dryers require a load allowance of 38.0 kW; the proposal would allow 37.1 kW. This might seem to be an unsubstantiated reduction in safety until you realize that the present NEC says 20 dryers only require 35.0 kW and 21 require 36.8 kW. Therefore there should be no technical objection to allowing the 19 dryers to use 37.1 kW as the demand. The proposal keeps the calculations carefully in step with the existing table, but in a way that doesn't allow a user to reduce the calculated load by adding additional dryers. The Code Making Panel 2 action on Proposal 2-305 leaves this demand table as the only remaining such table to incorporate paradoxical load calculations, and the panel should take this opportunity to eliminate them for good. If the panel, in its judgment, chooses to ratchet the calculations slightly downward, it should still do so in the context of this proposal so the calculation problem doesn't recur.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #582)

2- 140 - (220-21 Exception No. 2 (New)): Reject
SUBMITTER: C. John Beck, Pacific Gas & Electric Co.
COMMENT ON PROPOSAL NO: 2-258
RECOMMENDATION: The proposal should be accepted.
SUBSTANTIATION: Article 225 deals with the requirements for outside branch circuits and feeders. These outside branch circuits and feeders are installed and intended for a different application than internal building wiring systems and must be considered in light of their intended installation, use and application. CMP 4 put together a task group to look at the specific requirements for calculating over 600 Volt outside feeder and branch circuit requirements. Distribution types of circuits. The requirements were developed for over 600 Volt installations based on outside installation, application, and supervision and engineering issues and applications. Other aspects, which may be more appropriate to internal building wiring systems would not necessarily be applicable. Merely incorporating these requirements into 220 would make them generally applicable to internal building systems, which was not the intent. It is appropriate that over 600 volt outside branch circuit and feeder requirements be included in Article 225 (Outside Branch Circuits and Feeders) not Article 220.
PANEL ACTION: Reject.
PANEL STATEMENT: The Technical Correlating Committee has made it clear that requirements dealing with sizing of circuits should be in the appropriate portions of Articles 210 and 215. The material proposed by Code-Making Panel 4 for outside branch circuits and feeders has been added to Articles 210 and 215 for over 600V branch circuits and feeders in general.

Code-Making Panel 2 also notes that the proposed material does not deal with load calculations, but does deal with conductor sizing. Article 220 does not establish the conductor sizing rules. As such, the exception is inappropriate.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #1862)

2- 141 - (220-30): Reject
SUBMITTER: David P. Brown, Baltimore Gas and Electric Co/EEI
COMMENT ON PROPOSAL NO: 2-289
RECOMMENDATION: This proposal should be accepted.
SUBSTANTIATION: Please see Bob Moore's negative vote comments on page 183 of the ROP. Additionally, the panel should reconsider the action on this proposal for many reasons including: (1) The calculated load for a heat pump can be higher than resistance heat while the actual load is always lower, (2) The calculations produce "erratic" results as shown in the proposal, (3) It is our understanding that the submitter did not intend to calculate the heat pump and strip heat system at 100 percent but simply wanted some clarification to make sure that the calculation method was understood and (4) Utility data is available from computer programs using load profiles to calculate residential demands that clearly verify that the 65 percent factor is very adequate for electric heat pump systems.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel has made it clear that the present language reflects its intent and does not agree that its statement is in error.

The panel has made it clear that the present language reflects its intent and does not agree that its statement is in error.

The submitter did not supply the information indicated in the substantiation. Furthermore, any submitted data would need to show that the submitter's claims are indeed true for heat pumps used throughout the country and not in limited climatic conditions.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NEGATIVE: 1
ABSTENTION: 1
EXPLANATION OF NEGATIVE:
MOORE: I do not agree with the panel action or the panel statement. It is my opinion that the 1999 NEC text was not a clarification from previous cycles and was revised without adequate substantiation.

The current code allows diversification at 65 percent of nameplate rating for central electric space heating for 4 units or less. However, current code allows no diversification (100 percent of the nameplate ratings) for a system employing heat pump compressors with supplemental heating. Heat pump compressors are more efficient than electric space heating. Thus, a combination central space heating installation employing heat pump compressors with supplemental heat in simultaneous operation would have a lower demand than a pure central resistance heat system of the same size. Rating the total load of the combination unit at 65 percent would be in line with the allowed 65 percent rating for a system composed only of electric space heating.

It is also my opinion that the submitter provided the necessary substantiation for the proposal.
EXPLANATION OF ABSTENTION:
TOMAN: This substantiation merits reconsideration by the code making panel, as the panel statement is not definitive and lacks clarity.

(Log #443)

2- 142 - (220-32(c)): Accept
SUBMITTER: Dan Leaf, Palmdale, CA
COMMENT ON PROPOSAL NO: 2-297
RECOMMENDATION: Accept proposal.
SUBSTANTIATION: The word "computed" is also consistent with wording elsewhere in the Code and is more technically accurate as it includes loads which are not "connected" but assigned values. All connected loads are computed but not all computed loads are connected.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12

VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

ARTICLE 225 — OUTSIDE BRANCH CIRCUITS AND FEEDERS

(Log #2340)

4- 4 - (225-3): Reject
SUBMITTER: J. Pat Roche, Celanese Acetate
COMMENT ON PROPOSAL NO: 4-4
RECOMMENDATION: Reject Proposal 4-4 and previous panel action on Proposal 4-4.
SUBSTANTIATION: Calculation of ampacity for over 600 volts should not be incorporated into Part C (III) of Article 225. Sizing of branch-circuit and feeder conductors over 600 volts should be included in Articles 210 and 215. See Technical Correlating Committee action on Proposal 4-40b. See companion comments on Sections 210-19(a), new 210-19(b), 215-2(a), and new 215-2(e).
PANEL ACTION: Reject.
PANEL STATEMENT: The panel reaffirms Section 225-3 only applies to 600 volts nominal or less. The panel action on Proposal 4-4 only changed the title of that section to state that fact. For aspects regarding over 600 volts, see panel action and statement on Comment 4-36.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #2339)

4- 5 - (225-5): Reject
SUBMITTER: J. Pat Roche, Celanese Acetate
COMMENT ON PROPOSAL NO: 4-7 and 4-7a
RECOMMENDATION: Reject Proposal 4-7a and accept Proposal 4-7.
SUBSTANTIATION: Calculation of ampacity for over 600 volts should not be incorporated into Part C (III) of Article 225. Sizing of branch-circuit and feeder conductors over 600 volts should be included in Articles 210 and 215. See Technical Correlating Committee action on Proposal 4-40b. See companion comments on Sections 210-19(a), new 210-19(b), 215-2(a), and new 215-2(e).
PANEL ACTION: Reject.
PANEL STATEMENT: The panel reaffirms Section 225-5 only applies to 600 volts nominal or less. The panel action on Proposal 4-7a only changed the title of that section to state that fact. For aspects regarding over 600 volts as related to Proposal 4-7, see panel action and statement on Comment 4-36.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1723)

4- 6 - (225-19(d)): Reject
SUBMITTER: Don Ganiere, Ottawa, IL
COMMENT ON PROPOSAL NO: 4-12
RECOMMENDATION: Accept this proposal.
SUBSTANTIATION: Panel members should show this proposal to their local firefighters and ask them if overhead wiring at fixed windows is ever a problem.
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter provided no technical substantiation.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #444)

4- 7 - (225-22): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
COMMENT ON PROPOSAL NO: 4-14
RECOMMENDATION: Accept in principle revised:
Raceways on exterior surfaces of buildings or other structures. Raceways on exterior surfaces of buildings or other structures in wet locations shall be raintight and arranged to drain.
SUBSTANTIATION: All locations on exterior surfaces are not wet locations (see definition). Section 370-15 only requires boxes and fittings in wet locations to be listed for wet locations. If boxes in damp locations on exterior surfaces are not required to be raintight, why should surface raceways? This is not consistent.
PANEL ACTION: Reject.
PANEL STATEMENT: All raceways on exterior of buildings or other structures are subject to moisture and condensation and need to be arranged to drain. The panel reaffirms that Article 370 addresses the requirements for boxes and fittings in these locations.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #39)

4- 8 - (225-26): Accept
Note: The Technical Correlating Committee notes that the action on Comment 3-72a accomplishes the correlation.
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 4-15
RECOMMENDATION: It was the action of the Technical Correlating Committee that this Proposal be reconsidered for correlation with the action on Proposal 3-132. This action will be considered by the Panel as a Public Comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
PANEL STATEMENT: See panel action and statement on Comment 4-10.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #40)

4- 9 - (225-26): Accept
Note: The Technical Correlating Committee notes that the action on Comment 3-72a accomplishes the correlation.
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 4-16
RECOMMENDATION: It was the action of the Technical Correlating Committee that this Proposal be reconsidered for correlation with the action on Proposal 3-132. This action will be considered by the Panel as a Public Comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
PANEL STATEMENT: See panel action and statement on Comment 4-10 and Comment 4-11.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1916)

4- 10 - (225-26): Accept
Note: The Technical Correlating Committee notes that the action on Comment 3-72a accomplishes the correlation.
SUBMITTER: Michael I. Callanan, International Brotherhood of Electrical Workers
COMMENT ON PROPOSAL NO: 4-15
RECOMMENDATION: Accept this proposal.
SUBSTANTIATION: In accordance with the instructions of the TCC as referenced on this proposal and proposal 3-132, and to correlate with a sister comment on 4-16, this proposal should be accepted. The TCC has ruled that Panel 3 has jurisdiction in this matter. Panel 3 is firm in the position that vegetation must not be used as a support for temporary wiring.
This comment represents the official position of the International Brotherhood of Electrical Workers Codes & Standards Committee.
PANEL ACTION: Accept.
PANEL STATEMENT: This action deletes the exception to Section 225-26 in the 1999 NEC. The panel agrees with the Technical Correlating Committee that the support of temporary wiring is the responsiblity of Code Making Panel 3.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1917)

4- 11 - (225-26): Accept

Note: The Technical Correlating Committee notes that the action on Comment 3-72a accomplishes the correlation.

SUBMITTER: Michael I. Callanan, International Brotherhood of Electrical Workers

COMMENT ON PROPOSAL NO: 4-16

RECOMMENDATION: Reject this proposal.

SUBSTANTIATION: In accordance with the instructions of the TCC and to correlate with the action of Panel 3 on Proposal 3-132, this proposal should be rejected. The phrase "Vegetation, such as trees" is too vague and could conceivably be applied to a large weed. In addition, the time limits for temporary wiring on trees are too often overlooked, with temporary wiring installed for years. The Panel statement for proposal 3-132 clearly points out that the panel's position is that vegetation of any type shall not be permitted. The TCC has ruled that Panel 3 has jurisdiction in this matter.

This comment represents the official position of the International Brotherhood of Electrical Workers Codes & Standards Committee.

PANEL ACTION: Accept.

PANEL STATEMENT: By this action the panel accepts the rejection of Proposal 4-16. The panel reaffirms the deletion of the exception to Section 225-26 in the 1999 NEC. See panel action and statement on Comment 4-10.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #41)

4- 12 - (225-26, Exception): Accept

Note: The Technical Correlating Committee notes that the action on Comment 3-72a accomplishes the correlation.

SUBMITTER: Technical Correlating Committee National Electrical Code

COMMENT ON PROPOSAL NO: 4-17

RECOMMENDATION: It was the action of the Technical Correlating Committee that this Proposal be reconsidered for correlation with the action on Proposal 3-132. This action will be considered by the Panel as a Public Comment.

SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.

PANEL ACTION: Accept.

PANEL STATEMENT: See panel action and statement on Comment 4-10.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #1918)

4- 13 - (225-26, Exception): Accept

Note: The Technical Correlating Committee notes that the action on Comment 3-72a accomplishes the correlation.

SUBMITTER: Michael I. Callanan, International Brotherhood of Electrical Workers

COMMENT ON PROPOSAL NO: 4-17

RECOMMENDATION: Accept this proposal.

SUBSTANTIATION: In accordance with the instructions of the TCC, and to correlate with a sister comment to 4-16, this proposal should be accepted. Panel 3 has jurisdiction in this matter and has stated that vegetation is not suitable as a support for temporary wiring.

This comment represents the official position of the International Brotherhood of Electrical Workers Codes & Standards Committee.

PANEL ACTION: Accept.

PANEL STATEMENT: See panel action and statement on Comment 4-10.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #2314)

4- 14 - (225-26, Exception): Reject

Note: The Technical Correlating Committee notes that the action on Comment 3-72a accomplishes the correlation.

SUBMITTER: William M. Lewis, Eli Lilly and Co.

COMMENT ON PROPOSAL NO: 4-15

RECOMMENDATION: Change the wording of the exception to read:

Exception: For temporary wiring which meets all of the requirements of article 305, vegetation may be used as support for overhead conductor spans.

SUBSTANTIATION: This has been a long standing, approved practice which was questioned during the 1999 code cycle because there is no reference to vegetation support in 305. This rewording will hopefully clarify that if a feeder meets the time constraints, and construction requirements imposed upon temporary wiring in article 305, then support by trees may be allowed if it is the best option.

PANEL ACTION: Reject.

PANEL STATEMENT: See panel action and statement on Comment 4-10.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #42)

4- 15 - (225 Part B, and 225-30): Accept

SUBMITTER: Technical Correlating Committee National Electrical Code

COMMENT ON PROPOSAL NO: 4-18

RECOMMENDATION: The Technical Correlating Committee directs that the Panel clarify the Panel Action on this Proposal. This action will be considered by the Panel as a Public Comment.

SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.

PANEL ACTION: Accept.

PANEL STATEMENT: The panel action on Proposal 4-18 should have been accept in principle.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #43)

4- 16 - (225-30(a)(4)): Accept

Note: The Technical Correlating Committee directs that the Panel Action on Comment 4-16 be reported as "Hold" consistent with Section 4-4.6.2.2 of the NFPA Regulations Governing Committee Projects. By this action, Proposal 4-18a is reported as "Reject".

SUBMITTER: Technical Correlating Committee National Electrical Code

COMMENT ON PROPOSAL NO: 4-18a

RECOMMENDATION: The Technical Correlating Committee directs that the Panel clarify the Panel Action on this Proposal. There is presently no definition for "Standby Systems." This action will be considered by the Panel as a Public Comment.

SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.

PANEL ACTION: Accept.

In Section 225-30(A)(4), change to read as follows: (4) Optional Standby Systems

Add a new Section 225-30(F) to read as follows:(F) Redundant Supply. By special permission, redundant feeders or branch circuits shall be permitted in addition to the usual source of supply.

PANEL STATEMENT: The panel takes this action because Article 702 only addresses on-site generated power. Redundant supplies are often required, for example, to improve reliability.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #1766)

4- 17 - (225-30(a)(4)): Accept in Principle

Note: The Technical Correlating Committee directs that the action on Comment 4-17 be reported as "Accept". See Technical Correlating Committee action on Comment 4-16.

SUBMITTER: Jim Pauley, Square D Company
COMMENT ON PROPOSAL NO: 4-18a
RECOMMENDATION: Reject the proposal.
SUBSTANTIATION: The term "optional standby systems" from the 1999 NEC was correct. All possible standy by systems are covered by using emergency, legally required, and optional.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: By panel action on Comment 4-16 the panel has modified Proposal 4-18a to reinstate the term "optional standby systems" in Section 225-30(A)(4). In addition, the panel has developed a new Section 225-30(F) entitled "Redundant Supply" to allow a separate supply which is not derived from on-site generated power.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1061)

4- 18 - (225-31 and 225-32): Accept in Principle

Note: See the Technical Correlating Committee action on Comment 4-25.

SUBMITTER: Lanny McMahill, Rep. IAEI SW Section
COMMENT ON PROPOSAL NO: 4-22a
RECOMMENDATION: Accept this proposal, however, add "visible and not more than 50 ft away from" after "within sight."
SUBSTANTIATION: This change will clarify the intent of the revised text and provide for a maximum distance that the disconnecting means can be located away from the building or structure.
PANEL ACTION: Accept in Principle.
The panel accepts in principle this comment and revises the text in Proposal 4-22a, Section 225-31(A)(1) entitled "Outside", to read as follows: Where the branch circuit or feeder disconnecting means is outside a building or structure it shall be installed on the building or structure supplied or shall be located not more than 15m (50 ft) from the building or structure supplied.
PANEL STATEMENT: This change will clarify the requirements for the location of a building or structure disconnect. The panel utilized the term "within sight of" to stipulate a distance of 15m (50 ft). As the distance is now specified in the code, the terms "within sight of" or "visible" are not necessary.
See panel action and statement on Comment 4-25.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #738)

4- 19 - (225-31 Exception No. 5): Accept in Principle

Note: See the Technical Correlating Committee action on Comment 4-25.

SUBMITTER: Mike Theisen, St. Cloud, MN
COMMENT ON PROPOSAL NO: 4-27
RECOMMENDATION: Add text to the end of the exception to read as follows:
For outdoor emergency, legally required standby, or optional standby generator sets, the disconnecting means, when listed as suitable for use as service equipment, shall be permitted to be at the generator and no more than 25 ft from the building or structure supplied.
SUBSTANTIATION: The substantiation for the original Proposal 15-3 states "Most outdoor generator sets are located close to the building they serve, typically within 25 ft." I agree that this proposal has merit for the generator set located close to the building supplied, but I am concerned about the lack of a proximity requirement which could become a safety issue if the distance was unlimited.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel actions and statements on Comments 4-18, 4-20 (see substantiation) and 4-25. The panel accepts the concept of a specific distance. The panel does not accept the 25 foot distance limitation. The disconnecting means meeting the requirements of Section 225-31(A)(1) would be acceptable whether or not it is at or on a generator.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1768)

4- 20 - (225-31 Exception No. 5): Accept

Note: See the Technical Correlating Committee action on Comment 4-25.

SUBMITTER: Jim Pauley, Square D Company
COMMENT ON PROPOSAL NO: 4-27
RECOMMENDATION: Reject the proposal.
SUBSTANTIATION: The addition of this exception and its placement after the main rule in 225.31 would allow the building disconnect to be located at a generator regardless of the generator distance from a building. The exception removes the requirement that the disconnect would have to comply with (A) and (B) of 225.31. Furthermore, the exception is not necessary with the revisions to (A)(1) by the panel. A disconnect meeting the location requirements of (A)(1) would qualify regardless of whether or not it is at/on a generator.
PANEL ACTION: Accept.
PANEL STATEMENT: See also panel action and statement on Comment 4-25.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #2024)

4- 21 - (225-31 Exception No. 5 (New)): Accept

Note: See the Technical Correlating Committee action on Comment 4-25.

SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc.
COMMENT ON PROPOSAL NO: 4-27
RECOMMENDATION: Reject the proposal.
SUBSTANTIATION: The proposal is no longer necessary, since the proximity rule has been modified to allow for remote disconnects if they are within sight of the building or structure served. The proposed exception has another problem, in that not all objects separated by not more than 50 ft from another object are actually in sight from the other location. The literal text of this exception would qualify a generator disconnect as a building disconnect by reason of distance alone, regardless of visibility. That is a safety issue, and unlikely to represent the panel intent.
PANEL ACTION: Accept.
PANEL STATEMENT: See also panel action and statement on Comment 4-25.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #737)

4- 22 - (225-31(a)(1)): Reject

Note: See the Technical Correlating Committee action on Comment 4-25.

SUBMITTER: Mike Theisen, St. Cloud, MN
COMMENT ON PROPOSAL NO: 4-22a
RECOMMENDATION: Revise as follows:
Where the branch circuit or feeder disconnecting means is installed outside a building or structure it shall be on ~~or within sight of~~ the building or structure supplied.
SUBSTANTIATION: There is no need for this general permission to locate the disconnecting means away from the building or structure supplied. There already exists specific permissions given in the five (5) exceptions to Section 225.31. If there is another specific situation that needs to be addressed, then simply add another exception.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Comments 4-18 and 4-25. The submitter did not provide technical substantiation to limit the disconnect location to "on the building".
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #739)

4- 23 - (225-31(a)(1)): Accept in Principle in Part

Note: See the Technical Correlating Committee action on Comment 4-25.

SUBMITTER: Mike Theisen, St. Cloud, MN

COMMENT ON PROPOSAL NO: 4-22a

RECOMMENDATION: Revise as follows:

Where the branch circuit or feeder disconnecting means is installed outside a building or structure it shall ~~be~~ comply with either (a) or (b):

(a) the disconnecting means is installed on the exterior of the building or structure supplied ~~or~~

(b) the disconnecting means is installed within sight of and not more than 50 feet from the building or structure supplied and shall consist of a single switch or circuit breaker.

SUBSTANTIATION: I have two concerns regarding the outdoor location of the disconnecting means for a building or structur:

(1) "Within sight of a building" can be a very long distance. If the building were located "within sight of the disconnecting means" then the distance may be less formidable but still not very practical. A specific maximum distance must be prescribed for the sake of safety.

(2) Section 255.33 allows the disconnecting means to consist of a maximum of six switches; would this then allow a remotely located disconnecting means to contain up to six switches? Are we then not back to the possibility of six branch circuits or feeders supplying the building or structure from the remote "disconnecting means"? The remote disconnecting means must be limited to a single switch.

PANEL ACTION: Accept in Principle in Part.

The panel does not accept the requirement for a single switch or circuit breaker. The panel accepts in principle the remainder of the comment as addressed in the panel action and statement in Comments 4-18 and 4-25.

PANEL STATEMENT: The panel does not accept the requirement for a single switch or circuit breaker as no technical substantiation was provided for that requirement. See also panel action and statement in Comments 4-18 and 4-25.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #1767)

4- 24 - (225-31(a)(1)): Reject

Note: See the Technical Correlating Committee action on Comment 4-25.

SUBMITTER: Jim Pauley, Square D Company

COMMENT ON PROPOSAL NO: 4-22a

RECOMMENDATION: Reword the requirement in (A)(1) to read as follows:

(1) Outside. Where the branch circuit or feeder disconnecting means is installed outside a building or structure it shall be on, or within sight of and not more than 3 m (10 ft) from, of the building or structure supplied.

SUBSTANTIATION: The revised text by the panel is not an acceptable solution. Allowing the disconnect for a building to be fifty feet from the building will result in a reduced level of safety for the building occupants. For instance, I could have two apartment buildings (one fed from the other) with a chain link fence in between. The second building would not have to have a disconnect if it were within 50' of the first. The fence would not obstruct the "within sight" requirement. Allowing the disconnect to be not more than 10 feet away would allow disconnects mounted on posts/racks and on gen sets to be used as the building disconnect, but with a much more reasonable distance specified.

PANEL ACTION: Reject.

PANEL STATEMENT: The applicability of the terms "within sight of" and "readily accessible" are addressed by the panel actions and statements to Proposal 4-22a and Comments 4-18 and 4-25. The submitter has provided no technical substantiation to limit the distance to 3 m (10 ft).

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #44)

4- 25 - (225-32): Accept

Note: The Technical Correlating Committee directs that 225-31(A)(1)be revised to read as follows:

"(1) Outside. Where the branch circuit or feeder disconnecting means is outside a building or structure it shall be installed on the building or structure supplied or shall be located within sight from the building or structure supplied."

The Technical Correlating Committee directs that the issue involves safety and correlation concerns which warrant this change.

In the Panel Action text, delete the sentence "The following exceptions apply to all of NEC 225.31" and revise "Exception No. 1" to read "Exception No. 1 to (A) and (B)", revise "Exception No. 2" to read "Exception No. 2 to (A) and (B)", revise "Exception No. 3" to read "Exception No. 3 to (A) and (B)", and revise "Exception No. 4" to read "Exception No. 4 to (A) and (B)"

SUBMITTER: Technical Correlating Committee National Electrical Code

COMMENT ON PROPOSAL NO: 4-24

RECOMMENDATION: The Technical Correlating Committee directs that the Panel clarify the Panel Action on this Proposal as it relates to Proposal 4-22a. This action will be considered by the Panel as a Public Comment.

SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.

PANEL ACTION: Accept.

The panel clarifies that Section 225.31 including all of the changes incorporated through the proposal and comment period shall read as follows and is the panel's final action on Section 225.31:

225.31 Disconnecting Means.

Means shall be provided to disconnect all ungrounded conductors that supply or pass through a building or structure in accordance with (A) and (B).

(A) Readily Accessible Location. The branch circuit or feeder disconnecting means shall be installed at a readily accessible location in accordance with (1) or (2).

(1) Outside. Where the branch circuit or feeder disconnecting means is outside a building or structure it shall be installed on the building or structure supplied or shall be located not more than 15m (50 ft) from the building or structure supplied.

(2) Inside. Where the branch circuit or feeder disconnecting means is installed inside, it shall be nearest the point of entrance of the supply conductors.

(B) Conductors Considered Outside. For the purposes of this section, the requirements of 230.6 shall be permitted to be used.

The following exceptions apply to all of NEC 225.31:

Exception No. 1: For installations under single management, where documented safe switching procedures are established and maintained for disconnection, and where the installation is monitored by qualified individuals, the disconnecting means shall be permitted to be located elsewhere on the premises.

Exception No. 2: For buildings or other structures qualifying under the provisions of Article 685, the disconnecting means shall be permitted to be located elsewhere on the premises.

Exception No. 3: For towers or poles used as lighting standards, the disconnecting means shall be permitted to be located elsewhere on the premises.

Exception No. 4: For poles or similar structures used only for support of signs installed in accordance with Article 600, the disconnecting means shall be permitted to be located elsewhere on the premises.

PANEL STATEMENT: By this action the panel clarifies its action on Proposal 4-22a and incorporates all panel actions on Comments 4-18 through 4-24. The panel action for this comment is intended as the final action on Section 225-31.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #45)

4- 26 - (225-32 Exception No. 1): Accept

SUBMITTER: Technical Correlating Committee National Electrical Code

COMMENT ON PROPOSAL NO: 4-25

RECOMMENDATION: The Technical Correlating Committee directs that the Panel clarify the Panel Action on this Proposal as it relates to Proposal 4-22a. This action will be considered by the Panel as a Public Comment.

SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
PANEL STATEMENT: See panel action and statement on Comment 4-25.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #46)

4- 27 - (225-32 Exception No. 5 (New)): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 4-27
RECOMMENDATION: The Technical Correlating Committee directs that the Panel clarify the Panel Action on this Proposal as it relates to Proposal 4-22a. This action will be considered by the Panel as a Public Comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
PANEL STATEMENT: See panel action and statement on Comment 4-25.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #756)

4- 28 - (225-32 Exception No. 5): Reject
SUBMITTER: Lawrence A. Bey, Onan Corp.
COMMENT ON PROPOSAL NO: 15-3
RECOMMENDATION: Delete, ~~when listed as being suitable for use as service equipment.~~
SUBSTANTIATION: It was not the intent of the submitter to require service equipment at the generator, that was added to the original proposal by the panel, without explanation as to why. On-site generator conductors are feeders, not service conductors according to the Article 100 definitions of service and feeder. The problem is that in most generator set installations the generator is not separately-derived because the service neutral and generator neutral are solidly-interconnected at the transfer switch(es). In non-separately-derived installations use of service equipment at the generator may lead to inadvertent/incorrect multiple grounding points on the solidly interconnected neutrals. Where the generator is separately-derived, it should be grounded similarly to a separately-derived transformer, and service equipment is not required for the secondary of separately-derived transformers, indoors or outdoors.
PANEL ACTION: Reject.
PANEL STATEMENT: See the panel action and submitter's substantiation on Comment 4-30.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1705)

4- 29 - (225-36): Reject
SUBMITTER: Bradley D. Kaighen, Hadley, MI
COMMENT ON PROPOSAL NO: 4-29
RECOMMENDATION: Change reject to accept.
SUBSTANTIATION: The Panel missed the point of the original proposal. If the feeder supplying the second building has overcurrent protection, this situation is no different than a subpanel in the same building. Subpanels are not required to be rated as suitable for use as service equipment. If the building is supplied from a disconnect only, such as on a farm, it should be rated as suitable for use as service equipment.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel reaffirms its statement on Proposal 4-29 that the term "suitable for use as Service Equipment" does not imply that overcurrent protection is mandatory or provided. Also, the panel recommends that the commenter refer to Section 250-32(B)(2) requirements.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1769)

4- 30 - (225-36): Accept
SUBMITTER: Jim Pauley, Square D Company
COMMENT ON PROPOSAL NO: 4-30
RECOMMENDATION: The panel should reconsider and reject the proposal.
SUBSTANTIATION: The revision as accepted opens up a gaping hole in electrical safety associated with disconnecting means. The requirement that the disconnect be SUSE not only provided for the proper components in the product (like neutral disconnect links, number of disconnects, arrangement of disconnects, etc.) it also required a disconnect that was of a type suitable for disconnecting under load. Electrical spacings in the disconnect are critical to these applications, the SUSE requirement ensured that the disconnect had appropriate spacings to be used as a service/feeder disconnect. Without this SUSE requirement, a device such as a manual motor controller could be used as the building disconnect. Also, a true isolation switch (one not capable of being opened under load) could be used as the disconnect as well since it is not required to be SUSE.
In addition, the revision by the panel creates a conflict with 430.95. CMP 11 determined a number of code cycles ago that due to the construction of an MCC, it should only be permitted to have a maximum of two disconnects when used in service applications. This same limitation always extended to an MCC used as a building disconnect as well because it had to be SUSE. Now that CMP 4 has removed the SUSE limitation, an MCC could have up to six disconnects as the building disconnecting means. This is in direct conflict with the intent set forth in 430.95.
The panel should return to the 1999 NEC wording for this section. Education of installers, inspectors and users has been very successful and most now understand what to look for in a disconnect at a second building. The revision as proposed would set back those education efforts considerably. **PANEL ACTION:** Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #402)

4- 31 - (225-37): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
COMMENT ON PROPOSAL NO: 4-35
RECOMMENDATION: Accept in Principle in Part revised.
This section shall not apply where all disconnects are grouped.
Exception No. 2: This identification shall not be required for ~~branch~~ circuits from a dwelling unit to a second building or structure or for a service supplying such building or structure.
SUBSTANTIATION: It is possible and feasible to locate all different supply disconnects at one location since limitation to six applies to each supply. Where grouped, there are no remote locations to warrant plaques. Identification is required by 110-22.
A second building may have a power service for specific use such as a 240 volt 2-wire welder in addition to a branch circuit or feeder supplied from the dwelling unit. The occupant will be fully aware of the disconnecting means.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel affirms that a plaque or directory identifying multiple supplies is useful and enhances safety even when those supplies are grouped in one location. There is no requirement for multiple plaques where the supplies are grouped at one location.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1961)

4- 32 - (225-38, Exception): Reject
SUBMITTER: Phil Simmons, Simmons Electrical Services
COMMENT ON PROPOSAL NO: 4-35a
RECOMMENDATION: Revise text as follows:
225-38. Exception: For garages and outbuildings on residential property, snap switches, other than ~~or~~ sets of 3-way or 4-way snap switches, shall be permitted as the disconnecting means.
SUBSTANTIATION: The present permission to use a set of 3-way or 4-way switches for the disconnecting means at a garage or outbuilding violates the concept of disconnection of power at the building for safety where one may be working on an electrical system. The 3-way or 4-way switch at a remote location can accidentally be operated which will energize the system being worked on and create a shock or safety hazard.
It should not be necessary to show a body count or history of electric shock incidents to recognize that this change in the code is necessary. (I wonder how many volunteers from Code Making Panel 4 we could get to work on the electrical system at a remote building downstream from a 3- or 4-way switch, especially if the other building is occupied?!)
PANEL ACTION: Reject.
PANEL STATEMENT: The panel reaffirms its statement to Proposal 4-32 that the submitter has not provided any accident data to support the elimination of a long standing code requirement.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1956)

4- 33 - (225-41): Reject
SUBMITTER: Phil Simmons, Simmons Electrical Services
COMMENT ON PROPOSAL NO: 4-38
RECOMMENDATION: Move the existing Section Section 240-13 and the exceptions to become a new Section 225-41 (or other appropriate Section).
SUBSTANTIATION: Part B of Article 225 deals with disconnecting means for buildings and structures on the premises that are supplied from a service in another building or structure. Section 240-13, which covers equipment ground fault protection requirements for building disconnecting means, should be located where the other requirements for building or structure disconnecting means are located. This should improve the structure of the Code and make the Code more "user friendly."
The origin of ground-fault protection of equipment was when it was added to Section 230-95 for service equipment. Similar rules were added to Article 215 as many utility services are at primary voltages and transformers on-site reduce the voltage and phase arrangement to 480Y/277 with overcurrent devices rated 1000 amperes or more. The same hazard exists for feeders as for services. This addition "plugged a hole" in the Code as the equipment was supplied by feeders and not services. All the rules for building disconnecting means should be located at the same place in the Code.
PANEL ACTION: Reject.
PANEL STATEMENT: This action would not be under the pervue of Code Making Panel 4. Additionally, ground fault protection for feeder is covered in Section 215-10.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #2241)

4- 34 - (225-48): Reject
SUBMITTER: Robert W. Baird, IEC
COMMENT ON PROPOSAL NO: 4-39
RECOMMENDATION: The panel action should be revised to accept in principle in part as follows:
Modify the proposed section to read:
225-48 Supervised Installations.
For the purposes of Part C, the term "supervised installation" is defined as the portions of a facility where all of the following conditions are met:
1) Conditions of design, and installation are provided under engineering supervision.
2) Qualified persons provide maintenance, monitoring and servicing of the system.
SUBSTANTIATION: The additional text previously proposed by the code panel relating to training, experience and voltage level is redundant and unnecessary. By definition, Part C covers Outside Branch Circuits and Feeders over 600 volts. The definition of qualified person as adopted by Code Making Panel 1 in their action related to Proposal 1-178, states that a qualified person is one who has skills and knowledge related to the construction and operation of the equipment and has received safety training on the hazards involved. Therefore, individuals working on circuits under this section must have the skills and knowledge related to the construction and operation, and have received safety training, related to the installation and use of outside branch circuits and feeders over 600 volts.
PANEL ACTION: Reject.
PANEL STATEMENT: This comment would modify Section 225-50 to eliminate documentation of training and experience. The panel reaffirms that documented training and experience is necessary for over 600 volt supervised installations. The panel recognizes and affirms that the documentation required is subject to acceptance by the Authority Having Jurisdiction.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #2338)

4- 35 - (225-48(New 225-50): Reject
SUBMITTER: J. Pat Roche, Celanese Acetate
COMMENT ON PROPOSAL NO: 4-39
RECOMMENDATION: Reject Proposal 4-39 and panel action on Proposal 4-39.
SUBSTANTIATION: Calculation of ampacity for over 600 volts should not be incorporated into Part C (III) of Article 225. Sizing of branch-circuit and feeder conductors over 600 volts should be included in Articles 210 and 215. See Technical Correlating Committee action on Proposal 4-40b. See companion comments on Sections 210-19(a), new 210-19(b), 215-2(a), and new 215-2(e).
PANEL ACTION: Reject.
PANEL STATEMENT: By this action the panel reaffirms its Acceptance in Principle of Proposal 4-39 and the retention of the action on Proposal 4-39 is required to complete the panel's action on Comment 4-36.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #47)

2- 143 - (225-50, 51, and 52): Accept
Note: See Code-Making Panel 2's action on Comment 2-88.
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 4-40b
RECOMMENDATION: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 2 for inclusion of the material in Articles 210 and 215 to cover over 600 volt branch circuits, feeders, and supervised installations, in general. This action will be considered by the Panel as a Public Comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
PANEL STATEMENT: See panel actions and statements on Comments 2-84 and 2-131.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #583)

4- 36 - (225-50, 225-51, and 225-52): Accept

Note: The Technical Correlating Committee directed that the Action on Proposal 4-40b be incorporated into Articles 210 and 215. This has been accomplished by the panel actions on Comments 2-84, 2-131 and 2-143. The Technical Correlating Committee also notes that the material is now under the purview of Code-Making Panel 2.

SUBMITTER: C. John Beck, Pacific Gas & Electric Co.
COMMENT ON PROPOSAL NO: 4-40b
RECOMMENDATION: CMP 4 disagrees with the action proposed by the Technical Correlating Committee that this proposal be relocated to CMP 2, specifically Articles 210 and 215. The content of Proposal 4-40b should remain in Article 225. A Task Group of CMP 4 members was put together to review this material and issue. Included were: John Beck; William Lewis; Tom Adams; Junior Owings; Floyd Ferris; Howard Hughes; and John Young.
SUBSTANTIATION: Article 225 deals with the requirements for outside branch circuits and feeders. These outside branch circuits and feeders are different than internal building wiring systems and must be considered in light of their intended installation, use and application. A Task Group of CMP 4 members was provided with a copy of the Technical Correlating Committee action to direct NEC Proposal 4-40b)to CMP 2 for relocation in Article 210 and 215. Based on that review and comments provided, the CMP 4 Task Group did not concur with that action. The concerns expressed by the Task Group included the fact that the material in Proposal 4-40b was developed only for outdoor applications, as covered by Article 225, and did not address indoor applications or issues. If such a relocation occurs, it is believed that there will be other negative impacts to related areas already worked on by CMP 4 such as 225-3. Further, as a general note, if 4-40b is relocated for "general application" as proposed, the concern was expressed that it would only make sense that the remainder of Article 225 be "generally" incorporated into Articles 210 and 215, with results and other ramifications for the NEC. The CMP 4 Task Group believes alternative to relocation of the material, that the correct action for CMP 2 is to place a "reference" in Articles 210 and 215 to the material contained in Proposal 4-40b.
PANEL ACTION: Accept.
PANEL STATEMENT: The panel recognizes that the Technical Correlating Committee may wish to have this material located in Article 210 and Article 215. If that occurs the material should be retained as shown in Proposal 4-40b in its entirety. If Panel 2 does not accept the incorporation of these requirements in their entirety for above 600 volts, then this material should remain in Article 225. Therefore, by this action Panel 4 reaffirms that the material in Proposal 4-40b should be retained and the action on Proposal 4-40b be referred to the Technical Correlating Committee and Panel 2 for their information and consideration.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1784)

4- 37 - (225-50): Reject
SUBMITTER: Alan Manche, Square D Co.
COMMENT ON PROPOSAL NO: 4-43
RECOMMENDATION: The panel should reconsider this proposal and accept the original proposal that adds the words "or equivalent".
SUBSTANTIATION: Product manufacturers are going to mark the product for the appropriate hazards and comply with the ANSI Z535 standards. The explicit nature of the present wording in the NEC establishes conflict between the NEC marking restrictions and the required hazard markings outlined in ANSI Z535.4.

The objective of the NEC wording is to generally convey the basic message requirement to user. However, in order to comply with Z535.4, the exact words stated in the NEC may not be appropriate for the contemplated circumstances. Revising the text to allow "or equivalent" would permit a hazard sign to comply with the NEC and be formatted in accordance with Z535.4.

Similar proposals were submitted to a number of code panels. Panels 3, 9, 14, and 15 have accepted the addition of the words "or equivalent," and Panel 13 has accepted the proposal in principle and revised the marking requirements to warn of the hazard without establishing specific wording and permitting compliance with the ANSI Z535 set of standards. The panel may also want to review and consider the action taken by Code-Making Panel 13 in Proposal 13-25.

Most importantly, the panel needs to take action in order to reconcile the conflict between the NEC and the ANSI Z535 standards by accepting the proposal.
PANEL ACTION: Reject.
PANEL STATEMENT: The term "or equivalent" is vague and unenforcable as per Section 3.2.1 of the NEC Manual of Style. The panel refers this comment and action to the TCC as the submitter has identified other areas of the code where this term is used.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #2139)

4- 38 - (225 Part C):

Note: The Technical Correlating Committee directs that the action on Comment 4-38 be recorded as "Accept in Principle" to correlate with the Technical Correlating Committee action on Comment 4-36. By this action, the Technical Correlating Committee directs that 225-50, 225-51, and 225-52 in the Report on Proposals are deleted. A new 225-50 is to be inserted that reads: "225-50 Sizing of Conductors. The sizing of conductors over 600 volts shall be in accordance with 210.19(B) for branch circuits and 215.2(E) for feeders."

SUBMITTER: J. Pat Roche, Celanese Acetate
COMMENT ON PROPOSAL NO: 4-40b
RECOMMENDATION: Reject Proposal 4-40b.
SUBSTANTIATION: Calculation of ampacity for over 600 volts should not be incorporated into Part C (III) of Article 225, sizing of branch-circuit and feeder conductors over 600 volts should be included in Section 210-215. See companion comments on Sections 210-19(a), new 210-19(b), 215-2(a), and new 215-2(e).
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Comment 4-36.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #2337)

4- 39 - (225 Part C): Reject
SUBMITTER: J. Pat Roche, Celanese Acetate
COMMENT ON PROPOSAL NO: 4-40b
RECOMMENDATION: Reject Proposal 4-40b.
SUBSTANTIATION: Calculation of ampacity for over 600 volts should not be incorporated into Part C (III) of Article 225. Sizing of branch-circuit and feeder conductors over 600 volts should be included in Articles 210 and 215. See companion comments on Sections 210-19(a), new 210-19(b), 215-2(a), and new 215-2(e).
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Comment 4-36.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

ARTICLE 230 — SERVICES

(Log #48)

4- 40 - (230-2(a)(4)):

Note: The Technical Correlating Committee directs that the Panel Action on Comment 4-40 be reported as "Hold" consistent with Section 4-4.6.2.2 of the NFPA Regulations Governing Committee Projects. By this action, Proposal 4-46a is reported as "Reject".

SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 4-46a
RECOMMENDATION: The Technical Correlating Committee directs that the Panel clarify the Panel Action on this Proposal. There is presently no definition for "Standby Systems." This action will be considered by the Panel as a Public Comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
In Section 230-2(A)(4), change to read as follows: (4) Optional Standby Systems

Reletter existing Section 230-2(E) to become Section 230-2(F).
Add a new Section 230-2(E) to read as follows:(E) Redundant Supply. By special permission, redundant services shall be permitted in addition to the usual source of supply."
PANEL STATEMENT: The panel takes this action because Article 702 only addresses on-site generated power. Redundant supplies are often required, for example, to improve reliability.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1770)

4- 41 - (230-2(a)(4)):
Note: The Technical Correlating Committee directs that the action on Comment 4-41 be reported as "Accept". See Technical Correlating Committee action on Comment 4-40.
SUBMITTER: Jim Pauley, Square D Company
COMMENT ON PROPOSAL NO: 4-46a
RECOMMENDATION: The panel should reconsider and reject the proposal.
SUBSTANTIATION: The term "optional standby systems" from the 1999 NEC was correct. All possible standy by systems are covered by using emergency, legally required, and optional. There is no conflict with 702.2 since that section does not prohibit a service from supplying optional systems.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: By panel action on Comment 4-40, the panel has modified Proposal 4-46a to reinstate the term "optional standby systems" in Section 230-2(A)(4). In addition, the panel has developed a new item 230-2(E) entitled "Redundant Supply" to allow a separate supply which is not derived from on-site generated power. The panel has relettered current Section 230-2(E) to become 230-2(F).
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #2348)

4- 42 - (230-2(d)): Reject
SUBMITTER: Neil F. LaBrake, Jr., Baldwinsville, NY
COMMENT ON PROPOSAL NO: 4-52
RECOMMENDATION: Revise text to read as follows:
(D) Different Characteristics. Additional services shall be permitted for different voltages, frequencies, or phases, or for different uses, such as for different rate schedules. Or, ~~T~~the services may be granted by special permission ~~shall be in sight from one another.~~
SUBSTANTIATION: I believe the Proposer had good intent for safety of services with different characteristics to require the service equipment located within sight of each other. However, this concept should be considered by the Panel to allow these situations optionally with special permission as in 230.2(C)(3). Special permission is defined in Article 100 meaning the written consent of the authority having jurisdiction.
It is understood that the installer must meet the requirements of the NEC for the premises wiring (re: Article 90) and the serving utility's requirements for the service connection. In situations like this which occur often, these rules will overlap and the utility has the right to ensure its rules are met due to their regulation by the State's public authority. As such, most utilities have rules regarding the supply of additional services with different characteristics. In addition, the local authority having jurisdiction over electrical installations would provide an approval certificate where code requirements have been met. These situations should not be precluded from having special permission where local conditions require it prior to installation and acceptance.
Code-Making Panel 4 should evaluate a change to 230.2(D) that would set forth management of special permission as an option to keep service connection facilities to a minimum on customer property and in the interest of safety in the event of fire or other problems on the customer's premises
PANEL ACTION: Reject.
PANEL STATEMENT: This comment does not have any relevance to Proposal 4-52. The aspect of special permission is already covered in Article 90.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #49)

10- 3 - (230-6): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 4-54
RECOMMENDATION: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 10 for consideration of Proposal 10-3a.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
The panel accepts the action of the Technical Correlating Committee. The panel has reviewed the action taken in Proposal 4-54 and has referenced Section 230-6 in total.
PANEL STATEMENT: See panel action and statement on Comment 10-8.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #49a)

4- 43 - (230-6): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 4-54
RECOMMENDATION: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 10 for consideration of Proposal 10-3a.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #50)

10- 4 - (230-6(3)): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 4-55
RECOMMENDATION: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 10 for consideration of Proposal 10-3a.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
The panel accepts the action of the Technical Correlating Committee. The panel has reviewed the action taken in Proposal 4-55 and has referenced Section 230-6 in total.
PANEL STATEMENT: See panel action and statement on Comment 10-8.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #50a)

4- 44 - (230-6(3)): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 4-55
RECOMMENDATION: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 10 for consideration of Proposal 10-3a.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #381)

4- 45 - (230-7): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
COMMENT ON PROPOSAL NO: 4-57
RECOMMENDATION: Accept in principle revised: OTHER CONDUCTORS in RACEWAY or CABLE. ~~Conductors other than service~~ Service conductors shall not be contained ~~installed~~ in ~~the same~~ a service raceway or service cable that contains other than service conductors or service conductors (with different characteristics) (of a different class) as covered in 230-2(a).
(phrases in parentheses are alternate choices)
SUBSTANTIATION: Code users (installers) may install conductors in a raceway but do not install them in a cable. That is done by the cable manufacturer who has no control over their use. Panel statement indicates intermixing of conductors is inevitable (?) in an auxiliary gutter supplementing wiring space at service equipment. Is this intended to suggest that different classes of service (e.g., 120/240 and 480 volts) can be contained in the same service raceway terminating at such auxiliary gutter?
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter has not provided any technical substantiation to prohibit the installation of different classes of service in the same raceway.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1568)

4- 46 - (230-7): Hold
SUBMITTER: Joseph McCann, City of Coral Springs
COMMENT ON PROPOSAL NO: 4-58
RECOMMENDATION: Add to 230-7:
Other conductors in raceway or cable conductors other than service conductors shall not be installed in the same service raceway or service cable or cable trays.
SUBSTANTIATION: Service conductors are being ran in cable trays with feeder conductors and Article 318 has no prohibition. Open conductors (TC) listed are being ran in the same cable trays, they are listed for the voltages applied.
PANEL ACTION: Hold.
PANEL STATEMENT: The panel agrees with the recommendation of the submitter to include cable trays. However, this constitutes new material that has not had public review and therefore must be held for further study in the next code cycle.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1722)

4- 47 - (230-9): Reject
SUBMITTER: Don Ganiere, Ottawa, IL
COMMENT ON PROPOSAL NO: 4-60
RECOMMENDATION: Accept this proposal.
SUBSTANTIATION: Panel members should ask their local firefighters if they ever have to access windows that are not designed to be opened.
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter provided no technical substantiation.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1700)

4- 48 - (230-21): Reject
SUBMITTER: Jason E. Dotson, Fenton, MI
COMMENT ON PROPOSAL NO: 4-63
RECOMMENDATION: Change Reject to Accept in Principle and add these additional words to the section: "... overhead service conductors, on the load side of the service point and not protected by overcurrent protection.
SUBSTANTIATION: This section is not clear as written. The section is addressing the conductors from a meter pole to buildings on the property that are installed by an electrician, not the utility. This additional phrase will help make that point clear.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Proposal 4-62a that has eliminated Section 230-21 and its Fine Print Note. The definition of "Service Drop" is covered in Article 100.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #2242)

4- 49 - (230-22): Reject
SUBMITTER: Tom Dunn, San Jose, CA
COMMENT ON PROPOSAL NO: 4-64
RECOMMENDATION: The proposed change should be accepted as stated by the submitter. The proposed wording does not change the code technically; and it certainly makes the code clearer and more "user friendly".
SUBSTANTIATION: 1) Intuitively, I interpret the terms, "covered" and "insulated" to be different. "Covered" does not imply any electrical insulating properties. "Insulated", of course, does imply electrical insulating properties.
2) As the submitter of the original proposal pointed out, the NEC's own definitions of "covered" and "insulated" (Article 100-A) makes this same distinction.
3) The panel's concern about services over 600 volts is covered by 230-202(b).
PANEL ACTION: Reject.
PANEL STATEMENT: The panel reaffims that it is acceptable to use insulated or covered conductors for overhead service conductors. See panel action and statement on Proposal 4-63a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #403)

4- 50 - (230-28): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
COMMENT ON PROPOSAL NO: 4-71
RECOMMENDATION: Accept proposal.
SUBSTANTIATION: The Panel Statement reinforces the need for this requirement. It mandates a coordination with the serving utility. Where service drops are exempt from the Code ,there is no required responsibility on the installers part to assure compliance with 230-24. One just has to travel the country to see many service drops to masts which do not conform to Code clearances.
PANEL ACTION: Reject.
PANEL STATEMENT: Compliance with Section 230-24 is already required for those service drops which are covered by the NEC. Refer to Section 90-2(b)(5).
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1143)

4- 51 - (230-28, Exception): Reject
SUBMITTER: James E. Brunssen, Telcordia Technologies, Inc.
COMMENT ON PROPOSAL NO: 4-73
RECOMMENDATION: Accept the proposal.
SUBSTANTIATION: This proposal was developed in an effort to find a reasonable and safe alternative to the main rule by permitting communications and CATV attachments to a service mast that is listed for the purpose of safely supporting multiple service drops. Listing of the service mast will address both the loading and personnel safety concerns expressed by Code-Making Panel 4. These are areas that will be well investigated by the listing agency prior to issuing the listing mark. In the panel statement, Code-Making Panel 4 stated that "the panel does not believe that the listing of the product will adequately address the personnel safety issues...". This statement by Code-Making Panel 4 is contrary to both the industry and NEC accepted method to ensure the safety of wiring, cable, and equipment when used for its intended

application, that of listing by a Nationally Recognized Testing Laboratory (NRTL). The NEC, in many articles and sections, not only accepts, but relies upon listing as a means to ensure that the product is safe when used for its intended application. Further, with respect to the personnel safety issue, I would reiterate my substantiation for my original Proposal 4-73 that personnel are presently trained to work in proximity to power service, communications, and CATV conductors. Section 800-10(a)(4) permits a minimum separation of 12 inches between power service drops and communications drops at their point of attachment to the building, Section 820-10(f)(1) permits separations of as little as 4 inches where cables of two systems are attached to buildings. In response to concerns that this is solely an economic issue for the communications providers, let me point out that the provision of an additional mast for the attachment of communications service drops is the responsibility of the homeowner, not the communications utility. Code-Making Panel 4 should accept Proposal 4-73 based on the merits of the submitter's original substantiation.

Note that companion comments for Proposals 16-202, 16-281 and 16-344 have been submitted.

PANEL ACTION: Reject.

PANEL STATEMENT: The panel has discussed over the past several code cycles the various issues regarding safety related to personnel and installation and continues to find the potential for multiple attachments by communications and other systems to be unacceptable. Therefore it is recommended the submitter undertake the development of a fact finding report or other documentation to provide the technical support and direction needed for the panel to address these safety concerns.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 10

NEGATIVE: 1

EXPLANATION OF NEGATIVE:

YOUNG: Personnel safety is important but the Code does not impose any limitations or restrictions on the installations of different systems today. A listed mast could well be safer by identifying where and how the systems are attached.

(Log #1929)

4- 52 - (230-28, Exception): Accept

SUBMITTER: James T. Dollard, Jr., Philadelphia, PA

COMMENT ON PROPOSAL NO: 4-73

RECOMMENDATION: Continue to reject this proposal.

SUBSTANTIATION: I agree with the Panel,s statement and the Affirmative comments of Mr. Hughes and Mr. Sumrall. Safety of persons must be the primary concern. As written in the Panel statement, the co-mingling of different systems on a common mast would present a serious safety hazard to all persons who will maintain or service the installation.

PANEL ACTION: Accept.

PANEL STATEMENT: See panel action and statement on Comment 4-51.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 10

NEGATIVE: 1

EXPLANATION OF NEGATIVE:

YOUNG: See my Explanation of Negative on Comment 4-51.

(Log #2250)

4- 53 - (230-28, Exception (New)): Reject

SUBMITTER: Guy R. Franks, SBC

COMMENT ON PROPOSAL NO: 4-73

RECOMMENDATION: Accept the proposal.

SUBSTANTIATION: This proposal represents a reasonable approach to having a single service mast accommodate multiple drop wires. Through listing, products are evaluated to determine if they are suitable for their intended purpose. Throughout the NEC, requiring the listing of products is one of the fundamental methods used to establish the adequacy of a product for the application and provide a suitable level of safety. Through listing, installation by qualified personnel and inspection by the authority having jurisdiction, service mast installations intended to accommodate multiple drop wires can be safely installed and maintained.

PANEL ACTION: Reject.

PANEL STATEMENT: See panel action and statement on Comment 4-51.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 10

NEGATIVE: 1

EXPLANATION OF NEGATIVE:

YOUNG: See my Explanation of Negative on Comment 4-51.

(Log #1174)

4- 54 - (230-30): Reject

SUBMITTER: Duane E. Craig, Power System Engineering, Inc.

COMMENT ON PROPOSAL NO: 4-74

RECOMMENDATION: Revise original submitter's wording to be as follows:

In cases where an outdoor structure (such as a pole on which a meter is installed) or an outdoor transfer switch (not attached to a building) is supplied by a service drop or service lateral, buried conductors from either of these points to a building or buildings having service entrance disconnects and overcurrent protection shall be sized and installed as service laterals.

An alternate location for this paragraph might more suitably be elsewhere such as in the definition section under "Service Laterals". Also some rewording may be in order.

SUBSTANTIATION: While the original submitter did not provide any technical substantiation for why the conductors should be treated as service laterals, the reason for the converse is not obvious to me either. If outdoor underground conductors from a utility transformer to a building can be sized according to 230-31(a), it seems that outdoor conductors from a meter pole or transfer switch to a building(s) should not be held to a higher standard. I can understand why more stringent ampacity requirements would apply to service-entrance conductors, feeders within buildings, or where outbuildings are fed through another building. This is because conductors attached to or within buildings pose a much greater fire risk than do those that are buried outdoors. Our concern is that many commercial and industrial installations are adding generators in the line between the utility transformer and their building service entrance. As the code now stands, it usually requires complete replacement of the conductors between the transfer switch and the building service and often major changes to the service-entrance panel. It seems that this equipment is being changed only because of a technicality and not for a practical reason.

PANEL ACTION: Reject.

PANEL STATEMENT: The requirements are different because those conductors are under the purvue of the NEC. The panel reaffirms its position that the requirements of Part IV of the draft of the 2002 NEC apply to the conductors on the load side of a terminal box, meter, or other enclosure. There is no method within the NEC to size service laterals any differently than service entrance conductors. Refer to Section 90-2(B)(5) for application of requirements of the NEC.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #589)

4- 55 - (230-40 Exception No. 1): Reject

SUBMITTER: William Barnett, City of Gresham, OR

COMMENT ON PROPOSAL NO: 4-79

RECOMMENDATION: Delete Exception No. 1.

SUBSTANTIATION: Code Making Panel No. 4's statement on Proposal 4-79 states "it is not permitted to run conductors without overcurrent protection through the interior of the building." I have provided part of an article from the September/October IAEI NEWS showing a six-plex with six meters, without mains, and six sets of service-entrance conductors connected to service panels in each dwelling unit. The 1999 NEC Handbook by NFPA shows similar installations. If Exception No. 1 is not deleted, a statement should be added indicating that persons using this exception shall install the service-entrance conductors outside the building if they do not comply with Section 230-70(a).

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

PANEL ACTION: Reject.

PANEL STATEMENT: The panel reaffirms its statement to Proposal 4-79 and the submitter has not provided any new or additional information which would change its position. Exception No. 1 permits multiple sets of service entrance

conductors to be supplied by a single service and Section 230-71(a) specifically addresses the location of the disconnecting means. The multiple sets of service entrance conductors are required to comply with the requirements of Section 230-70(a) and it is not permitted to run conductors without overcurrent protection through the interior of the building. The use of this exception has practical application for buildings with
more than one occupancy and the submitter has not provided documentation to indicate that this language has resulted in decreased safety of the installation.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #2106)

4- 56 - (230-42(a)): Reject
SUBMITTER: Truman C. Surbrook, Michigan State University
COMMENT ON PROPOSAL NO: 4-85
RECOMMENDATION: Change Reject to Accept.
SUBSTANTIATION: The adjustment and correction factors are applied to the allowable ampacity of the conductor not to the calculated load. The Panel's Statement, "the ampacity of the conductors is determined by calculating the continuous and noncontinuous loads before the application of any adjustment or correction factors." makes no sense. There does not need to be a reference to adjustment or correction factors in this section. Hundreds of electrical contractors and inspectors are confused by the phrase "before the application of any adjustment or correction factors." See the example I worked out in my Comment to Proposal 2-243 to illustrate a point of confusion created by this statement. "PLEASE" rework this section so the meaning is clear. The meaning may be clear to the members of the Panel, but they are not clear to electricians, inspectors, and engineers in the field.
PANEL ACTION: Reject.
PANEL STATEMENT: See statement on Proposal 4-85. The text recommended for deletion is necessary for the proper and consistent application of the code.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1674)

4- 57 - (230-42(a)(2)): Reject
SUBMITTER: Jason Williams, Homer, MI
COMMENT ON PROPOSAL NO: 4-88
RECOMMENDATION: Change reject to accept.
SUBSTANTIATION: Paragraph (2) is inconsistent with the rule in paragraph (1). Two different wire sizes can be used for the same rating on over current protection.

Example: Assume the load for a service is 90 amp continuous and 37 amps non-continuous. According to paragraph (1) the calculated load is 150 amps. The service is permitted to be rated at 150 amps and copper conductor 75 ft. C insulation and termination. The wire size is 1/0 AWG. If overcurrent is rated for continuous and paragraph (2) is used, then the calculated load is 127 amps and 150 amp overcurrent device is required. But in this case with 75 ft. C termination, the wire is permitted to be #1 AWG.
PANEL ACTION: Reject.
PANEL STATEMENT: The reason that rule 1 is different from rule 2 is because the overcurrent device and its assembly are listed for operation at 100% of their rating and may result in different wire sizes.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #51)

4- 58 - (230-44): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 4-93a
RECOMMENDATION: The Technical Correlating Committee understands that the last paragraph of the present Section 230-43 is deleted. The panel should also consider correcting the last phrase, "in accordance with Article 318", to comply with the NEC Style Manual. This action will be considered by the Panel as a Public Comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
Delete the phase "in accordance with Article 318". Section 230-44 should read as follows: "Cable Trays. Cable tray systems shall be permitted to support cable used as service-entrance conductors."
PANEL STATEMENT: The panel takes this action to conform with the NEC Style Manual.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #2245)

4- 59 - (230-46): Reject
SUBMITTER: Gary Di Troia, FGI USA Inc
COMMENT ON PROPOSAL NO: 4-94
RECOMMENDATION: Revise text as follows:

Spliced Conductors. Service-entrance conductors shall be permitted to be spliced or tapped by crimped, clamped, or bolted connections listed for the purpose. Splices shall be made in enclosures or, if directly buried, with a listed underground splice kit. Splices or conductors shall be made in accordance with Sections 110-14, 300-5(e), 300-13 and 300-15.
SUBSTANTIATION: Proposal 4-94 (Log #405) incorrectly includes the use of the exothermic process for power applications on indoor connections. The exothermic process is uncontrolled and does not have listing for the service entrance application. Exothermic connections are most appropriate for grounding applications in outdoor environments. Due to the nature of extreme heat and toxic gases produced, the exothermic process can lead to worker safety and equipment liability issues. It would not be recommended to bring an inherently unsafe methodology into the closed confinement of service entrance applications.

Proposal 14-82, submitted by Larry Smith, can be agreed upon in principle. However, in practice, the recommendation will not solve the problems of service entrance connections nor eliminate the need for proper installation techniques to be used, and will disallow mechanical connectors of all types that are used for the service entrance. The one advantage mechanical connectors have for the installer is that they are more range taking than compression connectors. Service entrance conductor requirements are not always the same for NEC and the Utility requirements, i.e. the conductors on each side are not matched. Mechanical connectors, when installed correctly, provide a greater flexibility in this situation, which is a common occurrence. The triplex conductor is very often different form the conductor being used to connect to the distribution system.

As a company, FCI has much experience in many types of the service entrance connectors, being a designer and manufacturer of both split-bolt/clamped connectors and compression connectors for use in service entrance applied by both the contractor and utility. Split-bolt connectors are subject to installation abuse, including incorrect torque applied, non-recommended conductor combinations, or even multiple conductors in excess of two. However, testing to industry standards including UL486 has shown the split-bolt connector to be relatively forgiving of installation errors. For example, we have performed testing on our split-bolt product that shows under-torque by 25% to over-torque of 50% will still yield an acceptable connection.

Similar installation abuses can and do occur on compression connectors, from incorrect tools and dies, insufficient tool output pressure, insufficient number of crimps, lack of conductor preparation, non-recommended conductor combinations, and overstuffing the connector. Our history of compression connections used for service entrance applications (which is very common on the utility service side) shows many more failures attributed to abuses of proper installation methods than split-bolts. Again, the proposed change will not solve these issues with service entrance connection failures.

Some of the issues with installation error can be solved through proper inspection. For split-bolt connectors, FCI is one manufacturer that supplies molded covers that allow for much easier inspection of installed connections. Unfortunately, the usage of these covers is substantially lower than the connectors

themselves, suggesting that tapping is preferred, which can lead to the hiding of installation problems.

Our testing has also shown that the quality and critical design features of split-bolt type connectors vary widely, especially on dual rated (AL9CU) connectors. In some instances, UL has been notified of discrepancies between stated performance to standards and their actual performance. We encourage the Panel to follow-up with UL as to their action on sub-perfoming items as we, being a manufacturer, are not privileged to their responses in such cases. Other mechanical design and irreversible compression should be subject to the same discussion. There are more split-bolt connectors imported with various levels of quality today than irreversible connectors. This may well be one of the the root causes of the apparent high level of call back service needs.

If the problem is perceived to be critical and requiring some Code change to improve safety at the point of service entrance, a reminder of the need for listed connectors for the conductor size and type is most beneficial. Copper-to-copper, use a copper listed connector. For any combination of aluminum an AL9CU listed product must be used. The increase to 90° rated connectors for service entrance would eliminate a small amount of unstable connectors still rated to lower 75° operation from the service entrance application.

The panel should also consider another simple fact - there have been more split-bolt connectors used in the US than any other single connector for service entrance taps and splices. FCI has been supplying split-bolt connectors since the 1920's and doing so in volumes well into the millions per year. There is no other service entrance connector that comes close in quantity sold. By pure statistics, if all connectors were installed with equal level of integrity, split-bolts will have more failures, but not necessarily a higher failure rate!

If the same group of electricians were asked a more open question, "Have you ever been called to address a service entrance connection issue?," you get the same or more number of hands. Then following up with the age of the connectors found a more complete picture of the problem would emerge. Then further breakdown on wire size, evidence of over-stuffing, more than two conductors, and the nature of the application (commercial, industrial, heavy industrial, etc.) the nature of this problem would become clearer, and the need for the removal of split-bolts from the Code will not be so evident.

PANEL ACTION: Reject.

PANEL STATEMENT: This is addressed by Proposal 4-96. The panel does not specify the type of device to make a splice or tap, only the rules that apply to how the splice or tap is to be made.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #405)

4- 60 - (230-56): Reject

SUBMITTER: Dan Leaf, Palmdale, CA

COMMENT ON PROPOSAL NO: 4-102

RECOMMENDATION: Accept proposal revised:

SERVICE CONDUCTOR with the HIGHER VOLTAGE TO GROUND. On a 4-wire delta-connected service where the midpoint of one phase winding is grounded, the service conductor having the higher phase voltage to ground shall be distinguished from the other phase conductors by a continuous outer finish that is orange in color along its entire length ~~durably and permanently marked by an outer finish that is orange in color or by other effective means, at each termination or junction point~~ except that a conductor that is larger than 6 AWG shall be permitted to be identified at the time of installation by a durable and permanent marking that is orange in color encircling the conductor at each termination and junction point except a conduit body that does not contain splices or unused hubs.

FPN: Junction point includes auxiliary gutters that supplement wiring spaces at service equipment.

SUBSTANTIATION: Present text permits service conductors smaller than No. 4 to be field-marked at terminations. This is not consistent with a continuous insulation color. Are safety considerations less for hi-leg conductors?

The Code does not limit the use of orange to hi-leg conductors as it does for white and green identification. The literal wording does not specify that orange is to be a distinguishing color, although that seems to be the intent. Intent is hard to enforce. If all the conductors were orange what section would be in violation? Field markings of grounded conductors are required to encircle the insulation per 200-6(b) and will be required for grounding conductors per Proposal 5-256.

Present text requires marking at junction points such as a conduit body; proposal would exempt them where there is no likelihood of any connection.

PANEL ACTION: Reject.

PANEL STATEMENT: This wording does not provide additional safety. It does not recognize current industry requirements, practices, or material availability. The existing wording provides the necessary requirements.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #1669)

4- 61 - (230-62(c)): Reject

SUBMITTER: John M. O'Connor, North American Technologies, Inc.

COMMENT ON PROPOSAL NO: 4-104

RECOMMENDATION: Add the following new text:

(c) Meter Sockets. Meter sockets shall be effectively closed by a closure which is integral to the meter socket enclosure when a meter is not installed in the socket.

SUBSTANTIATION: The enclosure of a meter socket is UL listed only when a meter is installed in a socket. The service which is energized without a meter being installed does not meet Section 111-27 Guarding of Live Parts. In many instances meters are bypassed, often by non-code approved means, in order to provide temporary power on construction jobsites. The protection of these live parts may or may not exist, depending on the installer and when or if a meter is installed.

These hazardous situations are occurring at new homes, offices, construction sites and at temporary classrooms (which are usually located on school playgrounds) while they are waiting to have meters installed. Utility deregulation may also cause increased incidence of these situations.

The addition of an integral closure to a meter socket would protect workers, children and others from a potentially dangerous situation, one that is preventable. Listed metering assemblies with integral socket closures are already commercially available.

NOTE: This is a companion proposal to my proposal on Section 373-4(b).

PANEL ACTION: Reject.

PANEL STATEMENT: The submitter has provided no new information from Proposal 4-104. The panel reaffirms the requirements of Sections 110-27 and 230-62. The panel also disagrees that the meter socket is only listed when the meter is in place. The meter socket is listed when it leaves the factory and it is intended for installation in accordance with the NEC.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #906)

4- 62 - (230-64 (New)): Reject

SUBMITTER: David A. Kerr, Jr., Friendsville, PA

COMMENT ON PROPOSAL NO: 4-106

RECOMMENDATION: This proposal should be accepted. If Article 230 is not the right place, it should be located somewhere else in the NEC. This proposal should be forwarded to the technical committees for NFPA 54 and 58 to get their opinions.

SUBSTANTIATION: There is an absolute requirement to keep gas and electric meters three feet apart. It doesn't matter who got there first, or if the weather is calm or windy. The NEC and the gas codes need to work together.

PANEL ACTION: Reject.

PANEL STATEMENT: The submitter has not provided any additional technical substantiation. The panel reaffirms its panel statement to Proposal 4-106. The scope of this issue is under the purvue of CMP-14.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #2172)

4- 63 - (230-64 (New)): Accept
SUBMITTER: Donald R. Cook, Shelby County Building Inspections
COMMENT ON PROPOSAL NO: 4-106
RECOMMENDATION: Code-Making Panel 14 supports the Code-Making Panel 4 action to reject Proposal 4-106.
SUBSTANTIATION: Code-Making Panel 14 agrees with the Code-Making Panel 4 statement that the determination of whether and to what extent a location is classified is outside the scope of CMP 4. Numerous factors must be considered and applied when classifying a location and these should be done on a case by case basis. This comment was developed from input provided by several members of Code-Making Panel 14. The panel was not balloted.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #764)

4- 64 - (230-70): Accept in Principle
Note: See Technical Correlating Committee action on Comment 4-66.
SUBMITTER: Richard E. Loyd, Perryville, AR
COMMENT ON PROPOSAL NO: 4-107a
RECOMMENDATION: Reconsider 4-107 and accept as revised.
F. Service Equipment - Disconnecting Means.
230-70. General. A means shall be provided to disconnect all conductors in a building or other structure from the service-entrance conductors. The service overcurrent device and ground fault protection where required shall be an integral part of the service disconnecting means or shall be located immediately adjacent thereto.
(A) Location. The service disconnect(s)ing means. Overcurrent device, and ground-fault protection where required shall be installed at a readily accessible location either in sight and within 50 feet outside of a building or structure, or inside nearest the point of entrance of the service conductors.
(1) Service disconnecting means shall not be installed in bathrooms.
(B) Disconnecting Device(s). The disconnecting device(s) shall simultaneously disconnect all ungrounded service conductors that it controls from the premises wiring system.
(1) Indicating. The service disconnecting means shall plainly indicate whether it is in the open or closed position.
(2) Marking. Each service disconnect shall be permanently marked to identify it as a service disconnect.
(3) Manually or Power Operable. The service disconnecting means for ungrounded service conductors shall consist of either:
(a) a manually operable switch or circuit breaker equipped with a handle or other suitable operating means or
(b) a power-operated switch or circuit breaker provided the switch or circuit breaker can be opened by hand in the event of a power supply failure.
(C) Suitable for Use. Each service disconnecting means shall be suitable for the prevailing conditions. Service equipment installed in hazardous (classified) locations shall comply with the requirements of Articles 500 through 517.
(D) Remote Control Device. A remote control device used to actuate the main disconnecting means shall be permitted as a optional control device and shall not be permitted as the disconnecting means required by 230-70 A through C.
SUBSTANTIATION: Although you accepted this proposal in principle, I don't believe Proposal 4-107a accomplished the intent of this proposal. I recommend that you reconsider 4-107 as revised. By revising 230-70 and incorporating existing 230-74, 230-76 and 230-77 into 230-70. It clarifies the existing intent, that although a shunt trip is permitted in addition to the required main that is optional and all of the requirements in 230-70 apply to the service disconnecting switch and not the remote device. I also considered Mr. Carrick's negative vote and added "within 50 feet" rather than "in sight of."
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: The submitter's concern with requiring the disconnecting means to be located in accordance with Section 230-70(A) when a remote control device is used as the actuator is addressed by the panel's action on Comment 4-66 (230-70(A)(3)).
This change clarifies the requirements for the location of a building or structure service disconnect.
The panel utilized the term "within sight of" to stipulate a distance of 15m (50 ft). As the distance is now specified in the code, the terms "within sight of" or "visible" are not necessary.
See panel action and statement on Comment 4-66.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #404)

4- 65 - (230-70(a)): Accept in Principle
Note: See Technical Correlating Committee action on Comment 4-66.
SUBMITTER: Dan Leaf, Palmdale, CA
COMMENT ON PROPOSAL NO: 4-107
RECOMMENDATION: Accept in Principle revised:
(A) (1)(a)(1) Outside. The service disconnecting means shall be ~~permitted~~ on or within sight of the building or structure served.
SUBSTANTIATION: The phrase "shall comply" in (a)(1)(a) does not correlate with "permitted" which is not used in the following (2).
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Comment 4-66. The panel agrees the term "permitted" should be deleted.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1062)

4- 66 - (230-70(a)): Accept in Principle
Note: The Technical Correlating Committee directs that 230-70(A)(1)(a)(1)be revised to read as follows: "(1) The service disconnecting means shall be on the building or structure served or shall be located within sight from the building or structure served". The Technical Correlating Committee directs that the issue involves safety and correlation concerns which warrant this change. The remainder of 230-70 remains as it appears in Comment 4-66.
SUBMITTER: Lanny McMahill, Rep. IAEI SW Section
COMMENT ON PROPOSAL NO: 4-107a
RECOMMENDATION: Accept this proposal, however, add "visible and not more than 50 ft away from" after "within sight."
SUBSTANTIATION: This change will clarify the intent of the revised text and provide for a maximum distance that the disconnecting means can be located away from the building or structure.
PANEL ACTION: Accept in Principle.
The following action is the panel's final action on Section 230-70 and incorporates all changes made during the proposal and comment periods.
Revise Section 230.70 to read as follows: 230.70 General. Means shall be provided to disconnect all conductors in a building or other structure from the service-entrance conductors.
(A) Location. The service disconnecting means shall be installed in accordance with (1), (2), and (3).
(1) Readily Accessible Location. The service disconnecting means shall be installed at a readily accessible location in accordance with (a) or (b).
(a) Outside. Service disconnecting means installed outside a building or structure shall comply with (1) or (2):
(1) The service disconnecting means shall be on the building or structure served or shall be located within 15m (50 ft) from the building or structure served.
(2) Where the service disconnecting means is located more than 15m (50 ft) from the building or structure served, a feeder disconnecting means for the building or structure supplied shall be installed in accordance with Part II of Article 225.
(b) Inside. Where the service disconnecting means is installed inside, it shall be nearest the point of entrance of the service conductors.
(2) Bathrooms. Service disconnecting means shall not be installed in bathrooms.
(3) Remote Control. Where a remote control device(s) is used to actuate the service disconnecting means, the service disconnecting means shall be located in accordance with 230.70(A)(1).
(B) Marking. Each service disconnect shall be permanently marked to identify it as a service disconnect.

(C) Suitable for Use. Each service disconnecting means shall be suitable for the prevailing conditions. Service equipment installed in hazardous (classified) locations shall comply with the requirements of Articles 500 through 517.

PANEL STATEMENT: This change will clarify the requirements for the location of a building or structure service disconnect. The panel previously utilized the term "within sight of" to stipulate a distance of 15m (50 ft). As the distance is now specified in the code, the terms "within sight of" or "visible" are not necessary.

The panel action on Comment 4-66 constitutes the panels final action on section 230-70 and includes all of the changes incorporated through the proposal and comment periods.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #1771)

4- 67 - (230-70(a)(1)): Accept in Principle in Part

Note: See Technical Correlating Committee action on Comment 4-66.

SUBMITTER: Jim Pauley, Square D Company

COMMENT ON PROPOSAL NO: 4-107a

RECOMMENDATION: Revise 230.70(A)(1) of the ROP to read as follows:

(1) Readily Accessible Location. The service disconnecting means shall be installed ~~at a readily accessible location~~ in accordance with (a) or (b).

(a) Outside. Where a service disconnecting means is installed outside a building or structure, ~~shall comply with (1) or (2):~~ ~~(1) The service disconnecting means~~ it shall be ~~permitted~~ installed at a readily accessible location on, or within sight of and not more than 3 m (10 ft) from, ~~of~~ the building or structure served.

~~(2) Where the service disconnecting means is not within sight of the building or structure served, a feeder disconnecting means for the building or structure supplied shall be installed in accordance with Part II of Article 225.~~

(b) Inside. Where the service disconnecting means is installed inside a building or structure, it shall be installed at a readily accessible location nearest the point of entrance of the service conductors.

SUBSTANTIATION: The revised wording suggested by this comment is to address the following:

1) The requirement that a disconnect be "within sight" (allowing it up to 50' away) is not acceptable for the building disconnecting means. 50' is too far and can introduce obstacles to effective disconnecting of power by someone at the building. This comment proposes that the disconnect be within 10' of the building or structure which would allow the disconnect to be located on posts/racks, etc. and still be easily accessed by the occupants of the building. Allowing a 50' distance in a rule that previously required it to be AT the building severely reduces the safety that was inherent in the rule.

2) This comment also removes the (2) of the section. This section is not necessary. If the service disconnecting means is not "within sight" (as defined item 1) then this would imply that the disconnect is located at another building or structure. The conductors are no longer service conductors, but they are a feeder and Article 225 applies. Keeping (2) in the Code seems to imply that there is some instance where Article 225 would not apply to a feeder that comes from a disconnect mounted remotely.

3) The readily accessible terminology has been moved from the introductory paragraph into the actual language of the rules. This is done to make sure that the rule is read completely. The wording of the proposal more directly implied that an inside disconnect MUST be "nearest" the point of entrance of the conductors. However, the readily accessible term was critical to application of the rule. Take a service busway that enters a building at a height of 10', turns down and enters a service switchboard. The disconnect is located at a readily accessible location nearest the point of entrance. Although one can attempt to get to the same point with the proposal wording, it can be more easily misinterpreted.

PANEL ACTION: Accept in Principle in Part.

The panel does not agree with the submitters requirement for 3m (10 ft) from the building or structure served.

The panel accepts in principle the remainder of the comment and refers the submitter to the panel action and statement on Comment 4-66.

PANEL STATEMENT: The submitter has provided no technical substantiation for that specific distance. See also, the panel action and statement on Comment 4-66.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #2026)

4- 68 - (230-70(d), 230.91 Exception (new), 250.24 (A) Exception (new), 250.28 Exception No. 3 (new (New)): Reject

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

COMMENT ON PROPOSAL NO: 4-129

RECOMMENDATION: Place the proposal on hold for this cycle by attaching it to this comment, which must be held because it unavoidably introduces extensive new material without public review. For the next cycle, (or for a sequence of TIAs) convert this into two Code-Making Panel 4 proposals, and two for Code-Making Panel 5, as follows:

I. Add a new 230.70(D) as follows:

(D) Meter Disconnect Switches. A meter disconnect switch located on the load side of the service point shall be readily accessible. It shall be classified as a service disconnect for the premises wiring system.

(1) Overcurrent Protection Incorporated. Where a meter disconnect switch incorporates overcurrent protection it shall be listed as suitable for use as service equipment.

(2) No Overcurrent Protection. A meter disconnect switch shall be permitted to omit overcurrent protection. The feeder to the building or structure served shall be wired in accordance with Parts I through IV of Article 230. The building or structure disconnecting means shall comply with 230.91 and shall be listed as suitable for use as service equipment.

(3) Building or Structure Disconnecting Means. A feeder disconnecting means for the building or structure served shall be installed in accordance with Part II of Article 225 if the meter disconnect switch (1) omits the grounding connections required by 250.24, or (2) is not in sight of the building or structure served.

(4) Grounding. Where any meter disconnect switch omits the grounding connections required by 250.24, (1) no utilization equipment shall be supplied at the meter location, (2) the feeder supplied shall comply with 250.32, and (3) any bonding jumper required by 250.28 shall be installed at the building or structure disconnecting means. The meter disconnect switch shall be bonded in accordance with 250.92.

II. Add an Exception to 250.24(A) as follows:

Exception: The grounding electrode conductor shall be permitted to be omitted at a meter disconnect switch classified as a service disconnect in accordance with 230.70(D) provided (1) no utilization equipment is supplied at the meter location, (2) the feeder supplied complies with 250.32, and (3) any bonding jumper required by 250.28 is installed.

III. Add a third exception to 250.28 as follows:

Exception No. 3: Where the service disconnect is a meter disconnect switch as covered in 250.70(C), the main bonding jumper shall be located in the feeder disconnecting means for the building or structure served.

IV. Add an exception to 230-91 as follows:

Exception: A meter disconnect switch as covered in 230.70(D)(2) shall be permitted to have overcurrent protection located as part of the feeder disconnecting means for the building or structure served.

SUBSTANTIATION: The submitter is well aware of the rules regarding public review, but offers this comment in an attempt to allow Code-Making Panel 4 to see a larger picture. This comment is intended to be read as fully supportive of the technical objectives of the the proposal submitter. The problem is to achieve those objectives in a way that does not create confusion and controversy around a fundamental principle of code application, namely, the determination of exactly which device located where constitutes the service disconnect. As submitted the original proposal clouds that issue irretrievably.

Meter disconnects have been around for a very long time, normally consisting of a multipole circuit breaker mounted within a multifunction meter enclosure or in a self-contained metering pedestal. Theoretically a manufacturer could make any of them as convertible to either "hot sequence" (meter ahead of switch) or "cold sequence" (switch ahead of meter) in the field, to suit local utility requirements. At present, most of this market consists of hot sequence units that aren't field-convertible. If these breakers are on

the load side of the service point (the usual case), and if they provide overcurrent protection for the conductors they supply (also the usual case), then what they supply is a conventional feeder, and not a continuation of service conductors.

Although these switches can always be installed as service disconnects, this submitter understands the practical reluctance to do so in many cases. One major reason is that if they are so classified a grounding electrode would have to be provided at the metering point. If the meter is on the outside of the building that isn't a big problem, but if the meter is hundreds of feet away, it would involve an additional electrode that would meet code but accomplish very little in terms of safety, since there would be no electrical loads at the remote metering point. It would be like requiring a grounding electrode conductor to be brought to every conventional meter socket.

We also have to recognize increased, and justified, utility interest in cold sequence metering, especially on self-contained 480Y/277 volt metering systems, because of the greater safety it affords their service personnel. Pulling a meter under load at 277 volts to ground can result in a severe arc, which is why the NEC has required GFPE on 480y/277 volt services for the last thirty years. The remote switch makes sense, and clearly increases safety. Considering that the conductors run from the meter to the "service" disconnect are usually run as unprotected service conductors, requiring overload protection for these conductors has no observable safety justification. Remember also that bypass switches in meter sockets are to maintain load continuity, not load interruption, and opening a meter bypass switch under load may destroy the meter socket.

Some other utilities have expressed interest in this concept where the metering is to be at a roadside, with the service running to the building served typically using an underground wiring method. This is true even on ordinary 120/240 Volt single phase services to single family dwellings. Utility representatives point out, correctly, that here as well a remote disconnect adds an additional level of safety. Often electricians have been in the position of needing to pull a meter in order to deenergize service equipment in a flooded basement; a remote disconnect is much safer.

The problem deserves to be fixed, and soon. Unfortunately, countless NEC rules depend on a common understanding of exactly where the service is. Allowing two devices, often widely separated on the same property that each potentially qualify as service disconnecting means will be extremely troublesome. In addition the switch without overcurrent protection effectively creates per long established code definitions, a feeder without overcurrent protection, which requires correlation with Section 230-91. This section requires service overcurrent protection to be located as an integral part of the service disconnecting means, or immediately adjacent thereto. This doesn't invalidate the utility safety argument, but it does mean that the utility proposal as presented will not accommodate these issues.

It was only in the last cycle that the following similar allowance was deleted from Section 230-82: "Fuses and disconnecting means or circuit breakers suitable for use as service equipment, in meter pedestals or otherwise provided and connected in series with the ungrounded service conductors and located away form the building supplied." The reason this provision was deleted (Proposal 4-159 in the 1999 NEC cycle) was that such disconnecting means are in fact service disconnects and the normal requirements in Part B of Article 225 should generally apply because the conductors they supply are feeders. Further, the existence of this provision (which originated in the 1971 NEC, long before building disconnects moved from old Section 230-84 to Article 225) was leading to confusion and inconsistent application of the rules because of conflicts with Article 225. That action was essentially correct.

Furthermore, in this cycle, Code-Making Panel 4 is about to finally impose a long-overdue proximity rule on outdoor service disconnects. If the remote service disconnect is within a building it doesn't matter because 225.32 imposes the same requirements for a building fed from another building or structure. A self contained metering pedestal, however, is not a building or structure under the provisions of most model building codes. It is these very metering pedestals that many utilities are now requiring to contain disconnecting means. Assuming the panel action stands, if one is located within 50 ft of and on a line of sight to the building served, then its disconnect could be viewed as the service disconnect. If not, then we would have a switch in the service conductors of the premises wiring system that (1) would be a service disconnect, but (2) could not be, in and of itself, the disconnecting means for the building or structure served.

Even if located in sight, frequently the designer would prefer a local building disconnect in addition to the one at the meter, and often the electrician prefers to wire the building disconnect as if it were a service. The meter disconnect supplies no electric equipment in its vicinity, and therefore requiring all the usual grounding provisions at a service disconnect appears to add little to safety, and discouraging its placement means reducing safety for the sake of editorial purity.

On the other hand, a remote disconnect that waddles and quacks like a service disconnect will be treated accordingly by many inspectors, resulting in substantial argument and inconsistency in the application of a fundamental concept, the location of the service disconnect. This comment intends to provide the framework for an eventual resolution of the following issues:

First, the potentially incidental nature of a meter disconnect needs to be clarified in a way that acknowledges that such a disconnect might be the actual service disconnect and wired accordingly. Many high-current applications today involve a main circuit breaker located (per local utility policy) either ahead of (cold sequence) or after (hot sequence) the instrument transformer connections for metering. This equipment is usually in or on the building served, and the circuit breaker is then wired without controversy as the service disconnect. Second, when the meter disconnect is remotely located, the installer needs a mechanism to make that disconnect effectively redundant to one located on or in the building served, but in a way that accommodates existing terminology.

Any such remote service switch potentially qualifies as a service disconnect, however no safety hazard (assuming no local utilization equipment) results if there is no grounding electrode at its location, as long as there is a building disconnect grounded in accordance with 250-32. This requires a far more fundamental approach than simply adding meter disconnect switches to Section 230-82(2), which is why that wording should not go forward at this time. This comment provides a new subsection 230.70, to address the subject. It provides a correlating exception in 230.91, which allows for the omission of overload protection at the switch. It also provides correlating language in Article 250 that will be required to arrange for appropriate grounding connections in instances where an electrode is to be omitted at the remote metering location.

PANEL ACTION: Reject.

PANEL STATEMENT: The material raised by the commenter is not relevant to Proposal 4-129 or to Section 230-82 nor would any of the changes submitted by the commenter affect the text of Section 230-82.

The material is not appropriate for Section 230-70 as it does not relate to service disconnects.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #52)

4- 69 - (230-71(a)): Accept

SUBMITTER: Technical Correlating Committee National Electrical Code

COMMENT ON PROPOSAL NO: 4-117

RECOMMENDATION: It was the action of the Technical Correlating Committee that this Proposal be reconsidered and correlated with the action on Proposal 4-118. This action will be considered by the Panel as a Public Comment.

SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.

PANEL ACTION: Accept.

Section 230-71 shall read as follows:

230.71 Maximum Number of Disconnects.

(A) General. The service disconnecting means for each service permitted by 230.2, or for each set of service-entrance conductors permitted by 230.40, Exception Nos. 1, 3, 4, or 5 shall consist of not more than six switches or sets of circuit breakers, or a combination of not more than six switches and sets of circuit breakers, mounted in a single enclosure, in a group of separate enclosures, or in or on a switchboard. There shall be no more than six sets of disconnects per service grouped in any one location. For the purpose of this section, disconnecting means used solely for power monitoring equipment, transient voltage surge suppression, or the control circuit of the ground-fault protection system or power-operable service disconnecting means, installed as part of the listed equipment, shall not be considered a service disconnecting means.

(B) Single-Pole Units. Two or three single-pole switches or breakers, capable of individual operation, shall be permitted on

multiwire circuits, one pole for each ungrounded conductor, as one multipole disconnect, provided they are equipped with handle ties or a master handle to disconnect all conductors of the service with no more than six operations of the hand.

FPN: See 384.16(A) for service equipment in panelboards, and see 430.95 for service equipment in motor control centers.

PANEL STATEMENT: This panel action correlates prior panel actions on Proposal 4-117 and 4-118. This action constitutes the final panel action on Section 230-71.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #53)

4- 70 - (230-71(a)): Accept

SUBMITTER: Technical Correlating Committee National Electrical Code

COMMENT ON PROPOSAL NO: 4-118

RECOMMENDATION: It was the action of the Technical Correlating Committee that this Proposal be reconsidered and correlated with the action on Proposal 4-117. This action will be considered by the Panel as a Public Comment.

SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.

PANEL ACTION: Accept.

PANEL STATEMENT: See panel action and statement on Comment 4-69.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #1785)

4- 71 - (230-71(a)): Hold

Note: It was the action of the Technical Correlating Committee that this Comment and Proposal 4-118 be reported as "Hold" to consider the requirements in 230-71(A) and 285-21(A)(1).

SUBMITTER: Alan Manche, Square D Co.

COMMENT ON PROPOSAL NO: 4-118

RECOMMENDATION: The panel should continue to accept the addition of the transient voltage surge suppressor disconnect when installed as part of a listed assembly with the following revision to 230-82(7):

230-87(7). Ground-fault protection systems or transient voltage surge suppressors, where installed as part of listed equipment, if suitable overcurrent protection and disconnecting means are provided.

SUBSTANTIATION: A correlation concern exists with the acceptance of the revision to 230-71(a) without a revision to Section 230-82(7). Disconnects for power monitoring, and the ground fault control circuits are currently not considered a service disconnecting means in 230-71(a), however, permission is then established in 230-82(6) and (7) for these disconnects to be connected ahead of the service disconnect when installed as part of the overall listed equipment. Adding "transient voltage surge suppressors" to 230-82(7) will resolve this issue.

The panel may decide the material proposed for 230-82(7) is new material and inappropriate during the comment stage. However, this is a direct result of the concept accepted in 230-71(a) and is only to correlate that action. If the panel decides this is new material and not an editorial correlation revision then this proposal should be rejected until such time the correlation issue can be resolved.

There is also a concern with the panel accepting the proposal without any comment to the submitter's substantiation. The submitter indicates the service disconnect must be rated 60A when in fact the service "disconnecting means" must be rated 60A and 230-80 states that the sum of the disconnects to meet the minimum ampacity restriction.

The submitter also indicates that misinterpretations have occurred treating the connection to the TVSS as a branch circuit. TVSS units should have the shortest connection possible to the equipment, but there is no prohibition on conductor length. This results in the conductors exiting the panelboard to connect to an externally mounted TVSS. These conductors should be treated and protected as branch circuit conductors to protect them from short circuit conditions just as any other circuit exiting the equipment. The tap rules might be applied in 240-21(b) to ensure appropriate short circuit protection of the conductors outside the panel, however, the minimum size tap conductor designated in each tap rule cannot be ignored.

PANEL ACTION: Hold.

PANEL STATEMENT: This is new material to be held for further consideration in the next code cycle.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #1265)

4- 72 - (230-71(a), FPN (New)): Reject

SUBMITTER: David A. Kerr, Jr., Friendsville, PA

COMMENT ON PROPOSAL NO: 4-119

RECOMMENDATION: Perhaps this proposal should be moved to some location in Article 240 if overcurrent protection devices are their specialty. Users of the Code are requied to follow the applicable rules of Article 384, but they don't.

SUBSTANTIATION: None given.

PANEL ACTION: Reject.

PANEL STATEMENT: The submitter has provided no technical substantiation for the recommendation.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #406)

4- 73 - (230-72(b)): Accept in Part

SUBMITTER: Dan Leaf, Palmdale, CA

COMMENT ON PROPOSAL NO: 4-121

RECOMMENDATION: Accept in Principle revised:

(b) ~~ADDITIONAL SERVICE~~ DISCONNECTING MEANS for ADDITIONAL SERVICES. The one or more additional service ~~disconnecting means~~ disconnects for fire pumps, emergency, or ~~legally required standby or optional~~ standby systems permitted by 230-2(a) to be served by an additional service(s) shall be installed ~~sufficiently~~ remote from the one to six service ~~disconnecting means~~ disconnects for the normal service to minimize the probability of simultaneous interruption of supply.

SUBSTANTIATION: The proposal makes it clear this section relates to additional services not taps ahead of the service. Emergency systems are clearly permitted by 230-2(a)(2) to be served by an additional service, as are fire pumps, and standby systems. The present text is confusing and may be interpreted as applying to taps ahead of the normal service. The word "disconnects" is used as in (a), and "sufficiently" is deleted per Style Manual.

PANEL ACTION: Accept in Part.

PANEL STATEMENT: The panel accepts the commenters recommendation to delete the term "sufficiently" as it is not consistent with the NEC Style Manual.

The panel rejects the remainder of the recommendation as there is no intention to prohibit connections ahead of the service disconnect to feed these loads.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #1994)

4- 74 - (230-72(c) Exception No. 2):

Note: It was the action of the Technical Correlating Committee that Comment 4-74 and Proposal 4-122 be reported as "Hold". The Technical Correlating Committee will direct that Code-Making Panels 4 and 10 establish a Task Group to resolve the conflicting actions on this Comment and Comment on 10-34.

SUBMITTER: William F. Laidler, Rep. Massachusetts Electrical Code Advisory Committee

COMMENT ON PROPOSAL NO: 4-122

RECOMMENDATION: Continue to accept.

SUBSTANTIATION: In the original submittal, the submitter lists only one example of an installation where the exception would allow an installation of service equipment without tenant access to the main service disconnect.

In the interest of safety, it is the ongoing opinion of the Massachusetts Electrical Code Advisory Committee, that in certain installations, tenants should in fact not have access to the main service disconnecting means. For example, mixed-use occupancies with large service ampacity located behind a mechanical room in the basement would be an area where one would not want a tenant venturing in the interest of safety as a matter of right.

By retaining this exception, Code-Making Panel 4 will allow designers and installers to create safer installations of service equipment, without seeking special permission from the authority having jurisdiction as allowed in 90-4.

PANEL ACTION: Accept in Principle.
PANEL STATEMENT: The panel reaffirms its action to accept in principle Proposal 4-122.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #54)

4- 75 - (230-75): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 4-122a
RECOMMENDATION: It was the action of the Technical Correlating Committee that further consideration be given to the comments expressed in the voting. This action will be considered by the Panel as a Public Comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
Section 230-75 shall read as follows:
230-75. Disconnection of Grounded Conductor. Where the service disconnecting means does not disconnect the grounded conductor from the premises wiring, other means shall be provided for this purpose in the service equipment. A terminal or bus to which all grounded conductors can be attached by means of pressure connectors shall be permitted for this purpose. In a multisection switchboard, disconnects for the grounded conductor shall be permitted to be in any section of the switchboard, provided any such switchboard section is marked.
PANEL STATEMENT: The panel has reconsidered its action on Proposal 4-122a and recognizes the need to retain the material. The panel action is intended to constitute the final action for Section 230-75.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1772)

4- 76 - (230-75): Accept
SUBMITTER: Jim Pauley, Square D Company
COMMENT ON PROPOSAL NO: 4-122a
RECOMMENDATION: The panel should reconsider and reject the proposal.
SUBSTANTIATION: I agree with Mr. Young's explanation of negative. The language needs to remain in the NEC to convey to the installer and inspector that the link can be in any section provided it is marked. The language was introduced to resolve a previous interpretation problem, removing it would simply reintroduce the same issue.
PANEL ACTION: Accept.
PANEL STATEMENT: See panel action and statement on Comment 4-75.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #387)

4- 77 - (230-79(c)): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
COMMENT ON PROPOSAL NO: 4-125
RECOMMENDATION: Accept in principle revised: (c) ONE-FAMILY DWELLING. For a one-family dwelling <u>where the initial computed load is 10kVA or more, or where the initial installation consists of six or more 2-wire circuits or the equivalent,</u> the service disconnecting means shall have a rating of not less than 100 amperes 3-wire <u>single-phase or 70 amperes 4-wire three-phase.</u>
SUBSTANTIATION: Many vacation homes, cabins, etc., with a small computed load or few branch-circuits do not warrant a 100 ampere service. The substantiation for proposal 4-152 of the 1998 ROP for this requirement was simply "to reflect current building practices". I agree that it does but this is a nebulous reason for a safety code and not generally acceptable justification for Code rules. If this substantiation was used to justify a requirement for nonmetallic boxes to be used with NMSC installations I don't think it would fly.

A vacation cabin qualifying as a one-family dwelling with 700 sq. ft. of area, one general lighting circuit, two small appliance circuits, a laundry circuit, and a circuit for a 1/4 HP forced air heating unit has a net computed load of 5456 volt-amperes, or 23 amperes. To require a disconnecting means almost 500 percent greater smacks of design requirements. A 60 ampere rated disconnecting means will be suitable for a 120/240 volt load up to 14400 volt-amperes.

This proposal would not affect the majority of one-family dwellings since the norm is a minimum 100 ampere disconnecting means, commonly established by previous Code but based on criteria such as load or number of circuits.

The 100 ampere 3-wire requirement is clarified to specifically indicate single-phase. A 70-ampere 4-wire three-phase system should be indicated for clarity as they are not prohibited by the Code.

PANEL ACTION: Reject.
PANEL STATEMENT: The panel believes the submitter intended his comment to be to Proposal 4-124 not Proposal 4-125. Regardless, he has not provided no technical substantiation and the panel reaffirms its position that current requirements of the code provide the minimum specifications for safe service installations. The current code does not prohibit a three-phase four-wire service to a dwelling provided it has the same capacity as the one hundred ampere three-wire rated disconnect.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #55)

4- 78 - (230-82): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 4-126
RECOMMENDATION: The Technical Correlating Committee directs the Panel to reword "in accordance with Article 250" to comply with the NEC Style Manual. This action will be considered by the Panel as a Public Comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
The following constitutes the final wording of Section 230-82. The revised text for Section 230-82 to read as follows:
Section 230.82 Equipment Connected to the Supply Side of Service Disconnect. Only the following equipment shall be permitted to be connected to the supply side of the service disconnecting means:
(1) Cable limiters or other current-limiting devices
(2) Meters, meter sockets, or meter disconnect switches nominally rated not in excess of 600 volts, provided all metal housings and service enclosures are grounded.
(3) Instrument transformers (current and voltage), high-impedance shunts, load management devices, and surge arresters
(4) Taps used only to supply load management devices, circuits for standby power systems, fire pump equipment, and fire and sprinkler alarms, if provided with service equipment and installed in accordance with requirements for service-entrance conductors
(5) Solar photovoltaic systems, fuel cell systems, or inter-connected electric power production sources.

(6) Control circuits for power-operable service disconnecting means, if suitable overcurrent protection and disconnecting means are provided

(7) Ground-fault protection systems where installed as part of listed equipment, if suitable overcurrent protection and disconnecting means are provided

(8) Transfer equipment installed in accordance with Sections 700-6, 701-7, and 702-6. A transfer switch installed under these provisions is not a service disconnect.

PANEL STATEMENT: By this action the panel complies with the requirements of the NEC Style Manual. This action incorporates all panel actions related to proposals and comments during this code cycle and constitutes the final wording for Section 230-82.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #56)

4- 79 - (230-82(2)): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 4-128
RECOMMENDATION: It was the action of the Technical Correlating Committee that further consideration be given to the comments expressed in the voting. The Technical Correlating Committee directs the Panel to reword "in accordance with Article 250" to comply with the NEC Style Manual. This action will be considered by the Panel as a Public Comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
PANEL STATEMENT: See panel action and panel statement on Comment 4-78.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1774)

4- 80 - (230-82(2)): Reject
SUBMITTER: Jim Pauley, Square D Company
COMMENT ON PROPOSAL NO: 4-128
RECOMMENDATION: The panel should reconsider and reject the proposal.
SUBSTANTIATION: The change is not logical. If there is a disconnect ahead of the meter, that disconnect should be suitable for use as service equipment and the system should be wired as such. There is no prohibition in the NEC to having a meter socket downstream of the service disconnect. We even have provisions in 250.142(B) Exception No. 2 to allow the grounded conductor to ground the enclosure of a meter socket downstream of the service disconnect. This Exception was to directly handle the instances described by the submitter.

For the user of the NEC, the simpler the rule the better. Simple in this instance means that the first disconnect for the building is the service disconnect, regardless of whether or not it is upstream or downstream of the meter socket.

Also, the addition of "meter sockets" to the rule is not necessary. The rule has always allowed "meters" and the mounting device was implicit in that permissions. This is evident from the fact that the rule has required all metal housings to be grounded by Article 250. The meter itself seldom can be said to have a "metal housing".
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Comment 4-78 and submitter's substantiation on Comment 4-82.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 9
NEGATIVE: 2
EXPLANATION OF NEGATIVE:
POLLOCK: I am voting negative on the panel action. The term "Meter Disconnect Switch" is defined in Proposals 4-128 and 4-129, as well as in Comment 4-82, but not in the NEC. The key factor in the proposal and comment to add this term is that the "meter disconnect switch" is under the sole control of the serving utility. Therefore, in accordance with Section 90-2(b)(5), a "meter disconnect switch" is not covered by the NEC. The term "meter disconnect switch" should not be added to the NEC.

YOUNG: NEMA votes negative on the panel action. The comment should be accepted resulting in rejection of the original proposal. Although the submitter of the original proposal had a specific application in mind (as described in Comment 4-82, the term "meter disconnect switch") is not defined. Without a clear definition, there will be misapplication of many products such as non-fused switches (in service equipment applications these have overcurrent protection immediately adjacent to the switch), isolation switches (that are not suitable for load break), and meter/mains (which are typically suitable for use only as service equipment). This provision should not go into the NEC without a clear definition and with more explicit code language as to what is intended to avoid misuse of the electrical equipment.

(Log #1775)

4- 81 - (230-82(2)): Reject
SUBMITTER: Jim Pauley, Square D Company
COMMENT ON PROPOSAL NO: 4-129
RECOMMENDATION: The panel should reconsider and reject the proposal.
SUBSTANTIATION: The change is not logical. If there is a disconnect ahead of the meter, that disconnect should be suitable for use as service equipment and the system should be wired as such. There is no prohibition in the NEC to having a meter socket downstream of the service disconnect. We even have provisions in 250.142(B) Exception No. 2 to allow the grounded conductor to ground the enclosure of a meter socket downstream of the service disconnect. This Exception was to directly handle the instances described by the submitter.

For the user of the NEC, the simpler the rule the better. Simple in this instance means that the first disconnect for the building is the service disconnect, regardless of whether or not it is upstream or downstream of the meter socket.

Also, the addition of "meter sockets" to the rule is not necessary. The rule has always allowed "meters" and the mounting device was implicit in that permissions. This is evident from the fact that the rule has required all metal housings to be grounded by Article 250. The meter itself seldom can be said to have a "metal housing".
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Comment on 4-78 and submitter's substantiation on Commet 4-82.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1867)

4- 82 - (230-82(2)): Accept
SUBMITTER: Timothy M. Croushore, Allegheny Power
COMMENT ON PROPOSAL NO: 4-128 & 4-129
RECOMMENDATION: Code Making Panel 4 should continue to accept Proposal 4-129. The word "normally" used in the first sentence in the recommended text of Proposal 4-128 should have been "nominally". I agree with the affirmative comment of Mr. Zinnante.
SUBSTANTIATION: Proposals 4-128 and 4-129 reference the addition of wording to include meter sockets and meter disconnect switches to the list of equipment permitted ahead of the service disconnecting means. Utilities routinely are requiring a means to de-energize a 480Y/277 self-contained meter before performing a meter change, maintenance, or to disconnect service. When the meter disconnect is ahead of the meter, this is commonly referred to as "cold sequencing".

The main reason for this requirement is safety of utility personnel. An arc that is generated with voltages above 150 volts to ground are considered "self sustaining", meaning that the arc isn't extinguished when the fault source is removed. An arc created on a 480Y/277 volt system can easily burn down the meter socket as well as injure the individual performing the work.

Some feel that by requiring a meter disconnect switch ahead of the meter creates confusion as to if this disconnect should be considered, or classified, as a service disconnecting means. If so, then grounding requirements in Article 250 and the overcurrent protection requirements in Article 230 would technically apply. From a utility standpoint, this would not be the case. To accomplish what the meter disconnect is intended for, the following criteria is important:

• No overcurrent protection shall be incorporated in the meter disconnect
• The meter disconnect shall be under the sole control of serving utility
• Bonding of the meter disconnect enclosure shall be in compliance with Section 250.92
• The meter disconnect shall serve no feeder conductors
• No grounding electrodes shall terminate in the meter disconnect as defined by Article 250
• The meter disconnect shall not be classified as service disconnecting means under Article 230

With the above requirements being used commonly throughout the utility industry, the distinction is clear as to what this disconnect is classified as - a meter disconnect and not a service disconnecting means.

To clarify some of these points, several factors standout. First, with no overcurrent protection incorporated within the meter disconnect, access by the public ceases to be necessary. In turn, sole control of the meter disconnect by the utility negates any possibility of using the disconnect for any reasons other than a meter change or meter maintenance. Second, safety is not compromised, as the meter disconnect enclosure will be bonded, as in the meter socket, by the grounded conductor (neutral), and the building service disconnect will be grounded and bonded to the grounded conductor as well as the grounding electrode system as required under Article 250. Third, even given that the location of the meter disconnect may be remote relative to the service disconnecting means, this does not alter in any way the point of demarcation or the approved service disconnect location as governed by Article 230.

To address the issue of "combination devices", such meter socket/disconnects and meter socket/ load centers, the above guidelines still apply. As a matter of suitability, manufacturers routinely resist or do not produce units with overcurrent protection on the supply, or line side of the meter. As for units with overcurrent/disconnect integral to the load side of the meter, these would in all cases be installed in accordance with Article 230, as they would always be classified as the service disconnecting means. To classify a disconnect with overcurrent protection installed on the load side of the meter otherwise would violate many articles governing services and disconnects (Articles 225, 230, 250, etc.). Again, regardless if the application is remote to or mounted on the structure served, the same provisions apply. This removes any discretion, and confusion, on the part of inspectors, installers and the serving utility.

To summarize, allowing installation of a disconnect on the line side of the meter serves to mitigate many critical concerns. No confusion, nor enforcement chaos, will result from this application. The disconnect serves a sole purpose (meter de-energization) and will not create any hazardous situations arising from inadequate grounding or misapplication. The approved Proposals 4-128/4-129 should remain as stated - "Meters, meter sockets or meter disconnect switches, nominally rated not in excess of 600 volts, provided all metal housings and service enclosures are grounded in accordance with Article 250".

PANEL ACTION: Accept.
PANEL STATEMENT:
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #2315)

4- 83 - (230-82(2)): Accept
SUBMITTER: William M. Lewis, Eli Lilly and Co.
COMMENT ON PROPOSAL NO: 4-128
RECOMMENDATION: Change the word "normally" to "nominally".
SUBSTANTIATION: To correct typographical error.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #57)

4- 84 - (230-82(5)): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 4-132
RECOMMENDATION: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 3 for information. The Technical Correlating Committee directs the Panel to reword "(See Articles 690, 691, or 705 as applicable.)" to comply with the NEC Style Manual. This action will be considered by the Panel as a Public Comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
PANEL STATEMENT: See panel action and statement on Comment 4-78.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1773)

4- 85 - (230-82(8)): Reject
SUBMITTER: Jim Pauley, Square D Company
COMMENT ON PROPOSAL NO: 4-127
RECOMMENDATION: The panel should reconsider and reject the proposal.
SUBSTANTIATION: If transfer equipment is installed on the service and as the first disconnect, it should become the service disconnecting means. There will be little value in having transfer equipment with appropriate SUSE markings if the panel retains the permission to allow it ahead of the service disconnect. By not making the transfer equipment the service disconnect (and as such not requiring it to be SUSE), there will be an influx of devices that inspectors and utilities will not be happy with. These devices will not meet all the necessary requirements for a piece of equipment located at the "head end" (i.e. high short circuit) portion of the system. Grounding and bonding will be done at the "service disconnect" downstream further impacting proper bonding at the generator.

The submitters substantiation does not support adding this new rule. In fact, the substantion is a good statement about why the transfer equipment must be the service disconnect if it is the first disconnect at/on the building and why it should be SUSE. By being the service disconnect, tt would be required to proper short circuit current ratings, proper devices suitable as a disconnects, proper electrical spacings and either integral overcurrent protection or protection mounted immediately adjacent to the transfer equipment.

Allowing the transfer equipment to escape the service equipment requirements will not improve the situation described by the submitter, it will only make it worse.
PANEL ACTION: Reject.
PANEL STATEMENT: A transfer switch may not have an open position and therefore cannot be considered the service disconnect. The panel does not intend that transfer switches become the service disconnecting means unless designed, identified and installed for that purpose.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
YOUNG: NEMA votes negative on the panel action. The comment should be accepted resulting in rejection of the original proposal. The revision by Proposal 4-127 introduces significant concern for the proper application of electrical equipment. If transfer equipment is installed as the first piece of equipment in a system, it should be the service equipment and would, as a result, be required to be suitable for use as service equipment. With the change, a piece of transfer equipment without overcurrent protection can be installed with a significant amount of unprotected service conductor between it and the service overcurrent device. This increases the potential of exposing the transfer equipment to extremely high fault currents without any overcurrent protection in place. In the 1999 NEC, this same application would require that the service overcurrent device be an integral part of the transfer equipment or located immediately adjacent thereto. In addition, the wording accepted by the panel

mixes the terms transfer equipment and transfer switch. These are two very different categories of devices. The term transfer equipment includes many product categories such as double throw switches and interlocked circuit breaker panelboards. The term transfer switch is only one type of transfer equipment.

(Log #2025)

4- 86 - (230-82(8) (New)): Accept in Part
SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc.
COMMENT ON PROPOSAL NO: 4-127
RECOMMENDATION: Add the following:
A transfer switch installed under these provisions is not a service disconnect and shall not be field marked under the provisions of 230.70(B).
SUBSTANTIATION: This proposal has the potential to offer the same degree of confusion about "will the actual service disconnect please stand up" as with meter disconnects, particularly if the transfer switch used in some application carries a listing as being suitable for use as service equipment. Since it generally won't be at a remote location, however, it doesn't present the grounding issues involved with remote meter disconnects. In this case, the solution is to make sure only one disconnect gets the 230.70(B) marking through a positive Code rule.
PANEL ACTION: Accept in Part.
Revise text to Section 230-82(8) to read as follows:
(8) Transfer equipment installed in accordance with Sections 700-6, 701-7, and 702-6. A transfer switch installed under these provisions is not a service disconnect.
PANEL STATEMENT: The panel agrees with the statement that a transfer switch is not a service disconnect switch in this application.
The panel rejects the comment concerning field marking as only service disconnects are required to be marked. See panel action and statement on Comment 4-78.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1668)

4- 87 - (230-83 (New)): Reject
SUBMITTER: John M. O'Connor, North American Technologies, Inc.
COMMENT ON PROPOSAL NO: 4-135
RECOMMENDATION: Meter sockets shall be bypassed or jumpered only by a full rated Listed bypass or jumper. The bypass/jumper shall be enclosed by a Listed method which prevents access to live parts.
SUBSTANTIATION: In many instances meters are bypassed, often by non-code approved means, in order to provide temporary power on construction jobsites and power to homes and businesses until a meter is installed. If a bypass switch is used this can be done safely. However, most times it is jumpered in an unsafe manner which can be dangerous to the individual doing the work and is a shock hazard to others if not properly protected. Removal of non-Listed jumpers can also be hazardous to the meter installer when it is time for the meter to be installed. With the advent of utility deregulation there will be increased occurrences of jumpering and hazardous situations. By requiring Listed bypass/jumpers and integral covers, the industry will be safer for workers and users.
Listed metering assemblies with safe bypass means and integral covers are already commercially available.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel believes that the submitter was commenting on Proposal 4-134 and not Proposal 4-135. The panel reaffirms its rejection of this recommendation as the use of by-pass mechanisms is not an installation issue. This is a maintenance and service issue and the proposed language is unenforceable.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #58)

4- 88 - (230-90): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 4-135a
RECOMMENDATION: The Technical Correlating Committee directs the Panel to reword Exception No. 3 "in accordance with Article 220" to comply with the NEC Style Manual. This action will be considered by the Panel as a Public Comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
This is the final action on section 230-90. Section 230-90 shall read as follows:
230.90 Where Required. Each ungrounded service conductor shall have overload protection.
(A) Ungrounded Conductor. Such protection shall be provided by an overcurrent device in series with each ungrounded service conductor that has a rating or setting not higher than the allowable ampacity of the conductor. A set of fuses shall be considered all the fuses required to protect all the ungrounded conductors of a circuit. Single-pole circuit breakers, grouped in accordance wtih 230.71(B), shall be considered as one protective device.
Exception No. 1: For motor-starting currents, ratings that conform with 430.52, 430.62, and 430.63 shall be permitted.
Exception No. 2: Fuses and circuit breakers with a rating or setting that conform with 240.3(B) or (C) and 240.6 shall be permitted.
Exception No. 3: Two to six circuit breakers or sets of fuses shall be permitted as the overcurrent device to provide the overload protection. The sum of the ratings of the circuit breakers or fuses shall be permitted to exceed the ampacity of the service conductors, provided the calculated load does not exceed the ampacity of the service conductors.
Exception No. 4: Overload protection for fire pump supply conductors shall conform with 695.4(B)(1).
Exception No. 5: Overload protection for 120/240-volt, 3-wire, single-phase dwelling services shall be permitted in accordance with the requirements of 310.15(B)(6).
(B) Not in Grounded Conductor. No overcurrent device shall be inserted in a grounded service conductor except a circuit breaker that simultaneously opens all conductors of the circuit.
PANEL STATEMENT: By this action the panel complies with the NEC Style Manual. This action constitutes the final action and incorporates all actions on proposals and comments during this code cycle for Section 230-90.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1463)

4- 89 - (230-90(a)): Reject
SUBMITTER: Steven Worley, Worley Group Engineering
COMMENT ON PROPOSAL NO: 4-139
RECOMMENDATION: This proposal should be accepted.
SUBSTANTIATION: The panel statement requested these two articles be provided: ("Electrical Safety: Service Cables Unprotected" by Frederick F. Franklin, in the July 2000 issue of "American Society of Safety Engineers" and "Fire Hazards and Welding Action in Service-Entrance Conductors" by Richard S. Sanford in September/October 1982 issue of "IEEE Transactions on Industry Applications") which provide adequate technical substantiation that service entrance conductors need to be fully protected before they enter a residence. While the articles were written 18 years apart, they come to the same conclusion. Fires caused by inadequately protected service conductors can be dramatically reduced. The latest paper estimates a savings of 16 deaths and $45 million in property savings each year.
Note: Supporting material is available for review at NFPA Headquarters.
PANEL ACTION: Reject.
PANEL STATEMENT: The comment to Proposal 4-139 carries significant impact to the code and long standing practices. No technical substantiation has been provided to support such a change. The information that has been provided is "opinion" without supporting data. We encourage the submitter to contact NFPA and other entities to see if such data can be developed.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #327)

4- 90 - (230-91(a)): Reject
SUBMITTER: Frederick F. Franklin, PACE Inc.
COMMENT ON PROPOSAL NO: 4-139
RECOMMENDATION: a. Replace "before the conductors enter the structure" with "at the utility transformer."
b. Replace "Outdoor, weatherproof fused disconnects or circuits breakers could be locked as long as the branch circuit devices, per Section 230-92, were accessible and of a smaller size than the outdoor main." with "Readily available cable fuses known variously as cable limiters or cable protectors shall be utilized for this purpose."
SUBSTANTIATION: a. I am an electrical engineer who has investigated over 2000 structure fires since 1970. Approximately one percent of all structure fires are caused by arcing in service cables. Many of these arcs occur in the service drop upstream from the power meter.
b. Circuit breakers were tried by one Indiana utility. They nuisance tripped and had to be removed. Cable fuses will not.
Note: Supporting material available for review upon request at NFPA headquarters.
PANEL ACTION: Reject.
PANEL STATEMENT: Part A of the recommendation is not under the purvue of the NEC per Section 90-2(B)(5).
Part B of the recommendation is a comment on the substantiation and is not accepted code.
See panel action and statement on Comment 4-89.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1369)

4- 91 - (230-212): Accept
SUBMITTER: Kari Barrett, American Chemistry Council
COMMENT ON PROPOSAL NO: 4-150
RECOMMENDATION: Change new wording to read:
230.212 Over ~~15,000~~ 35,000 Volts. Where the voltage exceeds ~~15,000~~ 35,000 volts between conductors, which enter a building they shall terminate in a metal-enclosed switchgear compartment or a vault conforming to the requirements of 450.41 through 450.48.
SUBSTANTIATION: This change is recommended to make requirements for feeders and services between 15,000 volts and 35,000 volts equivalent. There is no basic difference between the protection methods at this voltage level, and therefore no technical justification for different rules. The rules for non-oil insulated transformers in 450-21, 450-23, 450-24, and 450-25 make the 450 Part C requirements effective for transformers over 35,000 volts.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

ARTICLE 240 — OVERCURRENT PROTECTION

(Log #283)

10- 5 - (240-2):
Note: Based on Code-Making Panel 1's action on Comment 1-61, the Technical Correlating Committee directs that Comment 10-5 be reported as "Accept in Part". The Technical Correlating Committee further directs that the definition of "coordination" remain in 240-2.
SUBMITTER: James T. Dollard, Jr., IBEW Local Union 98
COMMENT ON PROPOSAL NO: 10-3b
RECOMMENDATION: Accept in principle Proposal 10-3b.
Revise as follows:
Continue to delete last paragraph of Section 240-12.
Delete the definition titled "Coordination" in the proposed new 240-2 Definitions.
SUBSTANTIATION: This comment is the work of a Task Group assigned to address the request of CMP 1 for response from CMP 10 on the panel action to accept Proposal 1-122. The Task Group consisted of the following members of CMP 10. Chair, Jim Dollard; John Brezan; Carl Fredericks; Clive Kimblin; Charles Eldridge; George Gregory; George Ockuly and Vince Saporita.
This Task Group is in agreement with the intent of CMP 1 to add a definition of "Coordination" to Article 100 and with the substantiation provided by the proposal submitter.
The net result of this comment and a companion comment to Proposal 1-122 is to remove the definition of "Coordination" from Article 240 and place it in Article 100.
The NEC Style Manual Section 2.2.2.1 mandates that "in general, Article 100 shall contain definitions of terms that appear in two or more other articles of the NEC".
As the substantiation for Proposal 1-122 clearly points out, this term "Coordination" is used in more than one Article of the NEC.
See companion comment to Proposal 1-122 developed by this Task Group.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
COMMENT ON AFFIRMATIVE:
DOLLARD: I am voting Affirmative to the panel action to Accept Comment 10-5.
My comments are as follows:
As a note to the TCC, CMP-10 agreed that the definition of "Coordination (Selective)" should be relocated to Article 100. Relocating the definition required a modification, due to the global impact of moving it to Article 100. Section 2.2.2.1 of the NEC style manual requires that defined terms that appear in two or more Articles of the NEC be located in Article 100. CMP-1 has rejected a sister comment (1-62) submitted by a CMP-10 task group to modify the definition. CMP-1 voted 11 to 1 to include this definition in Article 100 in the ROP stage. CMP-1 voted to reject the modified definition in the comment stage.
The following information is offered for TCC review:
The proposed definition in comment 1-62 did not propose "restricting outages within equipment", as written in the panel statement on comment 1-62, but "restrict outages to the equipment affected", as CMP-1 had accepted in the ROP stage.
The addition of the term "overcurrent" to the definition, when moved to Article 100, does not represent a change due to the fact that all references to "coordination" outside of Article 240 also reference overcurrent protection.
The term "Coordination" exists in the 1999 NEC in five sections.
1. 230-95(c) FPN # 2. This FPN addresses "proper selective overcurrent protection coordination"
2. 240-12. 240-12. This section addresses, "Electrical System Coordination.
Where an orderly shutdown is required to minimize the hazard(s) to personnel and equipment,..." (As determined by the task group, the intent of this section will not be changed by including this definition in Article 100, as modified by comment 1-62, or leaving it as written on page 62 of the 2002 Draft).
3. 310-15(b) FPN. This FPN addresses ". Coordination with circuit and
system overcurrent protection.
4. 620-62. "Selective Coordination. Where more than one driving machine disconnecting means is supplied by a single feeder, the overcurrent protective devices in each..."
5. 685-2. Application of Other Articles. This is a cross-reference to 240-12.
In all locations other than 240-12 and the reference to 240-12 in 620-62, the term overcurrent is used to qualify the type of protection. 240-12 deals specifically with situations where "Where an orderly shutdown is required to minimize the hazard(s) to personnel and equipment...". 685-2 specifically references 240-12. The term "coordination" as used in 230-95(c) FPN # 2, 310-15(b) FPN & 620-62 does not reference 240-12, the intent in each of these sections is to provide coordination of overcurrent protective devices.
Overcurrent by definition does include overload.
As the TCC correlates the actions taken in the ROC please consider the following:
An action by the TCC to move the definition to Article 100 should be as modified by the task group.
An action by the TCC to leave the definition in Article 240 should be as written on page 62 in the 2002 Draft.

(Log #1140)

10- 6 - (240-2):

Note: The Technical Correlating Committee directs that this comment be reported as "Accept" to comply with 4.1.1 of the NEC Style Manual.

SUBMITTER: Robert A. McCullough, Ocean County Construction Insp. Dept.,

COMMENT ON PROPOSAL NO: 10-3b

RECOMMENDATION: Revise the panel action as follows:

Replace the words "this section" in the last sentence of the definition of "Tap Conductor" with "240.4."

SUBSTANTIATION: Now that the definition has been relocated from 240.3 into 240.2, the words "this section" are no longer appropriate. 240.2 does not describe conductor protection requirements. They are found in 240.4.

PANEL ACTION: Accept in Principle.

In the wording of the Comment, change "this section" to "this article".

PANEL STATEMENT: The panel action satisfies the intent of the submitter. Tap conductors are mentioned in several sections within this article.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

(Log #1893)

10- 7 - (240-2): Reject

SUBMITTER: Michael I. Callanan, International Brotherhood of Electrical Workers

COMMENT ON PROPOSAL NO: 10-3a

RECOMMENDATION: Reject this proposal.

SUBSTANTIATION: This is a safety issue. As written this proposal would allow for unlimited lengths of unprotected conductor to be run from an outside transformer to a panel as long as the conductor was considered "outside". This could completely eliminate switchgear on the secondary of the transformer. If a problem occurred with the main disconnecting means of one of the panelboards, the only available means to disconnect power would be on the medium voltage side of the transformer. As such it could encourage an electrician to work the circuit "hot". 90-4 gives the AHJ the authority to wave specific requirements to cover similar situations.

This comment represents the official position of the International Brotherhood of Electrical Workers Codes & Standards Committee.

PANEL ACTION: Reject.

PANEL STATEMENT: The affirmative comment on Proposal 10-3a recognizes the Submitter's concerns. See panel action and statement on Comment 10-8. The safety issues addressed in the submitter's substantiation have been addressed in the panel action taken on Comment 10-8.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

(Log #1925)

10- 8 - (240-2): Accept in Principle

SUBMITTER: James T. Dollard, Jr., Philadelphia, PA

COMMENT ON PROPOSAL NO: 10-3a

RECOMMENDATION: Delete the proposed definition and Revise the following sections as follows:

240-21(b) (5) Outside Taps of Unlimited Length. Where the conductors are located outdoors <u>or enter a building or structure from the outdoors in accordance with Condition No. 1 or Condition No. 2 of 230-6,</u> except at the point of <u>load</u> termination, and comply with all of the following conditions.

240-21(c)(4) Outside Secondary Conductors. Where the conductors are located outdoors <u>or enter a building or structure from the outdoors in accordance with Condition No. 1 or Condition No. 2 of 230-6,</u> except at the point of load termination, and comply with all of the following conditions.

240-92(c)(3) The tap conductors are installed outdoors <u>or enter a building or structure from the outdoors in accordance with Condition No. 1 or Condition No. 2 of 230-6,</u> except at the point of <u>load</u> termination.

SUBSTANTIATION: The proposed text in this comment does not represent new material. This text exists in my affirmative comment to proposal 10-3a in the ROP. I believe that this text will satisfy the intent of the Panel.

The Panels substantiation is to recognize a long-standing practice of allowing tap conductors, which originate outdoors to be treated as service entrance conductors where they enter a building or structure. Presently these conductors are not recognized as being "outside the building" when installed beneath a building or structure and covered by two inches of concrete. The existing language in the NEC clearly requires that the disconnecting means for the tap conductors in sections 240-21(b)(5), 240-21(c)(4) and 240-92(c) be installed at a readily accessible location either outside of a building or structure, or inside nearest the point of entrance of the conductors.

I believe that the Panels intent is to allow outside tap conductors in sections 240-21(b)(5), 240-21(c)(4) and 240-92(c)(3) to be considered as outside the building when entering a building or structure.

However I believe that trying to incorporate section 230-6 into Article 240 for this reason will create more problems than it will solve.

Section 230-6 as written is not a definition. As proposed this new definition contains requirements and is in conflict with section 2.2.2 of the Style Manual, which does not permit a definition to contain a requirement.

Section 230-6 is constantly subject to change outside of the jurisdiction of CMP-10. This cycle for example CMP-4 has accepted a proposal to recognize 18 inches of earth, without the concrete to be considered as outside the building.

Incorporating this proposed definition into Article 240 as written will also result in confusion, with installations and interpretations that are not the intent of the Panel on this proposal.

For example when we apply 240-21(c)(4) there is no requirement that the transformer be located outdoors, only the conductors. This definition as written in the draft would allow for service equivalent taps in many installations.

For example a one story commercial structure may have a 480-volt service which terminates in a fused disconnecting means inside of the building. A transformer is installed on the load side of this disconnecting means to provide a 120/208-volt system. The secondary of this transformer could now have any number of tap conductors provided they meet the requirements of 240-21(c)(4). This transformer is indoors but the conductors would be considered as outside the building if they are beneath the building and under two inches of concrete. This will result in any number of service equivalent taps throughout the building. This will represent a serious safety hazard to all of those persons who will service and maintain the electrical system.

The word "load" is used to clearly point out that these tap conductors receive their supply outdoors and are terminated indoors on the load end of the tap conductors only.

PANEL ACTION: Accept in Principle.

Revise the present code text to read as follows:

240-21(b)(5) Outside Taps of Unlimited Length. Where the conductors are located outdoors of a building or structure, except at the point of load termination, and comply with all of the following conditions.

a. (No Change)

b. (No Change)

c. (No Change)

d. The disconnecting means for the conductors is installed at a readily accessible location complying with one of the following:

(1) Outside of a building or structure.

(2) Inside, nearest the point of entrance of the conductors.

(3) Where installed in accordance with 230-6, nearest the point of entrance of the conductors.

240-21(c)(4) Outside Secondary Conductors. Where the conductors are located outdoors of a building or structure, except at the point of load termination, and comply with all of the following conditions.

a. (No Change)

b. (No Change)

c. (No Change)

d. The disconnecting means for the conductors is installed at a readily accessible location complying with one of the following:

(1) Outside of a building or structure.

(2) Inside, nearest the point of entrance of the conductors.

(3) Where installed in accordance with 230-6, nearest the point of entrance of the conductors.

240-92(c) Outside Feeder Taps. (No change)

1. (No change)

2. (No change)

3. The tap conductors are installed outdoors of a building or structure, except at the point of load termination.

4. (No change)
5. The disconnecting means for the conductors is installed at a readily accessible location complying with one of the following:
(1) Outside of a building or structure.
(2) Inside, nearest the point of entrance of the conductors.
(3) Where installed in accordance with 230-6, nearest the point of entrance of the conductors."

PANEL STATEMENT: The revised language meets the intent of the submitter. The panel has expanded the change to include all provisions of Section 230-6.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #108)

10- 9 - (240-2 (New)): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 10-3a
RECOMMENDATION: It was the action of the Technical Correlating Committee that this Proposal be reconsidered and correlated with the action on Proposal 4-54 and 4-55. The Technical Correlating Committee directs the panel to clarify the location of the new definition. This action will be considered by the Panel as a Public Comment.
The Technical Correlating Committee directs that this proposal be forwarded to Code-Making Panel 4 for information.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
The panel accepts the direction of the Technical Correlating Committee to reconsider and correlate with the action on Proposals 4-54 and 4-55. The panel has reviewed the actions taken in Proposals 4-54 and 4-55 and has referenced Section 230-6 in total.
Where appropriate the requirements of Section 230-6 have been introduced into the text of Article 240. The proposed definition has been deleted; however, the intent of the definition remains in the revised text by the action taken on Comment 10-8.
PANEL STATEMENT: See panel action and statement on Comment 10-8.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #2055)

10- 10 - (240-2- Conductors Considered Outside the Building (new)): Accept
SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc.
COMMENT ON PROPOSAL NO: 10-3a
RECOMMENDATION: The proposal should be accepted in principle in the manner suggested in the affirmative comment on vote, however, in each case (three times) the reference should be to all of Section 230.6.
SUBSTANTIATION: As the submitter of rejected 1999 Proposal 10-68, I should probably refrain from comment, since Proposal 10-3a, from the entire panel no less, accomplishes exactly what it refused to do in 1999. The affirmative comment is correct, and squarely in accordance with the Style Manual command that definitions not contain rules. The accepted term is, to all intents and purposes, styled as a rule and so intended. My only quibble with the affirmative comment is that it only includes two conditions in 230.6. This comes from 695.6(A), of which I am also the author. That section, in Chapter 6, addresses a unique need to protect fire pump conductors from an already burning building, and a transformer fire in a vault will incinerate those conductors. Article 240, like most in the NEC, aims at the reverse condition, namely to protect building from occurrences in the wiring, and both Code-Making Panel 4 and 10 have long recognized that wiring in a vault is adequately protected. For example, the waiver from the 10 times ratio for the 10-ft tap rule applies not just to within equipment, but also within vaults. Therefore, the reference to all of Section 230.6 is appropriate. It also resolves the correlation issue identified by the Technical Correlating Committee.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #2056)

10- 11 - (240-2- Supervised Industrial Installation): Accept in Principle
SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc.
COMMENT ON PROPOSAL NO: 10-3b
RECOMMENDATION: In the paragraph following item (3), change "shall not apply" to "does not include."
SUBSTANTIATION: Definitions must not be configured as rules. (Style Manual, 2.2.2)
PANEL ACTION: Accept in Principle.
Revise the wording of the second sentence of (3) of the proposal to read as follows:
"This definition excludes installations in buildings used by the industrial facility for offices, warehouses, garages, machine shops, and recreational facilities that are not an integral part of the industrial plant, substantion, or control center."
PANEL STATEMENT: The panel action meets the intent of the submitter and provides further clarity.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #399)

10- 12 - (240-3): Accept in Part
Note: The Technical Correlating Committee understands that 240-4(B)(2) in Item G of the Panel Action becomes 240-5(B)(2) with the new numbering accepted in Proposal 10-3b.
SUBMITTER: Dan Leaf, Palmdale, CA
COMMENT ON PROPOSAL NO: 10-4
RECOMMENDATION: Accept in Principle revised:
PROTECTION OF CONDUCTORS. Ungrounded conductors, other than flexible cords, flexible cables, and fixture wires shall be protected against overcurrent in accordance with their amapcities as specified in ~~Section~~ 310-15 unless otherwise permitted or required in (a) through (g), ~~below~~.
(a) no change
(b) DEVICES RATED 800 AMPERES OR LESS. ~~The next~~ A higher ~~standard~~ overcurrent device rating or setting (above the ampacity of the conductor being protected) shall be permitted to be used provided all the following conditions are met.
(1) No change
(2) No change
(3) The ~~next~~ higher ~~standard~~ rating or setting selected does not exceed the next higher standard rating and 800 amperes.
(c) DEVICES RATED over 800 amperes. Where the overcurrent device is rated rating or setting is over 800 amperes, the ampacity of the conductors shall be ~~equal to or greater~~ not less than the rating or setting of the overcurrent device, as defined in Section 240-6.
(d) No change
(e) TAP CONDUCTORS. Tap conductors shall be permitted to be protected against overcurrent in accordance with 210-19 (c) and (d), 240-4(b)(2) 240-21, 364-11, and 430-53(d).
(f) No change
(g) No change

SUBSTANTIATION: Article 400 is titled "Flexible Cords and Cables"; the cables of the proposal are intended to apply to those cables, not Types AC, MC, MI, NMSC, etc.
The proposal does clarify (b); it includes settings of adjustable over current devices and permits a higher rated device which may be less than the next higher standard rating, and maintains the 800 ampere limit. Experienced inspectors generally permit this. The literal text permits a conductor with an ampacity of 180 amperes to be protected at 200 amperes, but not 190 amperes, which is not a "standard" rating. What is the rationale? A similar proposal ROP 12-76 has been accepted.
Proposed (c) includes "or setting" for adjustable devices and "not less than" per Code Style Manual.
The conductors covered in 240-4(b)(2) are tap conductors and should be included in (e) for correlation between the first paragraph and 240-4(b)(2).

PANEL ACTION: Accept in Part.

In the wording of the comment, the panel takes the following actions:

A. The panel does not accept the addition of the word "Ungrounded".

B. The panel accepts the inclusion of the words "flexible cables".

C. Deletion of the word "Section" is unnecessary.

D. No action is required on deleting the word "below" because it does not presently exist in the first paragraph of 240-3.

E. The panel rejects the proposed changes to subsection (b).

F. The panel rejects the proposed changes to subsection (c).

G. In subsection (e), the panel continues to accept the words "(c) and" and editorially accepts the addition of the reference to 240-4(b)(2).

PANEL STATEMENT: A. Adding the word "Ungrounded" is technically incorrect. Section 240-3 addresses protection for all conductors in accordance with their ampacities. Also, 430-36 permits the use of an overcurrent device in the grounded conductor.

B. The panel agrees with the submitter.

C. The word "Section" will be deleted throughout the NEC by NFPA staff for the 2002 Code.

D. The word "below" does not presently exist in Section 240-3.

E. 240-3(b) addresses maximum overcurrent protection. Values below the maximum allowable overcurrent protection are already permitted.

F. The proposed changes do not improve clarity.

G. Editorial.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

(Log #1387)

10- 13 - (240-3(c)): Reject

SUBMITTER: Kari Barrett, American Chemistry Council

COMMENT ON PROPOSAL NO: 10-6

RECOMMENDATION: The panel should have Accepted the proposal in Principle in accordance with the Explanation of Negative Vote given by Mr. Fredericks. The proposed text for Exception No. 1 should have been revised to:

Exception No. 1: The next higher available size of overcurrent device shall be permitted to be used, where its rating as defined in Section 240-6 is not more than 5% above the allowable conductor ampacity.

SUBSTANTIATION: Technical substantiation to accept this in principle is found in existing successful NEC practice that allows the use of the next larger overcurrent protective device for devices up to 800 amperes. For these sizes, the NEC already allows conductors to be protected at up to 18% above their allowable ampacity. The panel did not provide any reason why some form of this practice should not be permitted above 800 amperes.

PANEL ACTION: Reject.

PANEL STATEMENT: The panel would require additional data in order to determine whether or not the termination points of the smaller conductors would create a heat problem to interfere with the proper operation of the overcurrent protective devices.

No technical justification has been supplied for the change other than the comparison to overcurrent protective devices 800 amps or less.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12

VOTE ON PANEL ACTION:

AFFIRMATIVE: 9

NEGATIVE: 3

EXPLANATION OF NEGATIVE:

ELDRIDGE: This Comment should have been Accept. By making this change, a 1600-ampere service could be wired with four sets of 500kcmil, Cu, 75oC wire. This was done for years without any problems and no problems have been encountered for the 800 amperes or less, as permitted now in section 240-3(b). Of course, all the other Code provisions would have to be followed. This would permit a considerable cost savings without sacrificing safety.

FREDERICKS: I'm voting against the panel action. As stated in the comment, the NEC already allows conductors below 800 amperes to be protected at the next standard device rating, effectively allowing these conductors to be protected at up to 18% above their allowable ampacity. This practice has proven successful in many thousands of NEC installations and in years of practice. This successful practice is with conductors that are smaller and heat more quickly than those above 800 amperes. Also, the overcurrent protective device is smaller and more sensitive to the wire size below 800 amperes.

It would seem that if anything, there would be more technical merit in restricting the smaller devices and conductors, but again long successful practice and experience supports the existing latitude given in 240-3.

There is no technical reason to disallow the modest 5% allowance for conductors above 800 amperes. I believe research would prove that this change would not result in any potential operation of overcurrent devices with smaller conductors than their UL 489, etc. testing than already happens below 800 amperes. Or for larger devices, than with different conductor ampacities that are already allowed under existing rules. It seems most likely to me that the only reason for the existing code text is to respect larger standard device size jumps above 800 amps, which this Comment has addressed.

As a minimum, the panel should consider a task group to further explore this issue during the next code cycle.

MUNSON: I am voting negative against the panel action. I support the comments of Mr. Eldridge and Mr. Fredericks in their negative vote against the original Proposal 10-6. This proposal should have been an accept in principle.

COMMENT ON AFFIRMATIVE:

DOLLARD: I am voting Affirmative to the panel action to Reject Comment 10-13.

My comments are as follows:

The principle suggested in this comment has merit and deserves further consideration. However as pointed out in the panel statement, data is needed to address the concerns of additional heat created by a reduction in circular mill area of conductors. Inclusion of this concept for overcurrent devices up to 1600-amps (and if possible larger) should be accompanied by additional standard sizes to be included in 240-6.

(Log #1721)

10- 14 - (240-3(c)): Reject

SUBMITTER: Don Ganiere, Ottawa, IL

COMMENT ON PROPOSAL NO: 10-6

RECOMMENDATION: Accept this proposal in principle.

SUBSTANTIATION: The panel should give more consideration to the comments of Mr. Eldridge and Mr. Fredericks. Protecting circuits over 800 amps within 5% of the conductor ampacity would be at least as safe as allowing circuits under 800 amps to be protected at 15% above the conductor ampacity.

PANEL ACTION: Reject.

PANEL STATEMENT: See panel action and statement on Comment 10-13.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12

VOTE ON PANEL ACTION:

AFFIRMATIVE: 10

NEGATIVE: 2

EXPLANATION OF NEGATIVE:

FREDERICKS: See my Explanation of Negative vote on Comment 10-13.

MUNSON: I am voting negative against the panel action. See my explanation of negative vote on Comment 10-13.

COMMENT ON AFFIRMATIVE:

DOLLARD: See my Comment on Affirmative Vote on Comment 10-13.

(Log #419)

10- 15 - (240-4): Accept in Principle in Part

SUBMITTER: Dan Leaf, Palmdale, CA

COMMENT ON PROPOSAL NO: 10-14

RECOMMENDATION: Accept in Principle revised:

PROTECTION OF FLEXIBLE CORDS, FLEXIBLE CABLES and FIXTURE WIRES. Flexible cords and cables as covered in Article 400, including tinsel cords and extension cords, and fixture wires shall be protected against overcurrent by either (a) or (b).

(a) Flexible cords and cables shall be protected by an overcurrent device in accordance with ~~its~~ their ampacity as specified in Tables 400-5(A) and (B). Fixture wires shall be protected against overcurrent in accordance with their ampacities as specified in Table 402-5.

(b) BRANCH CIRCUIT OVERCURRENT DEVICE. Flexible cords and fixture wires shall be permitted to be protected by the branch-circuit overcurrent device in accordance with (1), (2), or (3) ~~one of the methods described below.~~

(1) No change
(2) No change
(3) No change

(c) PERMANENTLY CONNECTED. Where permitted to be permanently connected as branch-circuit or feeder conductors, flexible cords and cables shall be permitted to be protected in accordance with 240-3 (a), (b), and (g) as applicable.

SUBSTANTIATION: Tables 400-5(a) and (b) cover flexible cord and cables, which should be covered in the text. Since (b)(2) covers fixture wires it should be noted in the first paragraph of (b).

Since there are no sections in Articles 364, 430, 502, 503, 553, 555, 610, 620, 668 (where permanent connections are permitted) which specifically modify 240-4(a) the provisions of 240-3(a), (b), and (g) cannot be used. The next higher standard OPD rating cannot be used, for example, where a portable power cable supplies a floating building and has an ampacity which doesn't match standard ampere ratings of fuses and breakers.

A permanently connected flexible cord with an ampacity of 15, for a 460-volt 3-phase 7 1/2 HP motor would comply with 430-32 but if the motor is protected at 300 percent the flexible cord would be in violation of 240-4(a).

PANEL ACTION: Accept in Principle in Part.

The panel takes the following actions:

A. The panel accepts the addition of the words "Flexible Cables" in the title as shown in the comment.

B. The panel accepts in principle the submitter's suggested wording and revises the first sentence of existing 240-4 to read as follows:

"Flexible cord and flexible cable including tinsel cord and extension cords, and fixture wires shall be protected against overcurrent by either (a) or (b)."

C. The panel accepts in principle the proposed change to (a) as shown in the comment to read as follows:

"Flexible cord and flexible cable shall be protected by an overcurrent device in accordance with their ampacity as specified in Tables 400-5(A) and (B)." The remainder of (a) remains unchanged.

D. The panel does not accept the changes to (b) or the addition of (c) as shown in the comment.

PANEL STATEMENT: A. Editorial.

B. The panel action meets the intent of the submitter.

C. The panel action meets the intent of the submitter.

D. No technical substantiation has been provided for the proposed change in (b). Proposed (c) is redundant and is already covered in 240-4(a) which refers to Tables 400-5 (A) and (B).

The panel disagrees with the last paragraph of the submitter's substantiation because he limited his concern to the short-circuit protection only, and did not consider overload protection of the cord or cable provided by thermal protection or other means that may be part of the motor design.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #910)

10- 16 - (240-4(b)):

Note: The Technical Correlating Committee directs that Comments 10-16 and 10-17 and Proposal 10-15 be reported as "Hold". Based on the comments on the voting, it is clear that the panel does not have consensus on the intent of the revision. The Technical Correlating Committee notes that Mr. Brezan's comment on voting indicates that he changed his vote to affirmative contingent on Mr. Dollard's rewrite in his voting comment being accepted. However, the Technical Correlating Committee had no indication that the material proposed by Mr. Dollard has the consensus of the panel or represents the panel's intent. Due to the significance of the issue and the lack of a clear consensus, the Technical Correlating Committee is holding the material so that a full and complete review by the public and the panel can occur.

SUBMITTER: David A. Kerr, Jr., Friendsville, PA
COMMENT ON PROPOSAL NO: 10-15
RECOMMENDATION: Accept.

SUBSTANTIATION: The proposers, Mr. Dollard and Mr. Ockuly are right. Many fires are caused by cords and equipment that are barely protected. By 15 and 20 ampere branch circuit OCPD. Branch/feeder AFCI only provides minimal protection beyond the receptacle. The actual price at a local store is $38. British fused plugs would be a tiny fraction of the price and do a far better job. Other devices exist. Deletion of 1 and 3 might have truly massive effects in improving electrical safety. AFCI may not work and will probably get some inspector killed when people find out how expensive it is.

PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 8
NEGATIVE: 4

EXPLANATION OF NEGATIVE:

FREDERICKS: See my Explanation of negative vote on Comment 10-17.

KIMBLIN: See my Explanation of Negative vote on Comment 10-17.

MUNSON: I am voting against the panel action. See my Explanation of Negative vote on Comment 10-17.

ZAPLATOSCH: The proposal to delete 240-4(b)(1) and (b)(3) would require that all appliance and portable lamp power supply cords as well as extension cord sets (1) be protected against overcurrent at their ampacity per 240-4(a), or (2) have the size of the conductors increased such that they are protected by the branch circuit protective device. This action would necessitate UL to propose revisions to all product standards involving cord- and plug-connected appliances, portable lamps, and extension cords. Most products that currently do not have supplemental overcurrent protection would need to be redesigned to incorporate additional protection.

Substantiation was provided to the panel in the form of news service clippings. Although these reported incidents identified events involving cords, sufficient detail of the cord construction, age of the cord, and failure mechanism was not provided. It cannot be concluded from the substantiation that supplemental overcurrent protection would prevent these incidents.

COMMENT ON AFFIRMATIVE:

BREZAN: See my comment on affirmative vote on Comment 10-17.

BORTHICK: I believe the intent of the panel in removing 240-4(b)(1) and (3) is to remove from the NEC what is essentially a set of product standards.

240-4(b)(1) and (3) has generally been unenforceable by inspection authorities in the field and instead compliance has been via listing and labeling by testing agencies such as UL. Special variances, albeit based on extensive testing and/or other technical substantiation, are a product standards issue and do not belong in the NEC. Deletion of these sections from the NEC should allow UL and the other testing agencies to revise their product standards thus allowing acceptance of safe products that meet current safety criteria and also to expand aceptance to those products that include emerging technologies such as arc-fault circuit interrupters.

I agree with Mr. Dollard's comments on affirmative vote. I would ask, however, does his proposal to modify 240-4 contain replications of provisions that are set forth in Articles 90, 100, and 110?

DEATON: The intent of the panel was that protection requirements for flexible appliance cords and flexible extension cords be covered by the appropriate product standards and listing requirements. The revised text that accompanied the panel action, however, has been taken to imply that 240-4 specifically requires all such cords to be protected at their ampacities, which is a totally different meaning. Mr. Dollard has proposed text for 240-4 which clears up the matter. The text is repeated here:

240-4. Protection of Flexible Cords, Flexible Cables, and Fixture Wires.

(a) Flexible Cord, Flexible Cable, and Tinsel Cord. Flexible cord, flexible cable, and tinsel cord shall be protected by an overcurrent device in accordance with its ampacity as specified in Tables 400-5(A) and (B).

Exception No. 1: Flexible cords, flexible cable, and tinsel cord approved for and used with specific listed appliances or portable lamps.

Exception No. 2: Flexible cord used in listed extension cord sets.

(b) Fixture Wires. Firxture wires shall be protected against overcurrent in accordance with their ampacity as specified in Table 400-5.

Exception: Fixture wire shall be permitted to be tapped to the branch circuit conductor of a branch circuit of Article 210 in accordance with the following:

20-ampere circuits - 18 AWG 15.2 m (50 ft) of run length.
20-ampere circuits - 16 AWG 30.5 m (100 ft) of run length.
20-ampere circuits - 14 AWG and larger.
30-ampere circuits - 14 AWG and larger.
40-ampere circuits - 12 AWG and larger.
50-ampere circuits - 12 AWG and larger.

(c) Supplementary Overcurrent Protection. Supplementary overcurrent protection as in Section 240-10 shall be permitted to be an acceptable means to provide this protection.

DOLLARD: I am voting affirmative on the panel action to accept comment 10-16.

My comments are as follows:

It was the consensus of Panel 10 to remove 240-4(b) (1) and (3) from the text of 240-4. However, after removing this material the remaining text of 240-4 infers that flexible cords for appliances and extension cords must be protected at their ampacities.

This is not the intent of the Panel. Rather it is the desire of the Panel that protection requirements for appliance cords and extension cords be covered by the appropriate product standards and associated listing requirements.

The TCC is requested to modify the text in 240-4 as follows to meet the exact intent of the Panel:

240-4. Protection of Flexible Cords, Flexible Cables, and Fixture Wires.

(a) Flexible Cord, Flexible Cable, and Tinsel Cord. Flexible cord, flexible cable, and tinsel cord shall be protected by an overcurrent device in accordance with its ampacity as specified in Tables 400-5 (A) and (B).

Exception No. 1: Flexible cord, flexible cable, and tinsel cord approved for and used with specific listed appliances or portable lamps.

Exception No. 2: Flexible cord used in listed extension cord sets.

(b) Fixture Wires. Fixture wires shall be protected against overcurrent in accordance with their ampacity as specified in Table 402-5.

Exception: Fixture wire shall be permitted to be tapped to the branch circuit conductor of a branch circuit of Article 210 in accordance with the following:

20-ampere circuits – 18 AWG 15.2 m (50 ft) of run length
20-ampere circuits – 16 AWG 30.5 m (100 ft) of run length
20-ampere circuits – 14 AWG and larger
30-ampere circuits – 14 AWG and larger
40-ampere circuits – 12 AWG and larger
50-ampere circuits – 12 AWG and larger

(c) Supplementary Overcurrent Protection. Supplementary overcurrent protection as in Section 240-10, shall be permitted to be an acceptable means for providing this protection.

JHONSON: I agree with Mr. Dollard's comment on affirmative.

OCKULY: I am voting in the affirmative; however, the resulting text in 240-4 after removing subsections 240-4(b)(1) and (3) may be misleading. I believe the intent of the panel was to require product standards, not the NEC to address the protection, suitability and proper use of appliance cords and extension cords. I support the proposed language to modify the text of 240-4 as suggested by Panel Chairman James Dollard and contained in his comment and reasons on affirmative vote. Mr. Dollard's proposed text clarifies the intent of the changes discussed by the panel members during the ROC meeting in Phoenix in December 2000.

(Log #1793)

10- 17 - (240-4(b)):

Note: The Technical Correlating Committee directs that this Comment be reported as "Hold". See Technical Correlating Committee action on Comment 10-16.

SUBMITTER: Vincent J. Saporita, Cooper Bussmann

COMMENT ON PROPOSAL NO: 10-15

RECOMMENDATION: Panel 10 should accept this proposal.

SUBSTANTIATION: Protection of appliance and equipment power cords is a product standards issue. The NEC should not interfere with requirement that are inherently part of the product safety standard.

Twice, the panel statement refers to inadequate substantiation. Per the panel's request, substantiation in the form of two clipping services is provided. The first from 1981 is strikingly similar to the one recorded earlier this year. Both clipping services recorded reported fires that were started by various types of cords. In the three month period from April through June 1981, there were 60 fires reported to have been started by electrical cords. Almost 20 years later, from May through July of 2000, there were 63 similar fires reported. Unfortunately it appears that we have done little as an industry to prevent these types of fires. It is quite obvious that the existing practices are not working. Something needs to be done and AFCI's are a good start, but they do nothing for the millions of existing homes. By removing this long standing erroneous practice of assuming protection for small conductors from the NEC, the determination of "product safety" will rest with UL, where it belongs. the NEC has no business writing requirements for products that are not part of the fixed wiring system. Let UL write the rules on product safety.

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

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12

VOTE ON PANEL ACTION:

AFFIRMATIVE: 8
NEGATIVE: 4

EXPLANATION OF NEGATIVE:

FREDERICKS: I don't believe the panel action will result in what the majority of the panel was hoping to achieve, The panel action should be reconsidered, perhaps by a task group during the next Code cycle.

What I heard during the panel meetings was that a majority of the panel wanted to remove listed appliance and extension cords from the scope of the NEC and let the product standards organizations determine what the safety requirements for these cords should be. I tend to accept this idea in principle myself, though the ramifications of such a major change should be considered very carefully first.

There was also an expressed hope at the panel meetings that further testing and product development would result in long-term improvements to the safety performance of these cords. The goal of moving the requirements for these cords to the listing agencies was also stated as the commenter's intent.

However, this transfer of cord requirements to the product standards organizations is not what the comment, and the panel action in accepting it, has really accomplished. The proposal left the first sentence of 240-4 intact, which results in effectively requiring that all cords be protected at their NEC ampacity, including protection by a supplementary overcurrent device, such as a fuse or a thermal overload. Whether or not that text is enforceable by inspectors, it should be considered that the product standards organizations may not ignore this new NEC requirement in future listing requirements. In fact, their historical performance suggests that they would follow the NEC as a minimum. So the proposal has not removed overcurrent protection requirements for cords from the scope of the NEC. It has in fact added new and unsubstantiated requirements, which the product standards organizations would undoubtedly feel required to follow. Conscientious code users would likely also follow this NEC requirement, whether or not they were required to by inspectors. I think it is also very possible that some makers of supplemental overcurrent protection would use the new code text to actively push for the above two effects.

The substantiation provided with the comment, consisting of newspaper quotes stating the alleged causes of a limited number of fires, did not have any statistical merit or contribute any new technical information. All it established is that cords continue to be associated with certain fire losses, which is already a well known fact. However, statistics quoted by the industry show a dramatic decrease in cord-related fires, over 40% in the last five years.

This is in the face of a significant increase in residential electricity usage, and a dramatic expansion of extension cord usage that has accompanied the rapid proliferation of home electronics and continued expanded usage of other home electrical devices.

It seems clear that earlier NEC requirement changes (which have been followed by UL) and other improvements undertaken by the cord manufacturers have already had a dramatic impact in improving fire safety, even though many cords that do not meet present NEC and UL requirements are still in use.

Also, neither the original submitter nor the commenter provided any evidence that fusing present NEC-compliant cords at their ampacity will have any measurable safety benefit. Any safety benefit from fusing a damaged cord at its NEC ampacity seems doubtful, since the proposed new requirements could be met with a 13 amp fuse (or even a 13 amp thermal overload device) for a #16 cord. The substantiation provided with the earlier AFCI proposals demonstrated that branch circuit overcurrent devices as small as 15 amps cannot begin to protect against fires caused by low-level arcing faults involving these cords. Based on the data presented, it seems very doubtful that this situation will be any better with protection at 13 amps. Also, no evidence was provided that an intact cord is not already protected by the existing rules.

So to summarize, we have no evidence that the proposal improves fire safety at all for either damaged or intact cords. This could be an enormously expensive change, and it has not been supported with any technically substantiated safety benefit, so I am voting against it.

If the panel wishes to leave these cords out of the NEC, it should consider modifying the rest of 240-4 to fully effect this. If the panel instead really wishes to require that these cords be protected at

their NEC ampacity, it should first look for technical substantiation that proves a commensurate safety benefit.

If this proposal continues to pass, a TIA should be undertaken to correlate the code text vs. the majority of the panel's intent.

KIMBLIN: The substantiation provided seems to indicate that misuse of or physical damage to cords cause problems but does not substantiate an issue with the ampacity of cords. NEMA is opposed to the panel action. The panel has acted on anecdotal substantiation without consideration of the past changes that have been made to address protection of cords. During the processing of the 1984 NEC, an Ad-Hoc Committee on Control Circuit Protection was formed. This committee investigated the same type of data that was presented to Code-Making Panel 10. After much discussion, and an extensive Fact-Finding study, revisions were incorporated into the NEC. After much deliberation by the Code-Making Panel, revisions were made to 240-4 that are basically reflected in the present language.

Appliance and Portable Lamp Cords. The Ad-Hoc committee found, after investigating the field incidents, that the appliance cords rated #18 AWG and larger are appropriately protected by the 20A overcurrent device. Appliances and portable lamps are a known load on the cord so overload is not of a concern. Proper short-circuit protection of the cord is afforded by the 20A branch circuit overcurrent device. The committee acknowledged at that time that arcing faults may not be protected by the branch overcurrent device, but also acknowledged that supplemental protection at the cord ampacity would not address those arcing faults either.

Extension Cords. The Ad-Hoc committee noted that there was an issue with overloading of extension cords. This led to the change that required that extension cords be a minimum of #16 AWG and also led UL to eliminate the use of type SPT-1 cords. They noted that most of the field data involving alleged fires were using #18 AWG SPT-1 cord. Code-Making Panel 10 has not been presented any data to indicate that the field problem still exists with the minimum #16AWG and the use of type SPT-2 cord. In effect, Code-Making Panel 10 has analyzed the same data as the Ad-Hoc committee did in the early 1980's and has imposed a remedy without consideration of the earlier changes.

It was mentioned at the panel meeting that code language should be enforceable. Enforceability is not limited to the field inspector. The code does influence requirements in the product standards, particularly at the interface point between the infrastructure wiring and items such as appliances. The present language is enforced through appropriate coordination of the product standards. NEMA contends that the real issue at hand is one of consumer education. In order to raise public awareness about the dangers of misuse and abuse of extension cords, UL in 1995 upon a recommendation from NEMA, instituted requirements in the cord set and power-supply cord product standard UL 817, for warning tags for all general-use extension cords. These tags warn consumers not to use damaged cords, not to plug more than the specified number of watts into a cord, not to run a cord through doorways or ceilings, to fully insert the plug, as well as numerous other important warnings. Has the public benefited from these warning tags? Since 1995, electrical cord fires, according to CPSC statistics, were reduced from 3700 in 1995, to 2500 in 1996, to 2200 in 1997, that last year for which data were available. This represents a 41% decrease in this time span, the largest decrease of any of the causes of fire associated with electrical distribution equipment that are categorized.

With respect to Mr. Dollard's Comment on Affirmative that appeared during the recirculation of ballots, the TCC should consider that the suggested code changes in that Comment introduce new material. In particular, if this new material is necessary to complete the code change as envisaged by the majority of the panel, then the TCC should Reject or at least Hold Comments 10-16 and 10-17. Thus, Mr. Dollard, in his Comment on Affirmative, has requested that the TCC modify the overall text of 240-4 to meet the intent of the Panel. He states that the present code changes infer that flexible cords for appliances and extension cords must be protected at their ampacities and that this is counter to the panel's intent. However, the original proposal, number 10-15 by Randall Kirkman of Energy, IL, dealt solely with the deletion of items (1) and (3) from 240-4(b). The intent was indeed to require protection of small cords at their ampacity. As with Proposal 10-15, Comments 10-16 and 10-17 solely request deletion of items 240-4(b)(1) and 240-4(b)(3). Mr. Dollard's request to the TCC in his Affirmative Comment, however, is to make additional code changes, not sanctioned word for word by the panel, to bring the code language into line with the commentor's intent rather than the proposer's intent. The significant code language changes in Mr. Dollard's Affirmative Comment are considered inappropriate at this stage of the panel decision making process. These suggested code changes have not received thorough discussion at either the Proposal or Comment Code Panel Meetings.

MUNSON: I am voting negative against the panel action. The panel action to prohibit the tapping of appliance and lamp cords of 18 and 16 AWG and extension cords of 16 AWG to the premises wiring system will force a redesign of virtually every consumer cord connected product, and in addition, a number of permanently connected products as well.

Comment 10-17 presented documentation to support the original Proposal 10-15. The documentation is from news clipping services. The reports do not represent any forensic evaluation by experts, nor do they give any final outcome of the event. Yes, there were reported loss. The raw undocumented reports had language such as "damaged cords, frayed wires, thought to have started in, may have started, etc."

In looking at the documentation, it describes 60 fires for a reporting period in 1981, and 63 fires for a similar reporting period in 2000. Given the enormous increase in the use of appliance cord sets for computers, printers, scanners, power tools, etc, since 1981, it would indicate that the fires attributed to extension cords and appliance cords have actually declined.

One reason for the reduction in fires is that extension cords and cordsets have been steadily improved over the last 19 years. Today there is more use of double insulated extension cords and appliance cordsets. There has been a significant improvement in the parallel conductor (ripcord) cords used in lamps and small appliances. Extension cords come with a label warning about misuse.

Let's look at some of the implications of the panel's action. First, the obvious solution, where possible, is to attach a 14 AWG cord to all cord connected appliances and lamps and only produce 14 AWG extension cords. There will still be fires from abused, frayed or damaged cords. Unfortunately, adding a 14 AWG cord set to the appliance is not as simple as it seems. Section 240-4(b)(1) and (3) permitted an 18 and 16 gauge wire to be protected by a 20 ampere OCPD. Within the appliance, there will be 18 and 16 gauge wiring to the various components. This wiring is "tapped" to the 14 AWG appliance cordset. For example, a clothes washer may have 16 gauge wire to the motor and 18 gauge wiring to the valves and controls. These wires will have met all of the current product tests for safety; however, since the NEC no longer permits these wires to be protected by 20 ampere OCPDs the smaller wiring will be required to have additional overcurrent protection. The protection will have to be rated for branch circuit not supplemental since the permissive language that was in 240-4(b)(1) and (3) that permitted the tap, has been removed from the NEC. The obvious solution then is to wire all appliances with 14 AWG wiring. The problem not all motors, valves, printed circuits can be terminated to a 14 AWG wire.

In the substantiation to the original Proposal 10-15, the author suggested that the AFCI would be added to appliances, lamps and extension cords. While the work done to develop the AFCI was remarkable and represented a real breakthrough in being able to detect an arc signature, it is unclear if the product, in its present form, will work on all appliances, extension cords and lamps. The AFCI will have to be rated as branch circuit overcurrent protection for 18 and 16 AWG wiring not supplemental protection, since Code-Making Panel 10 no longer permits these taps.

If we accept the belief that the issue is about failures of extension cords and appliance and lamp cordsets, and not an attempt to sell some plug end product by legislation, the panel needs to set up a task group to examine cord usage and write appropriate code language that will promote safe applications. One size may not fit all.

ZAPLATOSCH: See my explanation of negative vote on Comment 10-16.

COMMENT ON AFFIRMATIVE:

BREZAN: I would like my change my vote on Comment 10-17 from negative to affirmative contingent on the comment on the affirmative received from the Panel Chair, James Dollard. In my original comment on Comment 10-17, I stated that I felt the panel was moving in the right direction, but it required additional language to prevent a serious problem for the manufacturing industry. I believe the correction to Article 240, as presented by Mr. Dollard, will remove the impression the panel wanted fuses installed in the cords. With this clarification by Mr. Dollard, I feel the panel's intent will be properly worded. This will also remove the part that is not enforceable by the inspection community.

BORTHRICK: See my comment on affirmative vote on Comment 10-16.

DOLLARD: See my Comment on Affirmative Vote on Comment 10-16.

DEATON: See my Comment on Affirmative Vote on Comment 10-16.

ELDRIDGE: By making this change, an unenforceable provision is removed from the National Electrical Code, and the premises wiring system. The requirements for protection are now placed in the hands of a third party such as UL to evaluate. Appliance cords and extension cords will have to meet whatever product standards the third party develops and has evaluated for the continuing safety of homes and businesses.

It is without question that smaller extension cords and some appliance cords are still causing fires even though the smallest (#18) has been eliminated. The reason for the elimination of the provision in (1) and (3) is to throw the safety of these cords into the hands of the product standards. The panel is very concerned with the safety in residential occupancies and the unenforceable provisions. Most of the extension cords and appliance cords are used in dwelling units and that is where most fatal fires occur. Deletion of (1) and (3) will not affect commercial and/or industrial machinery and equipment.

Since most dwelling unit fires start past the receptacle, the new AFCI devices will be a tremendous help in stemming these fires. However, older homes have very few receptacles in comparison to the new ones – sometimes just a single receptacle in a bedroom. This demands the use of extension cords just to be able to use the home. Of course the proper solution is to install a permanent receptacle where it is needed. I think we all know that is not done in most cases.

This action is causing a big stir in the extension and appliance cord industry. This is understandable since they cannot just make their cords, sized for the load and the National Electrical Code,, and just plug them into the nearest receptacle.

The prime reason given to me for not doing this at this time is the requirement given in 240-4 "Flexible cord, including tinsel cord and extension cords, and fixture wires shall be protected against overcurrent by either (a) or (b)." Since (1) and (3) are being removed, only (2) remains and doesn't apply to flexible cord and extension cord, the main rule then must be applied. The main rule would then require that (a) would be the only means of protection for flexible cords and extension cords. This would require protection in accordance with Tables 400-5(A) and would require an overcurrent device inserted in every plug to comply.

I agree the wording can be interpreted in that manner; however, it is the panel's intent that the product standards be written to indicate what is safe for a particular cord. If a product is used in a manner consistent with its listing and labeling, it is Code compliant. I also believe the insertion of overcurrent devices in cords will not reduce fires. The insertion of AFCI type devices will reduce fires, however. It also needs to be said that no single device will protect from all fires due to cords.

Modern flexible appliance and extension cords are much safer than the older cords that would dry out and the insulation break when the cord was flexed. The insulation materials are thicker, more pliable, and longer lasting. The conductor size is larger or protected by supplementary OC protection or the load.

I believe this will cost the residential consumer as one of several actions is implemented for all new extension cords and some appliance cords. I do not believe the cost will be unbearable the same as the cost for a hair dryer is not unbearable. A hair dryer has a GFCI, immersion protection, and over heat protection. I would assume a new clock radio would be required to have an AFCI and will cost a couple of dollars more after the development costs have been recovered and mass production and competition take over.

I support the proposed language to modify the text of 240-4 as suggested by Panel Chairman James Dollard and contained in his comments on affirmative vote. Mr. Dollard's proposed text clarifies the intent of the changes discussed by the panel during the ROC meetinging in Phoenix in December 2000.

JHONSON: I agree with Mr. Dollard's comment on affirmative on Comment 10-16.

OCKULY: I am voting in the affirmative; however, the resulting text in 240-4 after removing subsections 240-4(b)(1) and (3) may be misleading. I believe the intent of the panel was to require product standards, not the NEC to address the protection, suitability and proper use of appliance cords and extension cords. I support the proposed language to modify the text of 240-4 as suggested by Panel Chairman James Dollard and contained in his comment and reasons on affirmative vote. Mr. Dollard's proposed text clarifies the intent of the changes discussed by the panel members during the ROC meeting in Phoenix in December 2000.

(Log #1478)

10- 18 - (240-12): Reject

SUBMITTER: Diane Ricotta, Ft. Worth, TX

COMMENT ON PROPOSAL NO: 10-22

RECOMMENDATION: Revise the proposal to read as follows:

240-12. Electrical System Coordination. Where an orderly shutdown is required to minimize the hazard(s) to personnel and equipment, a system of coordination based on the following two conditions shall be required.

1. Coordinated short-circuit protection.
2. Coordinated overload protection or overload indication based on monitoring systems or devices.

For the purposes of this section, coordination is defined as properly localizing an overcurrent condition to restrict outages to the equipment affected, accomplished by the choice of selective overcurrent protective devices.

FPN: The monitoring system is designed to cause the condition to go to alarm, leading to corrective action or an orderly shutdown, thereby minimizing personnel hazard and equipment damage.

SUBSTANTIATION: This revised wording is only slightly different than the existing text. The word "permitted" is replaced by "required" in the first sentence, in order to agree with the first part of the sentence, "Where an orderly shutdown is required to minimize the hazard(s) to personnel and equipment." The user is given a choice in (2), between coordinated overload protection and overload indication based upon monitoring systems. The word "fault" is replaced by "overcurrent" two times in the third paragraph because coordination, when required, is necessary for all overcurrents, not just faults. The FPN was changed to conform with the style manual.

PANEL ACTION: Reject.

PANEL STATEMENT: The intent of this section is permissive, and the suggested wording changes are inconsistent with this intent.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

(Log #1892)

10- 19 - (240-12): Reject

SUBMITTER: Michael I. Callanan, International Brotherhood of Electrical Workers

COMMENT ON PROPOSAL NO: 10-22

RECOMMENDATION: Accept this proposal in principle.

Accept this proposal in principle by deleting the phrase "overload and" from the first sentence of the proposal. The first sentence would then read, "Where an orderly shutdown is required to minimize the hazard(s) to personnel and equipment, the overcurrent protective devices shall be selectively coordinated for all values of available short-circuit current." The rest of the proposal remains unchanged.

SUBSTANTIATION: This is a safety issue. Where an orderly shutdown is required to minimize hazards, it should be mandatory. It should not be optional, as is currently allowed by 240-12. This above suggested wording to delete the phrase "overload and" covers the objection expressed by the panel in the panel statement. This comment represents the official position of the International Brotherhood of Electrical Workers Codes & Standards Committee.

PANEL ACTION: Reject.

PANEL STATEMENT: See panel action and statement on Comment 10-18.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

(Log #1955)

10- 20 - (240-13): Reject

SUBMITTER: Phil Simmons, Simmons Electrical Services

COMMENT ON PROPOSAL NO: 10-23

RECOMMENDATION: Delete this section and add these requirements to become a new Section 225-41.

SUBSTANTIATION: Part B of Article 225 deals with disconnecting means for buildings and structures on the premises that are supplied from a service in another building or structure. Section 240-13, which covers equipment ground fault protection requirements for building disconnecting means, should be located where the other requirements for building or structure

disconnecting means are located. This should improve the structure of the Code and make the Code more "user friendly."

The origin of ground-fault protection of equipment was when it was added to Section 230-95 for service equipment. Similar rules were added to Article 215 as many utility services are at primary voltages and transformers on-site reduce the voltage and phase arrangement to 480Y/277 with overcurrent devices rated 1000 amperes or more. The same hazard exists for feeders as for services. This addition "plugged a hole" in the Code as the equipment was supplied by feeders and not services. All the rules for building disconnecting means should be located at the same place in the Code.

PANEL ACTION: Reject.

PANEL STATEMENT: The general requirements for ground fault protection of non-service equipment belongs in Section 240-13. The panel agrees with Code-Making Panel 4's statement on Proposal 4-38.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

(Log #845)

10- 21 - (240-20(b)): Accept

Note: The Technical Correlating Committee directs that Proposal 10-26 and Comment 10-21 be reported as "Reject" because less than two-thirds of the members eligible to vote have voted in the affirmative.

SUBMITTER: Larry F. Miller, National Electrical Manufacturers Association (NEMA)

COMMENT ON PROPOSAL NO: 10-26

RECOMMENDATION: The panel should accept this proposal.

SUBSTANTIATION: NEMA supports the Code Making Panel's action on this proposal dealing with a circuit breaker issue. The tripping of individual poles in multi-pole circuit breakers results in the opening of all phases. This removes both current and voltage from the load. From the standpoint of safety, it is true that the handle of multi-pole circuit breakers still needs to be moved to the "off" position rather than the "tripped" position before the downstream circuit is investigated. The common trip capability provides additional safety.

From the standpoint of handle-tied single-pole circuit breakers, the consumer perceives that tripping of one pole will again cause all poles to open. The handle-ties certainly ensure that the multiple poles are switched to the "on" position together and to the "off" position together, however, handle ties will not ensure that all poles will open when one pole trips. Unless the circuit breakers have a common trip provision, the tripping for an individual circuit breaker for line-to-line loads can result in the presence of voltage at the load despite the fact that load-current has been interrupted.

The Code Making Panel's action correctly limits the use of handle-ties to common switching "on" "off" operations. The proposal exception still permits individual single-pole circuit breakers with handle-ties to be used for the protection for each ungrounded conductor of multiwire branch circuits that serve only single-phase, line-to-neutral loads. This is consistent since, for each of these loads, current interruption in any individual circuit will be accompanied by voltage removal.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12

VOTE ON PANEL ACTION:

AFFIRMATIVE: 7

NEGATIVE: 5

EXPLANATION OF NEGATIVE:

DOLLARD: I agree with the explanations of negative votes as written by Mr. Eldridge and Mr. Ockuly.

ELDRIDGE: See my explanation of negative vote on Comment 10-23.

FREDERICKS: The American Chemistry Council has reconsidered and determined that we agree with the reasons for negative voting that were given by Mr. Ockuly and Mr. Eldridge. In particular, we agree that inadequate substantiation of a practical safety problem was submitted to suport this change.

MUNSON: I am voting negative on the panel action. I support Mr. Ockuly's comment.

OCKULY: I vote negative on the panel action for the following reasons:

1. The initial Proposal 10-26 provided absolutely no evidence of a field problem existing in the application of single-pole circuit breakers with handle ties.

2. Single-pole breakers without handle ties were used for decades; i.e., 1940's through 1980's with no reported field incidents. The requirement for handle ties was added to the NEC to facilitate common disconnect requirements. The requirement for common trip circuit breakers for these applications is unnecessary, overly restrictive and levies an unwarranted cost upon the user with no proven benefit.

3. Application of single-pole circuit breakers with handle ties are recognized as a safe method of complying with NEC 240-20(b). See UL's "White Book" "General Information for Electrical Equipment-2000", page 10.

4. The documented long, safe history of applying single-pole circuit breakers (even without handle ties) speaks for itself. There is no justification to mandate common trip circuit breakers on single-phase line to line circuits.

(Log #908)

10- 22 - (240-20(b)):

Note: The Technical Correlating Committee directs that this Comment be reported as "Reject" because less than two-thirds of the members eligible to vote have voted in the affirmative. The Technical Correlating Committee directs that Proposal 10-26 and Comment 10-22 are both reported as "Reject".

SUBMITTER: David A. Kerr, Jr., Friendsville, PA

COMMENT ON PROPOSAL NO: 10-26

RECOMMENDATION: Terminate this proposal with extreme prejudice and never reintroduce it. Drive a stake through its heart.

SUBSTANTIATION: It's the same nonsense every three years. There has not been a shred of technical substantiation other than the handbook. That's like watching biblical movies. It's the tail wagging the dog. Meanwhile, Proposal 10-26a, item 3 seems to permit nonexistent unlisted breakers on 3 phase.

Neutrals don't exist.

PANEL ACTION: Reject.

PANEL STATEMENT: This is at least the third code cycle dealing with this issue. Previous technical substantiations have, indeed, dealt with specific field problems. It is noted that the submitter is also critical of Item 3 of Proposal 10-26a. This is essentially present code wording, and this proposal will remove the wording from the code.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12

VOTE ON PANEL ACTION:

AFFIRMATIVE: 7

NEGATIVE: 5

EXPLANATION OF NEGATIVE:

DOLLARD: See my explanation of negative vote on Comment 10-21.

ELDRIDGE: See my explanation of negative vote on Comment 10-23.

FREDERICKS: See my explanation of negative vote on Comment 10-21.

MUNSON: I am voting negative on the panel action. I support Mr. Ockuly's comment.

OCKULY: I vote negative on the panel action. See my explanation of negative vote on Comment 10-21.

(Log #1358)

10- 23 - (240-20(b)):

Note: The Technical Correlating Committee directs that Proposal 10-26 and Comment 10-23 be reported as "Reject" because less than two-thirds of the members eligible to vote have voted in the affirmative.

SUBMITTER: David P. Brown, Baltimore Gas and Electric Co/EEI

COMMENT ON PROPOSAL NO: 10-26

RECOMMENDATION: Accept the proposal in part, in principal.

SUBSTANTIATION: This proposal is another attempt by the circuit breaker manufacturers to remove 240-20(b)(2) and (3). This proposal should have added the words as follows, "Circuit breakers shall simultaneously open all ungrounded conductors of the circuit by means of a common trip mechanism unless otherwise permitted in (1), (2), or (3)." Common trip is used in the UL product standard and is recognized in the industry. The remaining portion shall remain unchanged, as the substantiation has presented no documented problems with handle ties. This is the same as trying to require common trip fuses.

This proposal has been presented with no substantiation other than to delete the two subsections to "provide better protection and to follow the National Fire Protection Association Handbook". If protection was the problem, why allow fuses to be used since they cannot be common trip. Circuit breakers with approved handle ties must be used on a grounded system. Is this any different than the way fuses are used with the same system? The ONLY reason for the

handle ties is to provide for common switching, the same as in the realm of safe fusing practices.

The question of safety was raised in the panel discussions. The failure of a load to continue to operate is not sufficient to determine that a circuit is dead and is a violation of all safety rules that I know of with or without common-trip breakers or fuses. It is not reasonable to assume a circuit is dead without testing for the presence of voltage.

I understand the cost of common trip circuit breakers is not much more than single pole breakers. Cost is not the problem. I have found that the cost of common trip circuit breakers is 15 percent to 30 percent over single pole circuit breakers without handle ties. It appears that this may be an attempt by the circuit breaker manufacturers to sell a more expensive product. Deleting (2) and (3) will require all line-to-line loads to have the more expensive "common trip" circuit breakers. In dwelling units this will include all 240-volt circuits.

PANEL ACTION: Reject.

PANEL STATEMENT: See panel action and statement on Comment 10-22.

Section 240-20(b) deals solely with the characteristics of circuit breakers. These devices typically open all poles simultaneously, both manually and automatically. For ungrounded systems, such circuit breakers must be common trip.

Fuses are not common trip, but they can also be used on ungrounded systems as they are recognized as fully rated single pole interrupting devices. Thus, the requirement of common trip circuit breakers on line-to-line loads on grounded systems will not impact the use of fuses for the same application.

Common trip circuit breakers provide additional safety to circuit breaker applications, since common trip is consistent with expected circuit breaker characteristics.

The submitter's proposed new wording adds no clarity.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12

VOTE ON PANEL ACTION:

AFFIRMATIVE: 7

NEGATIVE: 5

EXPLANATION OF NEGATIVE:

DOLLARD: See my explanation of negative vote on Comment 10-21.

ELDRIDGE: This Comment should have been Accept. Common trip is used in the UL product standard and is recognized in the industry. The substantiation has presented no documented problems with handle ties, which have been used safely for decades, even in dwelling units. This is the same as trying to require common trip fuses, which I suppose, will be next.

FREDERICKS: See my explanation of negative vote on Comment 10-21.

MUNSON: I am voting negative on the panel action. I support Mr. Ockuly's comment.

OCKULY: I vote negative on panel action. See my explanation of negative vote on Comment 10-21.

(Log #1464)

10- 24 - (240-20(b)):

Note: The Technical Correlating Committee directs that Proposal 10-26 and Comment 10-24 be reported as "Reject" because less than two-thirds of the members eligible to vote have voted in the affirmative.

SUBMITTER: Joseph Schomaker, St. Louis, MO

COMMENT ON PROPOSAL NO: 10-26

RECOMMENDATION: This proposal should be rejected.

SUBSTANTIATION: Absolutely no technical substantiation has been provided to justify a significant change in this Section. Circuit breakers with approved tie handles have safely and successfully been used for years. See Mr. Ockuly's comments in the ROP.

PANEL ACTION: Reject.

PANEL STATEMENT: See panel action and statement on Comment 10-23.

Substantiation was provided with Proposal 10-26 in the 2002 NEC ROP and Comment 10-21 in the 2002 NEC ROC, and relates to user expectation of circuit breaker characteristics.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12

VOTE ON PANEL ACTION:

AFFIRMATIVE: 7

NEGATIVE: 5

EXPLANATION OF NEGATIVE:

DOLLARD: See my explanation of negative vote on Comment 10-21.

ELDRIDGE: See my explanation of negative vote on Comment 10-23.

FREDERICKS: See my explanation of negative vote on Comment 10-21.

MUNSON: I am voting negative on the panel action. I support Mr. Ockuly's comment.

OCKULY: I vote negative on panel action. See my explanation of negative vote on Comment 10-21.

(Log #1520)

10- 25 - (240-20(b)):

Note: The Technical Correlating Committee directs that Proposal 10-26 and Comment 10-25 be reported as "Reject" because less than two-thirds of the members eligible to vote have voted in the affirmative.

SUBMITTER: Michael P. O'Quinn, MOGO Enterprises, Inc.

COMMENT ON PROPOSAL NO: 10-26

RECOMMENDATION: Delete the entire proposal; reinstate original wording of 240.20(b) with (1), (2) and (3).

SUBSTANTIATION: The proposal does not substantiate a safety problem with the use of handle ties on single-pole circuit breakers. The wording of the proposal's lone exception seems to allow handle ties in violation of 210.4(c), Exception No. 2.

The proposal does not substantiate why "common trip" is necessary with circuit breakers but not with fuses.

PANEL ACTION: Reject.

PANEL STATEMENT: See panel action and statement on Comment 10-23.

A consequence of removing Exception No. 2 of 240-20(b) in the existing code clarifies consistency with the switching requirement in existing Section 210-4(c), Exception No. 2.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12

VOTE ON PANEL ACTION:

AFFIRMATIVE: 7

NEGATIVE: 5

EXPLANATION OF NEGATIVE:

DOLLARD: See my explanation of negative vote on Comment 10-21.

ELDRIDGE: See my explanation of negative vote on Comment 10-23.

FREDERICKS: See my explanation of negative vote on Comment 10-21.

MUNSON: I am voting negative on the panel action. I support Mr. Ockuly's comment.

OCKULY: I vote negative on panel action. See my explanation of negative vote on Comment 10-21.

(Log #109)

10- 26 - (240-20(b)(1), (2), (3)): Accept

SUBMITTER: Technical Correlating Committee National Electrical Code

COMMENT ON PROPOSAL NO: 10-26a

RECOMMENDATION: It was the action of the Technical Correlating Committee that this Proposal be reconsidered and correlated with the action on Proposal 10-26. This action will be considered by the Panel as a Public Comment.

SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.

PANEL ACTION: Accept.

The panel accepts the action of the Technical Correlating Committee.

PANEL STATEMENT: See action on Comment 10-21.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

(Log #311)

10- 27 - (240-21(b)(5)): Reject

SUBMITTER: Roy T. Higa, Aiea, HI

COMMENT ON PROPOSAL NO: 10-30

RECOMMENDATION: If the panel reconsiders Proposal 10-30 and decides to accept it, whether it be in its original form or otherwise, recommend that parallel changes also be made to Section 240-21(c)(4).

SUBSTANTIATION: In the 1996 code, before Section 240-21 was broken up into two separate parts, one for feeder taps and the other for transformer secondary conductors, the rules for feeder

taps and transformer secondary conductors were combined under one section and the requirements were identical for both situations. When Section 240-21 was separated into two separate parts in the 1999 code, the requirement for feeder taps and transformer secondary conductors also stayed the same. Technically, there is no reason why it should not be the same. Therefore, if Section 240-21(b)(5) is changed, it stands to reason that similar changes should be made to Section 240-21(c)(4).
PANEL ACTION: Reject.
PANEL STATEMENT: The comment does not meet the requirements of 4-4.5(c) of the Regulations Governing Committee Projects.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #586)

10- 28 - (240-21(b)(5)): Reject
SUBMITTER: C. John Beck, Pacific Gas & Electric Co.
COMMENT ON PROPOSAL NO: 10-30
RECOMMENDATION: Proposal 10-30 should be accepted.
SUBSTANTIATION: Previously, the Technical Correlating Committee requested that Panel 4 review Panel 10's prior action on this subject and provide CMP 4's response in an effort to resolve the inconsistency between 225-33 and 240-21(b)(5). That was done. However, there continues to be a lack of coordination, which has resulted in continued confusion and conflict between the requirements and intent of the two sections and panels. CMP 4's position and intent was to treat the conductors as an extension of the distribution feeder. At issue, is the fact that what is being addressed is not internal premises wiring, but the fact that the conductors are forming part of an outdoor feeder distribution circuit and should be treated the same as service conductors.
Panel 10's continued portrayal of these conductors as taps is inconsistent with CMP 4's intended development and application for Section 225-33, much less Article 225. The proposal should be accepted.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel refers the submitter to its panel statement on Proposal 10-30 on Pages 240 and 241 of the 2002 NEC ROP.
Part H permits the use of six disconnects for qualifying supervised industrial installations.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 9
NEGATIVE: 3
EXPLANATION OF NEGATIVE:
ELDRIDGE: Mr. Beck is correct in his assessment. Panel 10 is treating all outside wiring as if it were under the purview of Panel 10 for overcurrent protection. By the definition of a tap in Article 240 and the definition of premises wiring in Article 100, Panel 10 is correct. However, Panel 10 is not correct in its treatment of the tap rules.
The tap feeder conductors are protected at the load end at their ampacity, the same as all taps. Short circuit and ground fault protection is provided at the source of the feeder. The tap conductors would be protected better if the overcurrent protection were in multiple overcurrent devices instead of a single overcurrent device because of the diversity. Overload, short circuit or a ground fault on the load side of the smaller overcurrent device would be of a smaller magnitude than if it were on the load side of a single, larger overcurrent device.
A change in ownership would not change the safety of the installation. Many times, a portion of the electric utility's distribution system is sold to its customer. At the instant of the sale, the customer is now in violation and is considered to have an unsafe installation. Ownership of the system does not make it safe or unsafe.
The following information was sent to Stanley D. Kahn, who was chairman of CMP 10 at the time, on Feb. 23, 1996. It was the outcome of a CMP 4 Task Group established at the direction of the Correlating Committee as the result of action on the part of Panel 10, which was considered outside its scope.
The following was CMP 4's unanimous Task Group Response to CMP 10:
"1. Substantiation referencing utility practices has no bearing on dictating changes to the requirements of the number of disconnects allowed for a feeder.
2. The number of disconnects referenced in Proposal 10-60 (this was Proposal 10-60 for the 1996 cycle) would be compatible with the requirements for a feeder found in Article 225. Six Disconnects installed at a location, in a single enclosure or in separate enclosures grouped together, would constitute a safe installation."
Copies of this were sent to Harold Ware, Don Strassburg (Task Group Chair), Mark Earley, and John Troglia.
Service conductors are permitted to be protected by up to six disconnecting means and there is no justification why feeders, which supply a building or other structure, should not be allowed the same measure of protection.
This has presented a problem of lack of coordination between Article 225 and 240 that will continue since it has not been addressed this code cycle. Since there is a conflict between these two Articles, the TCC should help resolve this issue.
FREDERICKS: See my Explanation of Negative vote on Comment 10-30.
MUNSON: I am voting negative against the panel action. I agree with the public comment. In addition, this section should be transferred to Code-Making Panel 4 for administrtion to eliminate the conflict between the two panels.

(Log #1359)

10- 29 - (240-21(b)(5)): Reject
SUBMITTER: David P. Brown, Baltimore Gas and Electric Co/EEI
COMMENT ON PROPOSAL NO: 10-30
RECOMMENDATION: Accept the proposal.
SUBSTANTIATION: The following information was sent to Stanley D. Kahn on February 23, 1996. It was the outcome of a Code-Making Panel 4 Task Group established at the direction of the Technical Correlating Committee as the result of action on the part of Panel 10 which was considered outside its scope.
The following was CodeMaking Panel 4's unanimous Task Group Response to Code-Making Panel 10:
1. Substantiation referencing utility practices has no bearing on dictating changes to the requirements of the number of disconnects allowed for a feeder.
2. The number of disconnects referenced in Proposal 10-60 (this was Proposal 10-60 for the 1996 cycle) would be compatible with the requirements for a feeder found in Article 225. Six disconnects installed at a location, in a single enclosure or in separate enclosures grouped together, would constitute a safe installation. Copies of this were sent to Harold Ware, Don Strassburg (Task Group Chair), Mark Earley, and John Troglia.
The Panel's statement regarding these conductors as taps is incorrect and the proposal should be accepted. Outside feeder taps must follow the other restrictions in 240-21(m), not just 240-21(m)(2). Service conductors are permitted to be protected by up to six disconnecting means and there is no justification why feeders, which supply a building or other structure, should not be allowed the same measure of protection.
This has presented a problem of lack of coordination between Sections 225-33 and 240-21(b)(5) that will continue if not addressed this code cycle. In addition, this issue needs to be resolved and correlated with Panel 4. Concerns have also been voiced about upgrades that would overload the tap. Any upgrade would have to be done in compliance with the NEC.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Comment 10-28.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 9
NEGATIVE: 3
EXPLANATION OF NEGATIVE:
ELDRIDGE: See my Explanation of Negative on Comment 10-28.
FREDERICKS: See my Explanation of Negative vote on Comment 10-30.
MUNSON: I am voting against the panel action. See my explanation of negative vote on Comment 10-28.

(Log #1388)

10- 30 - (240-21(b)(5)b): Reject
SUBMITTER: Kari Barrett, American Chemistry Council
COMMENT ON PROPOSAL NO: 10-31
RECOMMENDATION: The panel should have Accepted this proposal.
SUBSTANTIATION: The panel should consider that installations with from two to six grouped disconnects are presently allowed for feeders in Article 225, and for transformer secondary protection in

Article 450. The panel statement gave no justification for its claim that a single overcurrent device is required to limit the load at the end of the tap conductors and that this same effect could not be accomplished with up to six grouped overcurrent devices. Indeed, Articles 225 and 450 recognize this method of protection, so this panel action results in a lack of correlation with these articles.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel refers the submitter to its panel statement on Proposal 10-31 on Page 241 of the ROP.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 9
NEGATIVE: 3
EXPLANATION OF NEGATIVE:
ELDRIDGE: See my Explanation of Negative on Comment 10-28.
FREDERICKS: I'm voting against the panel action on this Comment, which should have been accepted. I don't believe the panel's earlier or present statements have given a good technical reason to maintain a miscorrelation vs. Articles 225 and 450. Supervised Industrial Installations under Part H are allowed an exception for six disconnect feeder tap installations, but only a very small percentage of installations qualify a Supervised Industrial Installations, unlike Services, which are universal.
MUNSON: I am voting against the panel action. See my explanation of negative vote on Comment 10-28.

(Log #587)

10- 31 - (240-21(c)(4)): Reject
SUBMITTER: C. John Beck, Pacific Gas & Electric Co.
COMMENT ON PROPOSAL NO: 10-39
RECOMMENDATION: Proposal 10-39 should be accepted.
SUBSTANTIATION: Previously, the Technical Correlating Committee requested that Panel 4 review Panel 10's prior action on this subject and provide CMP 4's response in an effort to resolve the inconsistency between 225-33 and 240-21(b)(5). This same issue applies to 240-21(c)(4). CMP 4 reviewed the material and responded to CMP 10 that the same requirements for services supplied by utilities should apply to these systems. CMP 4's comments and discussion was not directed toward internal building and structure systems. However, there continues to be a lack of coordination, which has resulted in continued confusion and conflict between the requirements and intents of the two sections and panels. CMP 4's position and intent was to treat the conductors as an extension of the distribution feeder. At issue, is the fact that what is being addressed is not internal premises wiring, but the fact that the conductors are forming part of an outdoor feeder distribution circuit and should be treated the same as utility distribution and service conductors.
Panel 10's continued portrayal of these conductors as taps is inconsistent with CMP 4's intended development and application of Section 225-33, much less Article 225. The proposal should be accepted.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel refers the submitter to its panel statement on Proposal 10-39 on Page 243 of the 2002 NEC ROP.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 9
NEGATIVE: 3
EXPLANATION OF NEGATIVE:
ELDRIDGE: See my Explanation of Negative on Comment 10-28.
FREDERICKS: See my Explanation of Negative vote on Comment 10-30.
MUNSON: I am voting against the panel action. See my explanation of negative vote on Comment 10-28.

(Log #1360)

10- 32 - (240-21(c)(4)): Reject
SUBMITTER: David P. Brown, Baltimore Gas and Electric Co/EEI
COMMENT ON PROPOSAL NO: 10-39
RECOMMENDATION: Accept the proposal.
SUBSTANTIATION: Proposal 10-39 should have been accepted. Addressing the panel statement, the tap feeder conductors are sized to carry the load and protected at their load end, the same as all taps. Short circuit and ground fault protection is provided at the source of the feeder. The tap conductors would be protected better if the overcurrent protection were in multiple overcurrent devices instead of a single overcurrent device because of the diversity. An overload, a short circuit or a ground fault on the load side of the smaller overcurrent device would have lesser effect on the tap conductors than if it were on the load side of a single, larger overcurrent device. The panel statement does not respond to these facts in its assertion that a single overcurrent device is necessary.
A change in ownership associated with the sale of a utility installation to a customer would not change the safety of the former service conductors, now classified as tap conductors.
The following information was sent to Stanley D. Kahn, who was chairman of Code-Making Panel 10 at the time, on February 23, 1996. It was the outcome of a Code-Making Panel 4 Task Group established at the direction of the Technical Correlating Committee as the result of action on the part of Panel 10, which was considered outside its scope.
The following was Code-Making Panel 4's unanimous Task Group Response to CMP 10:
1. Substantiation referencing utility practices has no bearing on dictating changes to the requirements of the number of disconnects allowed for a feeder.
2. The number of disconnects referenced in Proposal 10-60 (this was Proposal 10-60 for the 1996 cycle) would be compatible with the requirements for a feeder found in Article 225. Six disconnects installed at a location, in a single enclosure or in separate enclosures grouped together, would constitute a safe installation. Copies of this were sent to Harold Ware, Don Strassburg, (Task Group Chair), Mark Earley, and John Troglia.
The Panel's statement regarding these conductors as taps is incorrect and the proposal should be accepted. Service conductors are permitted to be protected by up to six disconnecting means and there is no justification why feeders, which supply a building or other structure, should not be allowed the same measure of protection. This has presented a problem of lack of coordination between Sections 225-33 and 240-21(b)(5) that will continue if not addressed this code cycle. In addition, this issue needs to be resolved and correlated with Code-Making Panel 4.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel refers the submitter to its panel statement on Proposal 10-39 on Page 243 of the 2002 NEC ROP.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 9
NEGATIVE: 3
EXPLANATION OF NEGATIVE:
ELDRIDGE: See my Explanation of Negative on Comment 10-28.
FREDERICKS: See my Explanation of Negative vote on Comment 10-30.
MUNSON: I am voting against the panel action. See my explanation of negative vote on Comment 10-28.

(Log #2058)

10- 33 - (240-24(b)): Reject
SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc.
COMMENT ON PROPOSAL NO: 10-41a
RECOMMENDATION: Revise text as follows:
(b) Occupancy. Each occupant shall have ready access to all overcurrent devices protecting the conductors supplying that occupancy, unless electric service and electrical maintenance are provided by the building management and these are under continuous building management supervision, but limited to the circumstances described in (1) or (2).
(1) Service and Feeder Overcurrent Devices. In multiple occupancy buildings and for guest rooms of hotels and motels that are intended for transient occupancy, each occupant shall not be required to have access to the service overcurrent devices and feeder overcurrent devices supplying more than one occupancy or room.
(2) Branch-Circuit Overcurrent Devices. For guest rooms of hotels and motels that are intended for transient occupancy, each occupant shall not be required to have access to the branch-circuit overcurrent devices supplying guest rooms.
SUBSTANTIATION: This comment responds to a desire expressed at the panel meeting for a coherent restructuring of these rules in positive language.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel appreciates the submitter's attempt to put this section into positive language; however, the language in Proposal 10-41a is easier to read and understand.
The panel reaffirms that the wording developed in proposal 10-41a is preferable.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12

VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #110)

10- 34 - (240-24(b), Exception):

Note: The Technical Correlating Committee directs that the action on this Comment and Proposal 10-42 be reported as "Hold" to correlate with the Technical Correlating Committee action on Comment 4-74.

SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 10-42
RECOMMENDATION: It was the action of the Technical Correlating Committee that this Proposal be reconsidered and correlated with the action on Proposal 4-122. This action will be considered by the Panel as a Public Comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
The panel accepts the action of the Technical Correlating Committee, however, continues to reject Proposal 10-42.
PANEL STATEMENT: Adequate substantiation has not been provided to show that the change in Proposal 10-42 is necessary. Evidence of unsafe practices due to the present code language has not been presented. The panel reaffirms its position of rejecting the proposal.

Other provisions can be made, such as building a separate room in the structure or moving the overcurrent protective devices outside the building.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #1995)

10- 35 - (240-24(b), Exception): Reject
SUBMITTER: William F. Laidler, Rep. Massachusetts Electrical Code Advisory Committee
COMMENT ON PROPOSAL NO: 10-42
RECOMMENDATION: Accept the proposal.
SUBSTANTIATION: The Advisory Committee wishes to provide additional substantiation to support reconsideration of the original action on this proposal, as directed by the Technical Correlating Committee.

In the original submittal, the submitter lists only one example of an installation where the exception would allow an installation of service equipment without tenant access to the main service disconnect.

In the interest of safety, it is the ongoing opinion of the Massachusetts Electrical Code Advisory Committee, that in certain installations, tenants should in fact not have access to the main service disconnecting means. For example, mixed-use occupancies with large service ampacity located behind a mechanical room in the basement would be an area where one would not want a tenant venturing in the interest of safety as a matter of right.

By retaining this exception, Code-Making Panel 10 will allow designers and installers to create safer installations of service equipment, without seeking special permission from the Authority Having Jurisdiction as allowed in 90-4.

This exception does not preclude the tenant from having a disconnecting means within their occupancy, or another location to which he/she has access.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Comment 10-34.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #371)

10- 36 - (240-40): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
COMMENT ON PROPOSAL NO: 10-47
RECOMMENDATION: Accept in principle revised: Disconnecting means for FUSES. A disconnecting means shall be provided on the supply side of all fuses in circuits of over 150 volts to ground, and cartridge fuses in circuits of any voltage where accessible to other than qualified persons, so that each ~~individual circuit containing~~ set of fuses can be individually disconnected from the source of power.
SUBSTANTIATION: The Style Manual requires terms to be specific and clear. The literal wording only applies this rule to fuses of each "individual circuit"; as defined in Article one outlet. A comma after "ground" will limit the "other than qualified persons" to cartridge fuses.
PANEL ACTION: Reject.
PANEL STATEMENT: The proposed change would require individual disconnects on each set of fuses even when installed as multiple units on a single branch circuit, for example, for fuses protecting a control transformer that is part of a motor branch circuit. The disconnect requirements for each circuit adequately meet safety needs.

The panel does not agree that the addition of a comma after the word "ground" would add clarity.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #1264)

10- 37 - (240-83(a)): Reject
SUBMITTER: David A. Kerr, Jr., Friendsville, PA
COMMENT ON PROPOSAL NO: 10-49
RECOMMENDATION: Accept. Change to "marked in white or other contrasting color".
SUBSTANTIATION: Black on black is invisible. The Code demands that the ampere rating be durable and visible after installation. The certifiers clearly are not doing their job. It is right and proper for the Code to drive UL. The Manufacturers are too cheap to spend another penny to do it right.
PANEL ACTION: Reject.
PANEL STATEMENT: No new information has been provided. Section 240-83 is already clear concerning visibility requirements. The product standard also contains visibility requirements. The panel refers the submitter to UL 489.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #353)

10- 38 - (240-83(c)):

Note: The Technical Correlating Committee directs that Proposal 10-50 and Comment 10-38 be reported as "Reject" because less than two-thirds of the members eligible to vote have voted in the affirmative.

SUBMITTER: Jerome W. Seigel, West Hartford, CT
COMMENT ON PROPOSAL NO: 10-50
RECOMMENDATION: This Proposal should be rejected and no change be made to the present wording of 240-83(c). (240-86)
SUBSTANTIATION: This approach will not increase the safety of the system and could actually compromise the intended increase in safety.

This approach is actually working around the problem and not fixing the problem caused by a required increase of the service which in turn causes an increase in the available fault current to the total installation. The way to fix the problem is to either replace the equipment which has been claimed to "cause an excessive waste of dollars and resources" or to isolate the existing equipment from the new increased service and equipment. The isolation could be done through the use of a 1:1 transformer or by inserting additional impedance between the new service and the existing equipment to reduce the available fault current at the existing equipment. This a much better and safer engineering approach than that proposed.

I had the privilege to attend the January meeting of Panel 10 as a guest and was surprised that in all the time this subject has been in discussion that there had been no testing done to either prove or

disprove that this type of analytical approach would work. In addition there was no fact finding report in this area.

There just is no technical substantiation behind this proposal.

PANEL ACTION: Reject.

PANEL STATEMENT: See panel action on Comment 10-56. The IEEE Recommended Practice for Applying Low-Voltage Circuit Breakers Used in Industrial and Commercial Power Systems was approved by the IEEE Standards Board on February 10, 1997. In Chapter 4, Specific Applications, of that standard in Section 4-4, Selection Approach for Electrical Ratings, paragraph (d) states: "In cases where increases in available short-circuit current necessitates a system upgrade, a second approach shown in Figure 4- 4, may be used for retrofitting existing older systems where a recognized series rating is not available. A line-side current-limiting circuit breaker or fuses, which limits peak current and let-through energy, may be added, only if the existing load side breakers do not exhibit dynamic impedance within the first half cycle. The distribution of short-circuit energy is shifted away from the slower, load-side circuit breaker to the higher speed current-limiting device. The downstream circuit breaker is then subject to no more short-circuit energy than its ratings."

Care should be exercised when introducing inductive reactance into the system as it may, in some cases, cause the breaker X/R rating to be exceeded.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12

VOTE ON PANEL ACTION:

AFFIRMATIVE: 7

NEGATIVE: 5

EXPLANATION OF NEGATIVE:

BORTHICK: My concerns about misapplication by engineers who are not specialized in this arena have caused my opposition to this series rating issue. I would have felt more at ease had these changes been placed in Section H where these applications are less rare, have a historical basis, and the engineering staffs are comprised of more experienced engineers who realize the ramifications of their actions.

My concern is for the general application of these calculations by Bubba's Engineering Services whose less experienced, albeit licensed, engineers don't realize when they are out of their depths.

I can't help but be concerned knowing the number of engineer stamped and AHJ approved plans I've seen that contain various code violations. These have included but have not been limited to:

a. undersized feeder and circuit conductors versus load and or specified voltage drop limitations

b. undersized equipment grounding conductors versus circuit conductor size

c. undersized grounding electrode conductors - I do especially like the more recent notations that appear on plans that simply state "size per the NEC" so that the electrician can properly size the conductors

d. insufficient 110-26(a) clearance requirements

e. conduits undersized for the contained conductors

f. 480 volt three-phase fountain pumps specified in violation of 680-51(b)

g. relocation of main breaker panelboards from immediately adjacent to the supply transformer to 60 feet away without an OCPD between

h. This is my absolute favorite. The engineers had on the plans to run a 480 volt three-phase four-wire feeder that was fed from a 480 volt ungrounded delta main panelboard. Even when standing below the transformer bank, these engineers couldn't recognize that the configuration was not a wye. After being convinced that it was indeed a delta , they insisted that I could somehow reconnect the secondaries into a wye and derive a neutral. Of course, the final resolution was for the electrical contractor to "just fix it" and send the change order through for approval

i. acceptance of panelboards rated for 120/208 volt 3-phase, 4-wire on a 120/240 volt 3-phase, 4-wire system. Of course, the branch breakers were rated 120/240 volt and some of these were installed on the "high leg" and were serving single-phase 240 volt loads

My observations in the field, some of which I listed above, have led to my unwavering confidence in engineers in general. Item (i) above leads to further concern on my part. During the panel discussion of comments 10-48 et al, that concerned the single-pole ratings of circuit breakers, concerns were voiced (by proponents of engineered series-ratings) that misapplication might be made by some engineers. Will the same engineers who misapply single-pole ratings also be the ones who decide when a downstream breaker is passive?

Many arguments were presented during the panel discussions. One was that ALL licensed professional engineers are competent and that their ethics would not permit them to jeopardize their licenses via misapplication. I maintain that a code of ethics is not the issue here but that a "license to kill" is the issue. Proponents of engineered series ratings also maintain that before the engineer selects the line side OCPD they will consult with the manufacturer of the load side circuit breaker and accept the information given. The most simply argument was that the installation of any sort of current limiting device would be better than no action at all. I don't think that inaction is an option.

The last sentence of the panel statement on Comment 10-55 is that "The authority having jurisdiction will rely on the engineer supervising the design and installation." It looks like they have no choice now and that the engineer will, in effect, become the AHJ.

DEATON: Although the validity of the "up-over-down" method for determining the proper engineering of series ratings for equipment combinations was demonstrated, the opportunity for abuse and misapplication is significant. Power air circuit breakers are larger, more expensive types of equipment where testing of series ratings has often been justified, and these breakers are typically repaired, not replaced, to correct deficiencies found during maintenance. Molded-case circuit breakers must be replaced when found to be defective. Molded-case circuit breakers, particularly the smaller frame sizes are relatively inexpensive devices where testing combinations is harder to justify and the incentive to use engineered combinations would be much greater. Replacement of an older, passive unit with a newer, interchangeable, nonpassive breaker is very likely to occur, even if personnel ensure that the replacement breaker has the same continuous and interrupting ratings as the unit being discarded.

KIMBLIN: See my explanation of negative vote on Comment 10-56.

MUNSON: I am voting negative against the panel action. After considering the debate around this issue, I believe that this practice should not be part of the NEC. However, this does not mean that the practice should not be allowed by the authority having jurisdiction. Authorities having jurisdiction are free to evaluate an engineered series rated system without the permission being in the NEC. The authority having jurisdiction is able to determine on a case- by-case basis if a system is a suitable candidate for a field engineered series rating upgrade. Placing this requirement in the code would suggest that all systems are suitable for upgrading, which may not be the case.

ZAPLATOSCH: A safe series combination cannot be selected solely based on the performance characteristics of the two (or more) series devices. When a manufacturer identifies a series combination for their listed equipment, the suitability of the hose equipment is also considered. For this reason, the circuit breaker-series connected information published in the Recognized Component Directory of Underwriters laboratories is not intended to be used in field applications to determine proper coordination and protection of load side circuit breakers. Testing may be necessary to determine the suitability of such series combinations. This is especially true as the determination of a suitable series combination of overcurrent devices must include an evaluation of the host equipment, not only a calculation of the performance characteristics of the two (or more) series connected devices. The full system of overcurrent devices, host equipment and connections must be reviewed, and perhaps tested, to determine the suitability of the system for use on a circuit with an available fault current greater than the marked rating of the overcurrent protective device(s). Determination of the need for tests and the method to conduct the tests must be in accordance with established safety standards.

COMMENT ON AFFIRMATIVE:

BREZAN: See my affirmative comment on Comment 10-54.

DOLLARD: See my Comment on Affirmative Vote on Comment 10-57.

ELDRIDGE: See my Comment on Affirmative on Comment 10-56.

(Log #354)

10- 39 - (240-83(c)):

Note: The Technical Correlating Committee directs that Proposal 10-51 and Comment 10-39 be reported as "Reject" because less than two-thirds of the members eligible to vote have voted in the affirmative.

SUBMITTER: Jerome W. Seigel, West Hartford, CT

COMMENT ON PROPOSAL NO: 10-51

RECOMMENDATION: This Proposal should be rejected and no change be made to the present wording of 240-83(c). (240-86)

SUBSTANTIATION: This approach will not increase the safety of the system and could actually compromise the intended increase in safety.

This approach is actually working around the problem and not fixing the problem caused by a required increase of the service which in turn causes an increase in the available fault current to the total installation. The way to fix the problem is to either replace the equipment which has been claimed to "cause an excessive waste of dollars and resources" or to isolate the existing equipment from the new increased service and equipment. The isolation could be done through the use of a 1:1 transformer or by inserting additional impedance between the new service and the existing equipment to reduce the available fault current at the existing equipment. This a much better and safer engineering approach than that proposed.

I had the privilege to attend the January meeting of Panel 10 as a guest and was surprised that in all the time this subject has been in discussion that there had been no testing done to either prove or disprove that this type of analytical approach would work. In addition there was no fact finding report in this area.

There just is no technical substantiation behind this proposal.

PANEL ACTION: Reject.

PANEL STATEMENT: See panel action and statement on Comment 10-38.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12

VOTE ON PANEL ACTION:

AFFIRMATIVE: 7

NEGATIVE: 5

EXPLANATION OF NEGATIVE:

BORTHICK: See my explanation of negative vote on Comment 10-38.

DEATON: See my explanation of negative vote on Comment 10-38.

KIMBLIN: See my explanation of negative vote on Comment 10-56.

MUNSON: I am voting against the panel action. See my explanation of negative vote on Comment 10-38.

ZAPLATOSCH: See my explanation of negative vote on Comment 10-38.

COMMENT ON AFFIRMATIVE:

BREZAN: See my affirmative comment on Comment 10-54.

DOLLARD: See my Comment on Affirmative Vote on Comment 10-57.

ELDRIDGE: See my Comment on Affirmative on Comment 10-56.

(Log #355)

10- 40 - (240-83(c)):

Note: The Technical Correlating Committee directs that Proposal 10-52 and Comment 10-40 be reported as "Reject" because less than two-thirds of the members eligible to vote have voted in the affirmative.

SUBMITTER: Jerome W. Seigel, West Hartford, CT

COMMENT ON PROPOSAL NO: 10-52

RECOMMENDATION: This Proposal should be Accepted and no change be made to the present wording of 240-83(c). (240-86)

SUBSTANTIATION: I had the privilege to attend the January meeting of Panel 10 as a guest and was surprised that in all the time this subject has been in discussion that there had been no testing done to either prove or disprove that this type of analytical approach would work. In addition there was no fact finding report in this area.

Therefore no change should be made to the present wording in 240-86.

PANEL ACTION: Reject.

PANEL STATEMENT: See panel action and statement on Comment 10-38.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12

VOTE ON PANEL ACTION:

AFFIRMATIVE: 7

NEGATIVE: 5

EXPLANATION OF NEGATIVE:

BORTHICK: See my explanation of negative vote on Comment 10-38.

DEATON: See my explanation of negative vote on Comment 10-38.

KIMBLIN: See my explantion of negative vote on Comment 10-56.

MUNSON: I am voting against the panel action.See my explanation of negative vote on Comment 10-38.

ZAPLATOSCH: See my explanation of negative vote on Comment 10-38.

COMMENT ON AFFIRMATIVE:

BREZAN: See my affirmative comment on Comment 10-54.

DOLLARD: See my Comment on Affirmative Vote on Comment 10-57.

ELDRIDGE: See my Comment on Affirmative on Comment 10-56.

(Log #356)

10- 41 - (240-83(c)):

Note: The Technical Correlating Committee directs that Proposal 10-53 and Comment 10-41 be reported as "Reject" because less than two-thirds of the members eligible to vote have voted in the affirmative.

SUBMITTER: Jerome W. Seigel, West Hartford, CT

COMMENT ON PROPOSAL NO: 10-53

RECOMMENDATION: This Proposal should be Accepted and no change be made to the present wording of 240-83(c). (240-86)

SUBSTANTIATION: I had the privilege to attend the January meeting of Panel 10 as a guest and was surprised that in all the time this subject has been in discussion that there had been no testing done to either prove or disprove that this type of analytical approach would work. In addition there was no fact finding report in this area.

Therefore, no change should be made to the present wording in 240-86 and no change should be made until technical substantiation has been provided.

PANEL ACTION: Reject.

PANEL STATEMENT: See panel action and statement on Comment 10-38.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12

VOTE ON PANEL ACTION:

AFFIRMATIVE: 7

NEGATIVE: 5

EXPLANATION OF NEGATIVE:

BORTHICK: See my explanation of negative vote on Comment 10-38.

DEATON: See my explanation of negative vote on Comment 10-38.

KIMBLIN: See my explantion of negative vote on Comment 10-56.

MUNSON: I am voting against the panel action. See my explanation of negative vote on comment 10-38.

ZAPLATOSCH: See my explanation of negative vote on Comment 10-38.

COMMENT ON AFFIRMATIVE:

BREZAN: See my affirmative comment on Comment 10-54.

DOLLARD: See my Comment on Affirmative Vote on Comment 10-57.

ELDRIDGE: See my Comment on Affirmative on Comment 10-56.

(Log #357)

10- 42 - (240-83(c)):

Note: The Technical Correlating Committee directs that Proposal 10-54 and Comment 10-42 be reported as "Reject" because less than two-thirds of the members eligible to vote have voted in the affirmative.

SUBMITTER: Jerome W. Seigel, West Hartford, CT

COMMENT ON PROPOSAL NO: 10-54

RECOMMENDATION: This Proposal should be Accepted and no change be made to the present wording of 240-83(c). (240-86)

SUBSTANTIATION: I had the privilege to attend the January meeting of Panel 10 as a guest and was surprised that in all the time this subject has been in discussion that there had been no testing done to either prove or disprove that this type of analytical approach would work. In addition there was no fact finding report in this area.

Therefore, no change should be made to the present wording in 240-86 and no change should be made until technical substantiation has been provided.

PANEL ACTION: Reject.

PANEL STATEMENT: See panel action and statement on Comment 10-38.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12

VOTE ON PANEL ACTION:

AFFIRMATIVE: 7

NEGATIVE: 5

EXPLANATION OF NEGATIVE:

BORTHICK: See my explanation of negative vote on Comment 10-38.

DEATON: See my explanation of negative vote on Comment 10-38.
KIMBLIN: See my explantion of negative vote on Comment 10-56.
MUNSON: I am voting against the panel action. See my explanation of negative vote on Comment 10-38.
ZAPLATOSCH: See my explanation of negative vote on Comment 10-38.
COMMENT ON AFFIRMATIVE:
BREZAN: See my affirmative comment on Comment 10-54.
DOLLARD: See my Comment on Affirmative Vote on Comment 10-57.
ELDRIDGE: See my Comment on Affirmative on Comment 10-56.

(Log #358)

10- 43 - (240-83(c)):

Note: The Technical Correlating Committee directs that Proposal 10-57 and Comment 10-43 be reported as "Reject" because less than two-thirds of the members eligible to vote have voted in the affirmative.
SUBMITTER: Jerome W. Seigel, West Hartford, CT
COMMENT ON PROPOSAL NO: 10-57
RECOMMENDATION: This Proposal should be Accepted and no change be made to the present wording of 240-83(c). (240-86)
SUBSTANTIATION: I had the privilege to attend the January meeting of Panel 10 as a guest and was surprised that in all the time this subject has been in discussion that there had been no testing done to either prove or disprove that this type of analytical approach would work. In addition there was no fact finding report in this area.
Therefore, no change should be made to the present wording in 240-86 and no change should be made until technical substantiation has been provided.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Comment 10-38.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 7
NEGATIVE: 5
EXPLANATION OF NEGATIVE:
BORTHICK: See my explanation of negative vote on Comment 10-38.
DEATON: See my explanation of negative vote on Comment 10-38.
KIMBLIN: See my explantion of negative vote on Comment 10-56.
MUNSON: I am voting against the panel action. See my explanation of negative vote on Comment 10-38.
ZAPLATOSCH: See my explanation of negative vote on Comment 10-38.
COMMENT ON AFFIRMATIVE:
BREZAN: See my affirmative comment on Comment 10-54.
DOLLARD: See my Comment on Affirmative Vote on Comment 10-57.
ELDRIDGE: See my Comment on Affirmative on Comment 10-56.

(Log #359)

10- 44 - (240-83(c)):

Note: The Technical Correlating Committee directs that Proposal 10-58 and Comment 10-44 be reported as "Reject" because less than two-thirds of the members eligible to vote have voted in the affirmative.
SUBMITTER: Jerome W. Seigel, West Hartford, CT
COMMENT ON PROPOSAL NO: 10-58
RECOMMENDATION: This Proposal should be rejected and no change be made to the present wording of 240-83(c). (240-86)
SUBSTANTIATION: This approach will not increase the safety of the system and could actually compromise the intended increase in safety.
This approach is actually working around the problem and not fixing the problem caused by a required increase of the service which in turn causes an increase in the available fault current to the total installation. The way to fix the problem is to either replace the equipment which has been claimed to "cause an excessive waste of dollars and resources" or to isolate the existing equipment from the new increased service and equipment. The isolation could be done through the use of a 1:1 transformer or by inserting additional impedance between the new service and the existing equipment to reduce the available fault current at the existing equipment. This is a much better and safer engineering approach than that proposed.
I had the privilege to attend the January meeting of Panel 10 as a guest and was surprised that in all the time this subject has been in discussion that there had been no testing done to either prove or disprove that this type of analytical approach would work. In addition there was no fact finding report in this area.
There just is no Technical Substantiation behind this Proposal.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Comment 10-38.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 7
NEGATIVE: 5
EXPLANATION OF NEGATIVE:
BORTHICK: See my explanation of negative vote on Comment 10-38.
DEATON: See my explanation of negative vote on Comment 10-38.
KIMBLIN: See my explanation of negative vote on Comment 10-56.
MUNSON: I am voting against the panel action. See my explanation of negative vote on Comment 10-38.
ZAPLATOSCH: See my explanation of negative vote on Comment 10-38.
COMMENT ON AFFIRMATIVE:
BREZAN: See my affirmative comment on Comment 10-54.
DOLLARD: See my Comment on Affirmative Vote on Comment 10-57.
ELDRIDGE: See my Comment on Affirmative on Comment 10-56.

(Log #360)

10- 45 - (240-83(c)):

Note: The Technical Correlating Committee directs that Proposal 10-59 and Comment 10-45 be reported as "Reject" because less than two-thirds of the members eligible to vote have voted in the affirmative.
SUBMITTER: Jerome W. Seigel, West Hartford, CT
COMMENT ON PROPOSAL NO: 10-59
RECOMMENDATION: This Proposal should be Accepted and no change be made to the present wording of 240-83(c). (240-86)
SUBSTANTIATION: I had the privilege to attend the January meeting of Panel 10 as a guest and was surprised that in all the time this subject has been in discussion that there had been no testing done to either prove or disprove that this type of analytical approach would work. In addition there was no fact finding report in this area.
Therefore no change should be made to the present wording in 240-86 and no change should be made until Technical Substantiation has been provided.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Comment 10-38.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 7
NEGATIVE: 5
EXPLANATION OF NEGATIVE:
BORTHICK: See my explanation of negative vote on Comment 10-38.
DEATON: See my explanation of negative vote on Comment 10-38.
KIMBLIN: See my explanation of negative vote on Comment 10-56.
MUNSON: I am voting against the panel action. See my explanation of negative vote on Comment 10-38.
ZAPLATOSCH: See my explanation of negative vote on Comment 10-38.
COMMENT ON AFFIRMATIVE:
BREZAN: See my affirmative comment on Comment 10-54.
DOLLARD: See my Comment on Affirmative Vote on Comment 10-57.
ELDRIDGE: See my Comment on Affirmative on Comment 10-56.

(Log #361)

10- 46 - (240-83(c)):

Note: The Technical Correlating Committee directs that Proposal 10-60 and Comment 10-46 be reported as "Reject" because less than two-thirds of the members eligible to vote have voted in the affirmative.

SUBMITTER: Jerome W. Seigel, West Hartford, CT
COMMENT ON PROPOSAL NO: 10-60
RECOMMENDATION: This Proposal should be Accepted and no change be made to the present wording of 240-83(c). (240-86)
SUBSTANTIATION: I had the privilege to attend the January meeting of Panel 10 as a guest and was surprised that in all the time this subject has been in discussion that there had been no testing done to either prove or disprove that this type of analytical approach would work. In addition there was no fact finding report in this area.

Therefore no change should be made to the present wording in 240-86 and no change should be made until Technical Substantiation has been provided.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Comment 10-38.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 7
NEGATIVE: 5
EXPLANATION OF NEGATIVE:
BORTHICK: See my explanation of negative vote on Comment 10-38.
DEATON: See my explanation of negative vote on Comment 10-38.
KIMBLIN: See my explantion of negative vote on Comment 10-56.
MUNSON: I am voting against the panel action. See my explanation of negative vote on Comment 10-38.
ZAPLATOSCH: See my explanation of negative vote on Comment 10-38.
COMMENT ON AFFIRMATIVE:
BREZAN: See my affirmative comment on Comment 10-54.
DOLLARD: See my Comment on Affirmative Vote on Comment 10-57.
ELDRIDGE: See my Comment on Affirmative on Comment 10-56.

(Log #111)

10- 47 - (240-85): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 10-66
RECOMMENDATION: The Technical Correlating Committee directs the panel to reconsider the action relative to the inclusion of a recommendation in the Fine Print Note to comply with the NEC Style Manual. This action will be considered by the Panel as a Public Comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
The panel accepts the action of the Technical Correlating Committee.
PANEL STATEMENT: See panel action and statement on Comment 10-53.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
COMMENT ON AFFIRMATIVE:
DOLLARD: I am voting Affirmative to the panel action to Accept Comment 10-47.
My comments are as follows:
As a note to the TCC, the panel reconsidered the action taken in the ROP stage relative to the inclusion of a recommendation in a FPN. The use of the word "consider(s)" is similar to the FPN's located in 501-8(b) and 505-20(c).

(Log #846)

10- 48 - (240-85): Reject
SUBMITTER: Larry F. Miller, National Electrical Manufacturers Association (NEMA)
COMMENT ON PROPOSAL NO: 10-66
RECOMMENDATION: The Panel should reject the proposal.
SUBSTANTIATION: It is clear from the panel action and statement that the marking was not intended to be a requirement. The fine print note proposed by the panel is a recommendation. Recommendations are not in accordance with the NFPA Style Manual as clarified by the Technical Correlating Committee note. The proposal should be rejected.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Comment 10-53.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NEGATIVE: 2
EXPLANATION OF NEGATIVE:
KIMBLIN: See my Explanation of Negative on Comment 10-53.
ZAPLATOSCH: The single pole interrupting capability of three-pole circuit breaker is a performance issue already addressed in the product standard. Additionally, 110-9 already addresses interrupting ratings for devices.
COMMENT ON AFFIRMATIVE:
ELDRIDGE: See my Comment on Affirmative on Comment 10-56.

(Log #2059)

10- 49 - (240-85): Accept in Principle
SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc.
COMMENT ON PROPOSAL NO: 10-66
RECOMMENDATION: Revise the FPN as follows:
FPN: Fault currents occurring ~~Application of circuit breakers~~ on systems other than solidly grounded single-phase or solidly grounded wye, particularly on corner grounded delta systems, and that are within the nominal interrupting rating of a multipole circuit breaker, may occur disproportionately on only one pole. ~~should consider the~~ Individual pole interrupting capability capabilities have been evaluated to determine suitability for these applications.
SUBSTANTIATION: This makes the note properly explanatory as requested by the Technical Correlating Committee. It also includes single-phase distributions, that were inadvertently omitted.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Comment 10-53 which meets the intent of the submitter.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NEGATIVE: 2
EXPLANATION OF NEGATIVE:
KIMBLIN: See my explanation of negative vote on Comment 10-53.
ZAPLATOSCH: See my explanation of negative vote on Comment 10-48.
COMMENT ON AFFIRMATIVE:
ELDRIDGE: See my Comment on Affirmative on Comment 10-56.

(Log #2114)

10- 50 - (240-85): Reject
SUBMITTER: C. W. Kimblin, Cutler-Hammer
COMMENT ON PROPOSAL NO: 10-66
RECOMMENDATION: Reject the proposal.
SUBSTANTIATION: The total proposal should be rejected. The single pole interrupting capability of circuit breakers is a standards performance issue. Here it is noted, for molded case circuit breakers, that the UL 489 single pole test requirements are similar to the International IFC 60947-2 single pole test requirements. With respect to the Panel's suggested Fine Print Note, this note is in the form of a recommendation and is not in accordance with the NFPA Style Manual. Furthermore, the FPN is all encompassing and makes no distinction (1) between low voltage power circuit breakers and molded case circuit breakers. With proper system maintenance, both types of circuit breakers can be used on solidly

grounded wye systems, resistively grounded wye systems, and ungrounded delta systems. Furthermore, the Code (210-85) already addresses the special markings required for two-pole circuit breakers protecting 3-phase, corner-grounded delta circuits.

Reference: "Comparing Test Requirements for Low-Voltage Circuit Breakers", C. W. Kimblin and R. W. Long, IEEE Industry Applications Magazine, volume 6, pp. 45-52, January/February 2000.

PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Comment 10-53.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NEGATIVE: 2
EXPLANATION OF NEGATIVE:
KIMBLIN: See my Explanation of Negative on Comment 10-53.
ZAPLATOSCH: See my explanation of negative vote on Comment 10-48.
COMMENT ON AFFIRMATIVE:
ELDRIDGE: See my Comment on Affirmative on Comment 10-56.

(Log #2115)

10- 51 - (240-85): Reject
SUBMITTER: George Gregory, Square D Company
COMMENT ON PROPOSAL NO: 10-66
RECOMMENDATION: Reject Proposal 10-66.
SUBSTANTIATION: This proposal along with its companion Proposal 10-55 is too broad. Article 250 requires most systems to be solidly grounded at the service entrance. For these systems, voltage across an individual pole of a circuit breaker cannot be greater than phase voltage. Molded-case circuit breakers are tested at their interrupting rating in 3-phase circuits that demonstrate the individual pole capability at phase voltage or above. In addition, all straight-rated (600, 480, 240 V) molded-case circuit breakers are tested in individual pole short circuit breaker tests at line-to-line voltage at a limited short circuit value. In other words, molded-case circuit breakers are fully tested for faults on solidly grounded WYE systems and their derivations and for single phase, 120 or 120/240 V systems. Individual poles of low-voltage power circuit breakers are fully tested for the maximum fault they could see in any system.

Industrial process facilities using three special systems came under the jurisdiction of the NEC during the 1970's. It is for these systems that the system designer must take special care in providing for both overcurrent protection and system maintenance. These systems are specially engineered for the process and are not intended or permitted for general application. The NEC is not and should not be thought of as a design manual for these cases.

Impedance-grounded WYE systems are specifically addressed in 250-36. The requirements are intended to detect and correct a first fault to ground before additional faults can occur that would apply the fault to a single pole. Without specific multiple faults, a single pole of a circuit breaker will not interrupt the fault alone.

Corner-grounded delta systems with two protected conductors are addressed by 240-85 and the "1ø-3ø" marking. Three pole circuit breakers on corner-grounded delta systems are not addressed in the NEC.

Addressing the need for information on the testing and rating of circuit breakers for these systems are the IEEE Std. 1015 Blue Book and an IEEE transactions paper titled "Single-pole short-circuit interruption of molded-case circuit breakers" in the November 1999 edition.

Calling for added ratings for all circuit breakers to address these special process industry systems is too broad. If a code revision is needed, perhaps it should be to provide requirements for the systems themselves. The addition of a fine print note with a recommendation is not in compliance with NEC style and does not establish a rule for installations.

PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Comment 10-53.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NEGATIVE: 2
EXPLANATION OF NEGATIVE:
KIMBLIN: See my explanation of negative on Comment 10-53.
ZAPLATOSCH: See my explanation of negative vote on Comment 10-48.
COMMENT ON AFFIRMATIVE:
ELDRIDGE: See my Comment on Affirmative on Comment 10-56.

(Log #2153)

10- 52 - (240-85): Reject
SUBMITTER: John W. Young, Siemens Energy & Automation, Inc.
COMMENT ON PROPOSAL NO: 10-66
RECOMMENDATION: Reject the proposal.
SUBSTANTIATION: The requirements for interrupting ratings are covered in 110-9 and 110-10 and there is no need for additional wording here. Specific requirements for ratings and the testing are dealt with in the product standards.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Comment 10-53.

Section 110-10 does not apply to the interrupting rating of an overcurrent protective device.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NEGATIVE: 2
EXPLANATION OF NEGATIVE:
KIMBLIN: See my explanation of negative on Comment 10-53.
ZAPLATOSCH: See my explanation of negative vote on Comment 10-48.
COMMENT ON AFFIRMATIVE:
ELDRIDGE: See my Comment on Affirmative on Comment 10-56.

(Log #1470)

10- 53 - (240-85, FPN): Accept in Principle
SUBMITTER: Vincent J. Saporita, Cooper Bussmann
COMMENT ON PROPOSAL NO: 10-66
RECOMMENDATION: Revise the FPN as shown below, then continue to accept the proposal.

"FPN: Proper application of circuit breakers on systems other than solidly grounded wye, particularly on corner grounded delta systems, considers the individual pole interrupting capability."

SUBSTANTIATION: The above rewording is suggested to meet the Technical Correlating Committee's requirements for the style manual. Changes are editorial.
PANEL ACTION: Accept in Principle.
Revise the wording in the comment to read as follows:

FPN: Proper application of molded case circuit breakers on 3-phase systems, other than solidly grounded wye, particularly on corner grounded delta systems, considers the circuit breakers' individual pole interrupting capability.

PANEL STATEMENT: The revised wording clarifies the intent of the submitter and meets the intent of the panel.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NEGATIVE: 2
EXPLANATION OF NEGATIVE:
KIMBLIN: NEMA considers the single pole capabilities of molded case circuit breakers, and their associated markings, to be a standards issue rather than a code issue. In particular, NEMA does not consider that the proposed Fine Print Note satisfies the Technical Correlating Committee's Comment 10-47 concerning the inclusion of a recommendation in a Fine Print Note. The wording of the FPN remains a recommendation since it suggests that if a user does not consider the single pole capability, then the installation of molded-case-circuit breakers on some three-phase systems will be improper. NEMA further asserts that three pole-listed circuit breakers, when applied within their three phase ratings, are safely applied on solidly grounded Y, resistively grounded Y and ungrounded delta systems. For corner grounded delta systems, two-pole molded case circuit breakers marked 1 phase-3 phase (240-85) may be used.
ZAPLATOSCH: See my explanation of negative vote on Comment 10-48.

(Log #112)

10- 54 - (240-86): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 10-67
RECOMMENDATION: The Technical Correlating Committee directs the panel to reconsider the proposal relative to the use of pemissive language in the first sentence. This action will be considered by the Panel as a Public Comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
The panel accepts the direction of the Technical Correlating Committee.
PANEL STATEMENT: See panel action on Comment 10-56.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
COMMENT ON AFFIRMATIVE:
BREZAN: I concur with the panel action because it adds another level of safety to the system.
I do have concerns of misapplication with the present wording. The ability to design the equipment for new installations exists and leaves the possibility for the use of mismatched equipment.
With all the listed equipment available I feel there isn't a need to use this calculation method for new work. It is my understanding that the panel developed this change with the intent for its use in new installations.
The wording should also contain language that requires a recalculation whenever additional equipment is added after the modification has been performed to prevent nonconforming equipment from being added.
My final concern is the ability to field identify the type of equipment covered by the provision for an engineered calculation of the system components.

(Log #847)

10- 55 - (240-86):
Note: The Technical Correlating Committee directs that Proposal 10-67 and Comment 10-55 be reported as "Reject" because less than two-thirds of the members eligible to vote have voted in the affirmative.
SUBMITTER: Larry F. Miller, National Electrical Manufacturers Association (NEMA)
COMMENT ON PROPOSAL NO: 10-67
RECOMMENDATION: The proposal to select series-rated overcurrent protective devices under engineering supervision should be rejected.
SUBSTANTIATION: From a safety standpoint, NEMA has consistently opposed the determination of series ratings by engineering calculations. If such a method were safe, circuit breaker manufacturers, from an economic standpoint, would have embraced the concept years ago. Rather, series ratings are determined by thorough test programs witnessed by a third party. From an economical standpoint, these tests are onerous for manufacturers who would gladly apply calculations, if calculations existed that would reliably determine an appropriate rating. Manufacturers do not know such a method. A number of reasons are outlined in the substantiations to proposals 10-52, -53 and -54. The tests take into account the full range of potential fault current (not just the maximum current level) and also the capabilities of the devices to perform with the equipment in which they are installed. The result is a safe system that provides consumers with the economic application of circuit breakers; namely the capability of using circuit breakers whose ratings are lower than the available fault current. This is possible because they operate, under high fault conditions, in series with an upstream fully-rated circuit breaker or fuse.
The proposal raises a number of questions, and if accepted the Code-Making Panel must address these questions to provide guidance to the engineering supervision and the authority having jurisdiction:
Series ratings, determined under engineering supervision, must provide the same level of safety as series ratings determined under the present third-party witnessed test programs. Here safety includes the performance of the "passive" circuit breaker, the performance of possible circuit breakers downstream from the "passive" circuit breaker, and the capability of the overall assembly.
1. What factors will the engineering supervision take into account in determining the safety of the series-rated system?
2. What third party or other verification will the authority having jurisdiction use to verify that the combination is acceptable?
The term "circuit breaker" covers a wide range of circuit breaker types; molded case circuit breakers (UL 489), insulated case circuit breakers (UL 489), and power circuit breakers (UL 1066) . Arguments, to the panel, presented primarily for power circuit breakers, could precipitate a code change that affects the prevalent users of series-ratings; namely fuses with downstream molded-case-circuit breakers or molded-case -circuit breakers with downstream molded-case-circuit breakers. The product standards have never tested products for being passive, there are no products marked as passive, and the major circuit breaker manufacturers, including Cutler-Hammer, GE, Siemens and Square-D, are unanimous in stating that molded-case-circuit breakers are designed to be active rather than passive during the first half cycle of current.
How does the panel intend that someone will determine that a circuit breaker is passive during the first half cycle of a fault?
This proposal allows an entire installation to be installed at a fault current level where the only component that has been tested and listed to that fault level is the first fuse or circuit breaker in the circuit. There is no requirement in the proposal for the switchboards, panelboards, switches, bus duct, motor control centers, etc. to comply with 110-10.
Since none of this equipment would be in compliance with 110-3(b), on what basis does the authority having jurisdiction accept installations in which all the equipment in an installation has a marked short circuit rating less than the available fault current?
This proposal allows the markings and ratings of the equipment that are supported by the manufacturer and backed up by third party certification and surveillance to be ignored. In effect this proposal takes all testing and rating of equipment would be away from the manufacturers and test labs and allows installations to be made only under engineering supervision.
1. How does the authority having jurisdiction ensure the engineering supervision is correct?
2. How does the authority having jurisdiction ensure the equipment has been evaluated to comply with 90-7?
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Comment 10-38.
The panel action correlates with accepted industry standards such as the IEEE Blue Book and various articles written by recognized industry experts. The panel concludes that the issues raised by the submitter in his substantiation can be safely addressed under conditions of engineering supervision. The authority having jurisdiction will rely on the engineer supervising the design and installation.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 7
NEGATIVE: 5
EXPLANATION OF NEGATIVE:
BORTHICK: See my explanation of negative vote on Comment 10-38.
DEATON: See my explanation of negative vote on Comment 10-38.
KIMBLIN: See my explantion of negative vote on Comment 10-56.
MUNSON: I am voting against the panel action. I agree with the public comment. The substantiation suggests that the practice is complex and involves much evaluation. This does not mean that the practice should not be allowed. Authorities having jurisdiction are free to evaluate an engineered series rated system without the permission being in the NEC.
ZAPLATOSCH: See my explanation of negative vote on Comment 10-38.
COMMENT ON AFFIRMATIVE:
BREZAN: See my affirmative comment on Comment 10-54.
ELDRIDGE: See my Comment on Affirmative on Comment 10-56.

(Log #1466)

10- 56 - (240-86):

Note: The Technical Correlating Committee directs that Proposal 10-67 and Comment 10-56 be reported as "Reject" because less than two-thirds of the members eligible to vote have voted in the affirmative.

SUBMITTER: George J. Ockuly, Chesterfield, MO

COMMENT ON PROPOSAL NO: 10-67

RECOMMENDATION: Revise the first paragraph of the proposal as follows and then continue to accept the proposal. "Where a circuit breaker is used on a circuit having an available fault current higher than its marked interrupting rating by being connected on the load side of an acceptable overcurrent protective device having the higher rating, it shall meet the requirements specified in (a) or (b), and (c)."

SUBSTANTIATION: This is an editorial comment to meet the requirements of the Technical Correlating Committee, so that the proposal does not conflict with the style manual.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12

VOTE ON PANEL ACTION:

AFFIRMATIVE: 7

NEGATIVE: 5

EXPLANATION OF NEGATIVE:

BORTHICK: See my explanation of negative vote on Comment 10-38.

DEATON: See my explanation of negative vote on Comment 10-38.

KIMBLIN: NEMA opposes the panel action based on safety concerns with the application of downstream circuit breakers, underrated for the available fault current, but dependent on the simultaneous operation of an upstream device, "selected under engineering supervision." As indicated in the panel's comment, the safety responsibility with such ratings rests with the engineer who designs the installation, especially since ratings marked in accordance with industry standards may be exceeded. The panel has accepted an associated FPN in Comment 10-61, "Molded-case circuit breakers are generally not considered passive during the first 1/2 cycle of a fault." NEMA circuit breaker manufacturers confirm that fact.

The panel statement does not adequately respond to questions raised in the Comment 10-56 substantiation regarding what factors to consider in determining the safety of the series rated system determined under engineering supervision and how to determine whether a circuit breaker is passive during the first 1/2 cycle. No calculation method is specified and none has been demonstrated to be fully effective.

With respect to the method of application to low-voltage power circuit breakers (LVPCBs), it is noted that such circuit breakers are not identified as being passive by either rating or marking. It is true that LVPCBs frequently have short-time withstand ratings in which the tripping mechanism is not activated instantaneously. In this mode, the objective is to permit fault isolation by which downstream devices will clear the fault. Here it is essential to consider the total system, and not only the individual circuit breaker.

LVPCBs are rated and tested under the ANSI C37 series of standards under which cascade (series) ratings are specifically not recommended and under which a very stringent series of tests are applied to fused circuit breakers.

Comments raised publicly and in panel discussion mention the desire to add protection by installing a current limiting device ahead of an existing installation for which the available fault current was increased. Although this practice may be safer than doing nothing, it would not provide the level of protection associated with a tested, recognized series rated system. The reason for not installing a full upgrade is given as economic.

MUNSON: I am voting against the panel action. See my explanation of negative vote on Comment 10-55.

ZAPLATOSCH: See my explanation of negative vote on Comment 10-38.

COMMENT ON AFFIRMATIVE:

BREZAN: See my affirmative comment on Comment 10-54.

DOLLARD: See my Comment on Affirmative Vote on Comment 10-57.

ELDRIDGE: In the March/April 1994 issue of the IAEI News, an article was written by NEMA concerning series ratings. On the Second page of the article, in the section labeled Testing vs. Up-Over-And-Down and Up-And-Over, a sentence says: "While the concept seems plausible and was valid with some breaker designs twenty or thirty years ago, it is not a viable concept today with most breaker designs."

In the May/June 1993 IEEE Transactions on Industry Applications, an article was written by Bernie DiMarco and Steven R. Hansen titled Interplay of Energies in Circuit Breaker and Fuse Combinations. In Part V of the article titled Fuse-Breaker Series Combinations and subsection "Are Analytical Methods Appropriate?, the first paragraph says:

"If the downstream device is passive, that is, it does not react to the fault current and its "withstand current" is known, then fuse let-through characteristics can be used for fuse selections. Likewise, if the downstream device is active but remains passive during fuse clearing time, then fuse let-through characteristics can be used for fuse selections. However, if the downstream device is active and capable of developing dynamic impedance concurrently with the fuse, then analytical fuse selection is in question."

Mr. Ockuly's proposal is very nearly identical to the IEEE Standard. Mr. Ockuly said the same thing in his proposal and in the Panel meeting that the above referenced articles are saying. A NRTL could test an older circuit breaker to provide data to an engineer that would allow a series rated circuit to be designed IF the circuit breaker is passive in the first half cycle of the fault.

This is an acceptable method for protecting some older circuit breakers under engineering supervision.

(Log #1894)

10- 57 - (240-86):

Note: The Technical Correlating Committee directs that Proposal 10-67 and Comment 10-57 be reported as "Reject" because less than two-thirds of the members eligible to vote have voted in the affirmative.

SUBMITTER: Michael I. Callanan, International Brotherhood of Electrical Workers

COMMENT ON PROPOSAL NO: 10-67

RECOMMENDATION: Continue to Accept this proposal.

SUBSTANTIATION: This is a safety issue. When the utility changes out a transformer for one that can deliver more short-circuit current, the building owner is often faced with an expensive choice of completely replacing the switchboard or doing nothing and hoping that a severe fault never occurs. When the owner does "nothing", the electrician is exposed to unnecessary hazards. This proposal will provide an economical alternative for the building owner and will limit unnecessary electrician's exposure to the hazards that could arise from improperly protected equipment.

This comment represents the official position of the International Brotherhood of Electrical Workers Codes & Standards Committee.

PANEL ACTION: Accept in Principle.

PANEL STATEMENT: See panel action on Comment 10-56.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12

VOTE ON PANEL ACTION:

AFFIRMATIVE: 7

NEGATIVE: 5

EXPLANATION OF NEGATIVE:

BORTHICK: See my explanation of negative vote on Comment 10-38.

DEATON: See my explanation of negative vote on Comment 10-38.

KIMBLIN: See my explanation of negative vote on Comment 10-56.

MUNSON: I am voting against the panel action. See my explanation of negative vote on Comment 10-55.

ZAPLATOSCH: See my explanation of negative vote on Comment 10-38.

COMMENT ON AFFIRMATIVE:

BREZAN: See my affirmative comment on Comment 10-54.

DOLLARD: This is a safety issue, and this change will benefit all those persons who maintain and service electrical installations. In existing installations where the available short circuit current has increased to a value above the rating of the existing equipment a very dangerous situation awaits all of those persons who service and maintain the equipment.

Presently the owner of such an installation has only one option. Remove and scrap his/her equipment and replace it with new series rated equipment. This will represent a large financial investment to the owner of such a facility. Acceptance of this concept will provide a cost-effective option for providing the necessary level of protection. Application of this concept will be limited to use by qualified engineers. It is the engineer of an installation of "A Series Rated System Selected under Engineering Supervision" who will bear the responsibility of proper application of this concept. The addition of a FPN to this section (Comment 10-61) which reads: "Molded case circuit breakers are generally not

considered passive during the first _ cycle of a fault" will aid the engineer and the AHJ in proper application of this principle.

Safety of persons is the primary purpose of the NEC. The safety of all of those persons who service and maintain electrical equipment will benefit from permitting this cost-effective solution to achieve adequate ampere interrupting capacity for electrical installations.

ELDRIDGE: See my Comment on Affirmative on Comment 10-56.

(Log #2119)

10- 58 - (240-86):

Note: The Technical Correlating Committee directs that Proposal 10-67 and Comment 10-58 be reported as "Reject" because less than two-thirds of the members eligible to vote have voted in the affirmative.

SUBMITTER: George Gregory, Square D Company
COMMENT ON PROPOSAL NO: 10-67
RECOMMENDATION: Reject Proposal 10-67.
SUBSTANTIATION: The proposed addition of a calculation method for determining series ratings is not really achievable at the present time. Further, it opens the door for mistakes and misapplication. The proposal should be rejected.

1. No calculation method presently available is even close to being as safe and complete as the present 4 step testing program through UL standards:
   A. Test each individual CB at its marked interrupting rating(s).
   B. Test the series combination at the maximum series rating value.
   C. Test the combination at intermediate level(s).
   D. Test the combination in equipment in which it will be used.

The Up-Over-Down method, which is the only calculation method generally available, completely ignores steps C and D. I have provided a paper entitled: "Series Connected Circuit Breakers, Test and Know" which was presented at the May 2000 IEEE Cement Industry Conference.

2. Introducing an alternate method to the testing method will introduce confusion in the industry. Application of series ratings is already confusing enough.
   A. The calculation method as presented is not readily enforceable.
   B. No calculation method has been specified in the proposal. How will engineering supervision or authorities having jurisdiction know what method is technically safe?
   C. The Up-Over-Down method has been shown inadequate in a large class of situations. See the Hansen & DiMarco paper referenced with the substantiation to 10-67.
   D. Engineers in general do not understand the meaning of the term "passive" as used in this proposal nor how to test to determine it. Circuit breakers are all designed to open automatically and are not passive devices.

3. Application and economics.

Unfortunately, the proposed method does not provide a viable solution to the problem of an upgraded installation or increasing the numbers of series ratings.

A. An extremely small class of circuit breakers could ever be considered passive, namely the very large circuit breakers of the type used for large system main devices. Most of these are set specifically to withstand fault current for a period of time so that addition of a current limiting device would not fit into the protection scheme.

B. If adding a single current limiting device in the system is a viable correction, why not simply replace the non-current limiting device with a current limiting device instead of adding an additional device.

C. Circuit breaker manufacturers are presently carrying an enormous cost of testing including follow-up testing of products manufactured through the life of the production line. If a viable calculation method existed, we would very gladly change to the calculation method.

Because of the very small numbers of combinations this addition could apply to, its benefit would be extremely limited. However, the probability that it will be misapplied is great. The best benefit to users of the NEC is to reject the proposal.

This comment was written for Proposal 10-67. It also applies to Proposals 10-50, 10-51, and 10-58.

Note: Supporting material available for review upon request at NFPA headquarters.

PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Comment 10-55.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 7
NEGATIVE: 5
EXPLANATION OF NEGATIVE:

BORTHICK: See my explanation of negative vote on Comment 10-38.

DEATON: See my explanation of negative vote on Comment 10-38.

KIMBLIN: See my explanation of negative vote on Comment 10-56.

MUNSON: I am voting against the panel action. See my explanation of negative vote on Comment 10-55.

ZAPLATOSCH: See my explanation of negative vote on Comment 10-38.

COMMENT ON AFFIRMATIVE:

BREZAN: See my affirmative comment on Comment 10-54.

DOLLARD: See my Comment on Affirmative Vote on Comment 10-57.

ELDRIDGE: See my Comment on Affirmative on Comment 10-56.

(Log #2273)

10- 59 - (240-86):

Note: The Technical Correlating Committee directs that Proposal 10-67 and Comment 10-59 be reported as "Reject" because less than two-thirds of the members eligible to vote have voted in the affirmative.

SUBMITTER: John W. Young, Siemens Energy & Automation
COMMENT ON PROPOSAL NO: 10-67
RECOMMENDATION: Reject the proposal.
SUBSTANTIATION: Once again - there are no breakers designed to be passive or identified as being passive!

This proposal is not just an issue with a single main circuit breaker behind a current limiting device. This proposal is to allow an entire installation including the panelboards, switchboards, feeder and branch breakers, etc. to be installed where the available current would exceed the short circuit ratings marked on the equipment (circuit breakers, switches, switchboards, panelboards, motor control centers, etc.). Application of the products would no longer be limited by the ratings marked on the product as determined by the manufacturer of the equipment and the third party certifier in the test labs. This proposal would allow "engineering supervision" to replace the manufacturers testing and ratings and to determine how equipment can be applied - without any tests being required and without any third party certification.

How is the engineering supervision going to determine that the panelboards and switchboards can be applied beyond the marked and tested ratings? What about the future? What if equipment is added or replaced? How does someone know that they may no longer be able to add a feeder or branch breaker marked on a panelboard because the available current is beyond the rating of the panelboard and the breakers indicated to be used? Since the markings on the products (the product ratings) no longer have meaning how does anyone know what to do in the future? Simply marking a rating someone determined between the first two devices does not address all the issues.

How does the authority having jurisdiction know what to accept in one of these installations? This proposal does not address any safety issue but if accepted could create a number of safety issues. The proposal should be rejected.

PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Comment 10-55. The panel disagrees with the submitter's substantiation as there are breakers that are passive for specific time versus current conditions. For example, power circuit breakers are allowed to be applied with intentional short-time delay.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 7
NEGATIVE: 5
EXPLANATION OF NEGATIVE:

BORTHICK: See my explanation of negative vote on Comment 10-38.

DEATON: See my explanation of negative vote on Comment 10-38.

KIMBLIN: See my explanation of negative vote on Comment 10-56.

MUNSON: I am voting against the panel action. See my explanation of negative vote on Comment 10-55.

ZAPLATOSCH: See my explanation of negative vote on Comment 10-38.
COMMENT ON AFFIRMATIVE:
BREZAN: See my Comment on Affirmative on Comment 10-54.
DOLLARD: See my Comment on Affirmative Vote on Comment 10-57.
ELDRIDGE: See my Comment on Affirmative on Comment 10-56.

(Log #2308)

10- 60 - (240-86):
Note: The Technical Correlating Committee directs that Proposal 10-67 and Comment 10-60 be reported as "Reject" because less than two-thirds of the members eligible to vote have voted in the affirmative.
SUBMITTER: Kevin J. Lippert, Cutler- Hammer
COMMENT ON PROPOSAL NO: 10-67
RECOMMENDATION: The proposal should be rejected.
SUBSTANTIATION: A series rating is a combination of a fully rated overcurrent protective device (fuse or circuit breaker) in series with a downstream circuit breaker that is under rated for the available fault current. At present, this system can be safely applied because the combination and application is 1) Proven by manufacturer's submittal and follow-up testing; 2) Third Party verified; 3) Stated on the end-use equipment; and 4) Confirmed by authority having jurisdiction inspection. The proposal would eliminate many of these steps and would lead to unsafe conditions.
In the original substantiation, Mr. Ockuly states: "All possible permutations of series rated combinations are not cataloged or identified by circuit breaker equipment manufacturers." As a manufacturer, we disagree with this statement. We publish series ratings that we have successfully tested under 3rd party supervision, and have proven to be safe for their application in the end-use equipment. To allow others to determine what is acceptable "under engineering supervision" through calculation would be erroneous. There is no method for users to determine whether the downstream device is "passive during the first 1/2 cycle of a fault." The proposal deals with the protection of passive load side circuit breakers, but we know that circuit breakers, in particular molded case circuit breakers, are not passive during the first 1/2 cycle. They are designed to be active. Furthermore, the total system needs to be addressed. It is insufficient to consider only the so called "passive" breaker, without consideration of any circuit breakers connected further downstream. Adoption of this proposal will surely lead to misapplication.
How can the authority having jurisdiction be expected to verify the accuracy of this information? His approval of equipment would expose him to liability for something that he cannot evaluate. It also exposes the circuit breaker manufacturers since it is the downstream circuit breakers that are under rated for the available fault current.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Comment 10-59.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 7
NEGATIVE: 5
EXPLANATION OF NEGATIVE:
BORTHICK: See my explanation of negative vote on Comment 10-38.
DEATON: See my explanation of negative vote on Comment 10-38.
KIMBLIN: See my explanation of negative vote on Comment 10-56.
MUNSON: I am voting against the panel action. See my explanation of negative vote on Comment 10-55.
ZAPLATOSCH: See my explanation of negative vote on Comment 10-38.
COMMENT ON AFFIRMATIVE:
BREZAN: See my affirmative comment on Comment 10-54.
DOLLARD: See my Comment on Affirmative Vote on Comment 10-57.
ELDRIDGE: See my Comment on Affirmative on Comment 10-56.

(Log #1126)

10- 61 - (240-86, FPN (New)):
Note: The Technical Correlating Committee directs that Comment 10-61 be reported as "Reject" as a result of the Technical Correlating Committee action on Comment 10-55.
SUBMITTER: Paul Dobrowsky, Holley, NY
COMMENT ON PROPOSAL NO: 10-67
RECOMMENDATION: Add a fine print note to (A) as follows:
FPN: Molded case circuit breakers are generally not considered passive during the first 1/2 cycle of a fault.
SUBSTANTIATION: I realize that this concept is intended under engineering supervision but adding the fine print note will help the NEC user.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
DEATON: See my explanation of negative vote on Comment 10-38.
COMMENT ON AFFIRMATIVE:
BREZAN: See my affirmative comment on Comment 10-54.

(Log #362)

10- 62 - (240-86(c)):
Note: The Technical Correlating Committee directs that Proposal 10-67 and Comment 10-62 be reported as "Reject" because less than two-thirds of the members eligible to vote have voted in the affirmative.
SUBMITTER: Jerome W. Seigel, West Hartford, CT
COMMENT ON PROPOSAL NO: 10-67
RECOMMENDATION: This Proposal should be rejected and no change be made to the present wording of 240-86.
SUBSTANTIATION: The approach will not increase the safety of the system and could actually compromise the intended increase in safety.
This approach is actually working around the problem and not fixing the problem caused by a required increase of the service which in turn causes an increase in the available fault current to the total installation. The way to fix the problem is to either replace the equipment which has been claimed to "cause an excessive waste of dollars and resources" or to isolate the existing equipment from the new increased service and equipment. The isolation could be done through the use of a 1:1 transformer or by inserting additional impedance between the new service and the existing equipment to reduce the available fault current at the existing equipment. This is a much better and safer engineering approach than that proposed.
I had the privilege to attend the January meeting of Panel 10 as a guest and was surprised that in all the time this subject has been in discussion that there had been no testing done to either prove or disprove that this type of analytical approach would work. In addition there was no fact finding report in this area.
There just is no Technical Substantiation behind this Proposal.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Comment 10-38.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 7
NEGATIVE: 5
EXPLANATION OF NEGATIVE:
BORTHICK: See my explanation of negative vote on Comment 10-38.
DEATON: See my explanation of negative vote on Comment 10-38.
KIMBLIN: See my explantion of negative vote on Comment 10-56.
MUNSON: I am voting against the panel action. See my explanation of negative vote on Comment 10-55.
ZAPLATOSCH: See my explanation of negative vote on Comment 10-38.
COMMENT ON AFFIRMATIVE:
BREZAN: See my affirmative comment on Comment 10-54.
DOLLARD: See my Comment on Affirmative Vote on Comment 10-57.
ELDRIDGE: See my Comment on Affirmative on Comment 10-56.

(Log #363)

10- 63 - (240-86(c)):

Note: The Technical Correlating Committee directs that Proposal 10-69 and Comment 10-63 be reported as "Reject" because less than two-thirds of the members eligible to vote have voted in the affirmative.

SUBMITTER: Jerome W. Seigel, West Hartford, CT
COMMENT ON PROPOSAL NO: 10-69
RECOMMENDATION: This Proposal should be rejected and no change be made to the present wording of 240-86.
SUBSTANTIATION: The approach will not increase the safety of the system and could actually compromise the intended increase in safety.

This approach is actually working around the problem and not fixing the problem caused by a required increase of the service which in turn causes an increase in the available fault current to the total installation. The way to fix the problem is to either replace the equipment which has been claimed to "cause an excessive waste of dollars and resources" or to isolate the existing equipment from the new increased service and equipment. The isolation could be done through the use of a 1:1 transformer or by inserting additional impedance between the new service and the existing equipment to reduce the available fault current at the existing equipment. This is a much better and safer engineering approach than that proposed.

I had the privilege to attend the January meeting of Panel 10 as a guest and was surprised that in all the time this subject has been in discussion that there had been no testing done to either prove or disprove that this type of analytical approach would work. In addition there was no fact finding report in this area.

There just is no Technical Substantiation behind this Proposal.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Comment 10-38.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 7
NEGATIVE: 5
EXPLANATION OF NEGATIVE:
BORTHICK: See my explanation of negative vote on Comment 10-38.
DEATON: See my explanation of negative vote on Comment 10-38.
KIMBLIN: See my explantion of negative vote on Comment 10-56.
MUNSON: I am voting against the panel action. See my explanation of negative vote on Comment 10-55.
ZAPLATOSCH: See my explanation of negative vote on Comment 10-38.
COMMENT ON AFFIRMATIVE:
BREZAN: See my affirmative comment on Comment 10-54.
DOLLARD: See my Comment on Affirmative Vote on Comment 10-57.
ELDRIDGE: See my Comment on Affirmative on Comment 10-56.

(Log #1895)

10- 64 - (240-92(b)(1)): Reject
SUBMITTER: Michael I. Callanan, International Brotherhood of Electrical Workers
COMMENT ON PROPOSAL NO: 10-72
RECOMMENDATION: Reject this proposal.
SUBSTANTIATION: The original Part H was added after negotiations for certain length limitations. Now, the submitter is trying to remove those length limitations. Length limitations have served the conductor protection needs of the industry in other parts of Article 240 for many years. There is no additional documentation submitted since the original proposals for the new Part H of the 1999 Code.

This comment represents the official position of the International Brotherhood of Electrical Workers Codes & Standards Committee.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel agrees with the submitter's substantiation for Proposal 10-72. See Page 255 of the 2002 NEC Report on Proposals.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #1896)

10- 65 - (240-92(b)(1)a and b): Reject
SUBMITTER: Michael I. Callanan, International Brotherhood of Electrical Workers
COMMENT ON PROPOSAL NO: 10-73
RECOMMENDATION: Reject this proposal.
SUBSTANTIATION: The original Part H was added after negotiations for certain length limitations. Now, the submitter is trying to remove those length limitations. Length limitations have served the conductor protection needs of the industry in other parts of Article 240 for many years. There is no additional documentation submitted since the original proposals for the new Part H of the 1999 Code.

This comment represents the official position of the International Brotherhood of Electrical Workers Codes & Standards Committee.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel agrees with the previous panel action taken on Proposal 10-73. See Page 255 of the 2002 NEC Report on Proposals.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #1897)

10- 66 - (240-92(b)(1)c): Reject
SUBMITTER: Michael I. Callanan, International Brotherhood of Electrical Workers
COMMENT ON PROPOSAL NO: 10-74
RECOMMENDATION: Reject this proposal.
SUBSTANTIATION: The original Part H was added after negotiations for certain length limitations. Now, the submitter is trying to remove those length limitations. Length limitations have served the conductor protection needs of the industry in other parts of Article 240 for many years. There is no additional documentation submitted since the original proposals for the new Part H of the 1999 Code.

This comment represents the official position of the International Brotherhood of Electrical Workers Codes & Standards Committee.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel agrees with the previous panel action taken on Proposal 10-74. See Page 258 of the 2002 NEC Report on Proposals.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #1777)

10- 67 - (240-92(d)): Reject
SUBMITTER: Jim Pauley, Square D Company
COMMENT ON PROPOSAL NO: 10-71
RECOMMENDATION: The proposal should be rejected.
SUBSTANTIATION: The added text only introduces confusion to the user of the NEC. As stated by Mr. Dollard in his explanation of negative, the material must be practical, easy to read and enforceable.

The desired type of protection can already be engineered under 240-92(B)(1)(c) and (B)(2)(d). The engineering calculations would, by these sections, have to "determine that the system overcurrent devices will protect the conductors within recognized time vs. current limits for all short-circuit and ground-fault conditions."

Introducing the text in (D) will only lead the user to believe that they can do something wildly different and of a lesser class than the engineering judgement that is spelled out in (B).
PANEL ACTION: Reject.
PANEL STATEMENT: The proposal provides additional information and specific restrictions on the proper protection of transformer secondary conductors vs. unbalanced currents and can help prevent a misapplication. The information is not confusing to the users of Section 240-92(a), who in accordance with Section 240-91(1) are required to apply this material under conditions of engineering supervision.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1

EXPLANATION OF NEGATIVE:
KIMBLIN: The proposed wording of proposal 10-71 is not user friendly. The desired protection can already be engineered under 240-92(b)(1)(c) and 240-92(b)(2)(d).

(Log #113)

10- 68 - (240-100(a)(1)): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 10-81
RECOMMENDATION: The Technical Correlating Committee directs the panel to reconsider the proposal relative to the use of permissive language in the second sentence. This action will be considered by the Panel as a Public Comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
The panel accepts the direction of the Technical Correlating Committee.
In the Proposal, (1), revise the last sentence of the first paragraph to read as follows:
"The separate overcurrent relay elements (or protective functions) shall be permitted to be part of a single electronic protective relay unit."
PANEL STATEMENT: The revised wording is in conformance with the NEC Style Manual.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

ARTICLE 250 — GROUNDING

(Log #1138)

5- 17 - (250): Accept
SUBMITTER: Elliot Rappaport, Electro Technology Consultants
COMMENT ON PROPOSAL NO: 5-54
RECOMMENDATION: Change item 6 from "12.7 mm (1/2 in.)" to "13 mm (1/2 in.)".
Change item 11 from "15.87 mm (5/8 in.)" to "16 mm (5/8 in.)".
Change item 12 from "12.7 mm (1/2 in.)" to "13 mm (1/2 in.)".
Change item 16 from "6.35 mm (1/4 in.)" to "6.4 mm (1/4 in.)".
Change item 17 from "1.52 mm (0.06 in.)" to "1.5 mm (0.06 in.)".
SUBSTANTIATION: The proposal uses a soft conversion for products which does not account for real world tolerances. Although there are no tolerances given for the inch-pound system when stated in fractions, once a decimal value is stated, the tolerance is typically +/-0.5 of the least significant decimal place. Thus, for "12.7 mm", the tolerance is +/-0.0.5 or 0.4 percent. If the tolerance on the "1/2 in." (for a ground rod) is 1/64 in., that would be 3.1 percent. The hard conversion to "13 mm" is in error by 2.4 percent and the number "13" now has a tolerance of 3.8 percent. The proposed change in item 11 from "15.87" to "16" represents a 0.2 percent change in rods of iron or steel.
Items 16 and 17 are plate thicknesses. The change from "6.35" to "6.4" represents a change of 0.8 percent as compared with a tolerance of 6.25 percent for a 1/64 in. tolerance on a 1/4 in. plate. The proposed change of "1.52 mm" to "1.5 mm" represents a change of 1.3 percent.
The proposed changes are intended to make the SI units compatible with the tolerances of the inch-pound system and provide values that represent realistic product ordering and manufacturing values.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16

(Log #1139)

5- 18 - (250):
Note: The Technical Correlating Committee directs that this Comment be reported as "Reject" as it is not consistent with the NFPA Manual of Style, Annex B, Section B.7.2.2 and Proposal 5-54 items 7, 14, 18, 22, 23 & 29 be reported as "Accept".
SUBMITTER: Elliot Rappaport, Electro Technology Consulltants
COMMENT ON PROPOSAL NO: 5-54
RECOMMENDATION: Change item 7 from "750 mm (30 in.)" to "0.75 m (30 in.)"
Change item 14 from "750 mm (30 in.)" to "0.75 m (30 in.)".
Change item 18 from "750 mm (30 in.)" to "0.75 m (30 in.)".
Change item 22 from "450 mm (18 in.)" to "0.45 m (18 in.)".
Change item 23 from "450 mm (18 in.)" to "0.45 m (18 in.)".
Change item 29 from "900 mm (3 ft)" to "0.90 m (3 ft)".
SUBSTANTIATION: The changes proposed by the Technical Correlating Committee utilize millimeters (mm) for all dimensions less than 1.0 meters. Although the conversion may be correct, they do not reflect the way measurements would be made in the field. Measuring instruments (tape measure) that are marked in meters and are several meters long, are marked in decimal values of meters between integral meter marks. It would, therefore, be more user friendly for dimensions less than 1.0 meter but greater than, perhaps 0.3 meters (12 inches) to be stated in decimal meters as indicated in the proposed changes.
In addition, the proposed changes reflect tolerances that are more realistic than tolerances of 0.5 mm when the distances are given in hundreds of millimeters.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
STEINMAN: The change does not appear to be in accordance with the style manual guidelines provided by the metrification task group.

(Log #517)

5- 19 - (250-2): Accept in Principle
SUBMITTER: David A. Kerr, Jr., Friendsville, PA
COMMENT ON PROPOSAL NO: 5-57
RECOMMENDATION: Accept.
SUBSTANTIATION: The fish rots from the head. Article 250 needs clear and correct definitions of grounded systems, ungrounded systems, earth connections, effective metal ground-fault and line-to-line fault current paths. Most O.C. devices need a fault current of ten times, not four, for a rapid trip. Proposal 5-57 looks like a good starting point.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Comment 5-26.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16

(Log #584)

5- 20 - (250-2): Accept in Principle
SUBMITTER: C. John Beck, Pacific Gas & Electric Co.
COMMENT ON PROPOSAL NO: 5-64
RECOMMENDATION: This proposal should be rejected.
SUBSTANTIATION: The panel has provided no rational or reasonable technical justification in support of its actions on Proposal 5-64. Proposal 5-64 expresses the personal opinion of the submitter but does not provide technical justification for elimination of a long understood and applied fact (See references below). The application of the terminology "likely to become energized" has legitimate, reasonable and factual technical foundation. Its elimination is arbitrary and capricious and such an action will have broad reaching implications and effects of which the panel has obviously overlooked or is unaware. The resultant wording of the proposal would require all electrically conductive materials, in all cases, to be bonded even if they were isolated and not remotely likely to become energized by any means! That was never the intent.
The aspect of requiring bonding metals when likely to become energized and when intended as grounding paths or conductors

has been in the code for quite some time. For example, even in the 1981 NEC several sections state such concepts:

"Section 250-75. Bonding Other Enclosures. Metal raceways, cable trays, cable armor, cable sheath, enclosures, frames, fittings, and other metal noncurrent-carrying parts that are to serve as grounding conductors shall be effectively bonded where necessary to assure electrical continuity and the capacity to conduct safely any fault current likely to be imposed on them."

"Section 250-80(b). Other Metal Piping. Interior metal piping which may become energized shall be bonded to the service equipment enclosure, the grounded conductor at the service, the grounding electrode conductor where of sufficient size, or to the one or more grounding electrodes used. The bonding jumper shall be sized in accordance with Table 250-95 using the rating of the circuit which may energize the piping. The equipment grounding conductor for the circuit which may energize the piping shall be permitted to serve as the bonding means."

If it is unlikely for something to become energized, or to serve as a grounding conductor, the panel must provide to the user and public an explanation of the purpose or intent of requiring bonding of the system which is not likely to become energized. More so, by not providing substantiation for such a requirement, the panel is perpetuating the same type of action which was undertaken by the Technical Correlating Committee, and which was the reason behind the action on Proposal 5-229 (regarding 250-104(b)). It should also be of interest to CMP 5 that the National Fuel Gas Code Committee (NFPA 54/ANSI ASCZ223) has issued a formal interpretation with regard to the issue of gas pipe bonding (material from which the panel extracted information). The formal interpretation issued was:

"It is the intent of Z223.1/NFPA 54, Section 3.14(a), and NFPA 70, 250-104(b) to consider this bonding requirement to be satisfied where a grounded gas appliance is attached to the metal gas piping."

Panel 5, by its prior actions regarding bonding and grounding, created the potential for conditions which could have diminished the safety of certain installations. Opening up this issue to all electrically conductive materials, regardless and without a thorough understanding of the potential wide application of such a broad requirement, of the understanding the consequences of potential installation or use of that material can result in the same situation.

By its actions on Proposals 5-64, the panel has not provided the required technical guidance to resolve the necessity of bonding all electrically conductive materials, no matter in what form or application, nor provided the public the necessary direction and guidance for providing that bonding. Furthermore, by not providing guidance on the appropriate means for implementing such bonding the panel's action on these proposals will continue to allow for an unsafe practice which is contrary to other safety and code documents. For instance, it creates a condition where the gas piping system becomes a current carrying conductor and grounding conductor and interjects the gas controls for such systems into the potential path, and to the possibility of fault level currents. How do you bond flexible metal gas venting pipe, and exposure of such to currents, much less fault currents, could result in damage to the venting system leading to possible CO issues. Gas piping and gas piping system components are not tested nor listed for such application, the components are not insulated nor contain isolating unions or bushings, and the results of subjecting these systems to such currents can result in unsafe or hazardous conditions. What about simple metal door frames or other electrically conductive building materials? Such broad application of such a requirement as promulgated by Proposal 5-64 is unwarranted and arbitrary without full consideration or understanding of the breath and scope of such an application.

It is my recommendation that Panel 5 reconsider and reject this proposal and not perpetuate requirements which have no technical justification and the application of which can result is unreasonable and unsafe conditions.

PANEL ACTION: Accept in Principle.

PANEL STATEMENT: See panel action and statement on Comment 5-26.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16

VOTE ON PANEL ACTION:

AFFIRMATIVE: 16

(Log #585)

5- 21 - (250-2): Accept in Principle

SUBMITTER: C. John Beck, Pacific Gas & Electric Co.

COMMENT ON PROPOSAL NO: 5-65

RECOMMENDATION: This proposal should be rejected.

SUBSTANTIATION: The panel has provided no rational or reasonable technical justification in support of its actions on Proposal 5-65. Proposal 5-65 expresses the personal opinions of the individual but does not provide technical justification for elimination of a long understood fact (See references below). The application of the terminology "likely to become energized" has legitimate and factual technical foundation and its use was not intended to apply only to structural steel, but to any ferrous system likely to become energized or intended for use as grounding conductors. Such a position that the applicability was intended only to structural steel is without foundation or historical technical support. For example, even in the 1981 NEC several sections support the concepts of "likely to become energized" and used as "grounding conductors":

"Section 250-75. Bonding Other Enclosures. Metal raceways, cable trays, cable armor, cable sheath, enclosures, frames, fittings, and other metal noncurrent-carrying parts that are to serve as grounding conductors shall be effectively bonded where necessary to assure electrical continuity and the capacity to conduct safely any fault current likely to be imposed on them."

"Section 250-80(b). Other Metal Piping. Interior metal piping which may become energized shall be bonded to the service equipment enclosure, the grounded conductor at the service, the grounding electrode conductor where of sufficient size, or to the one or more grounding electrodes used. The bonding jumper shall be sized in accordance with Table 250-95 using the rating of the circuit which may energize the piping. The equipment grounding conductor for the circuit which may energize the piping shall be permitted to serve as the bonding means."

Note that the above is referring to metal systems which are "likely to become energized" and "that are to serve as grounding conductors." To assume the submitter of Proposal 5-65 was at fault by misuse of a comma is to commit to a serious change without historical support or technical justification other than the opinion of a particular person.

If there is no possibility for such to become energized, the panel must provide to the user and public an explanation of the purpose or intent of requiring bonding of the system which is not likely to become energized. More so, by not providing substantiation for such a requirement, the panel is perpetuating the same type of action which was undertaken by the Technical Correlating Committee, and which was the reason behind the action on Proposal 5-229 (regarding 250-104(b)). It should also be of interest that the ANSI ASC Z223/NFPA 54 National Fuel Gas Code Committee issued the following formal interpretation with regard to the issue of gas pipe bonding (material from which the panel originally extracted information). The formal interpretation issued was:

"It is the intent of Z223.1/NFPA 54, Section 3.14(a), and NFPA 70, 250-104(b) to consider this bonding requirement to be satisfied where a grounded gas appliance is attached to the metal gas piping system."

By its actions on Proposal 5-65 the panel has not provided the required technical necessity of bonding all systems not likely to become energized or provided the public the necessary direction and guidance for providing that bonding. Furthermore, by not providing guidance on the appropriate means for implementing such bonding the panel's action on these proposals will continue to allow for an unsafe practice which is contrary to other safety and code documents. For instance, it creates a condition where the gas piping system could become a current carrying conductor and grounding conductor, and interjects the gas controls for such systems into the potential current path and subject to the possibility of fault level currents. Recall that National Fuel Gas Code specifically prohibits the use of gas piping as a means to carry current and is not to be used for such purposes. Gas piping and gas piping system components are not tested nor listed for such application, the gas piping systems components are not normally isolated by means of isolating unions or bushings. The results of subjecting these systems to such currents can result in unsafe or hazardous conditions. Further, which such potentially broad application of such a requirement as promulgated by Proposal 5-65 even metal gas venting systems would be interpreted as required to be electrically bonded. Such an action could have serious safety implications and result in damage to certain metal systems and introduction of CO gas. Blind application of such a requirement or condition on a broad scale, without due consideration of all aspects to the system being required to be bonded, can have

serious consequences. The original wording including "likely to become energized" was carefully, thoughtfully and reasonably thought out when it was first included in the NEC.

It is recommended that Panel 5 reconsider and reject this proposal and let the existing wording remain.

PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Comment 5-26.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16

(Log #1535)

5- 22 - (250-2): Accept in Principle
SUBMITTER: Michael J. Johnston, International Association of Electrical Inspectors
COMMENT ON PROPOSAL NO: 5-57
RECOMMENDATION: The panel should reconsider the proposal 5-57. The nature and spirit of the proposal are well intended and are continuing in the direction of further expanding on the performance aspect of Article 250. In (a)(1) change "or are optionally grounded" to "or other electrical systems specified in Section 250-21 that are grounded by choice". In (b)(2) that facilitates the operation of ground fault detection devices if utilized. The proposal adds clarity and is designed to organize this section for more logical layout. This is separation into two separate items (Grounded systems and ungrounded systems is in step with addressing the users concerns and is consistent with the reorganization patterns in other sections.)

5-57 - 250-2 Revision Proposed

250.2 General Requirements for Grounding and Bonding. The following general requirements identify what grounding and bonding of electrical systems are required to accomplish. The prescriptive methods contained in Article 250 shall be followed to comply with the performance requirements of this section.

(a) Grounded Systems.

(1) Electrical System Grounding. Electrical systems that are required to be grounded or are optionally grounded shall be connected to earth in a manner that will limit the voltage imposed by lightning, line surges, or unintentional contact with higher voltage lines and that will stabilize the voltage to earth during normal operation.

(2) Grounding of Electrical Equipment. Conductive materials enclosing electrical conductors or equipment, or forming part of such equipment, shall be connected to earth so as to limit the voltage to ground on these materials.

(3) Bonding of Electrical Equipment. Conductive materials enclosing electrical conductors or equipment, or forming part of such equipment, shall be connected together and to the supply system grounded conductor in a manner that establishes an effective fault current path.

(4) Bonding of Electrically Conductive Materials and Other Equipment. Electrically conductive materials, such as metal water piping, metal gas piping, and structural steel members, that are likely to become energized shall be connected together and to the supply system grounded conductor in a manner that establishes an effective fault current path.

(5) Creating an Effective Fault Current Path. Electrical equipment and wiring and other electrically conductive material likely to become energized shall be installed in a manner that creates a permanent, low impedance circuit capable of safely carrying the maximum fault current likely to be imposed on it from any point on the wiring system where a fault may occur to the grounded conductor at the service. The earth shall not be used as the sole equipment grounding conductor or fault current path.

(b) Ungrounded Systems.

(1) Grounding of Electrical Equipment. Conductive materials enclosing electrical conductors or equipment, or forming part of such equipment, shall be connected to earth in a manner that will limit the voltage imposed by lightning or unintentional contact with high voltage lines and limit the voltage to ground on these materials created by capacitance.

(2) Bonding of Electrical Equipment. Conductive materials enclosing electrical conductors or equipment, or forming part of such equipment, shall be connected together and to the supply system grounded equipment in a manner that facilitates the use of ground fault detection devices, where used voluntarily.

(3) Bonding of Electrically Conductive Materials and Other Equipment. Electrically conductive materials, such as metal water piping, metal gas piping, and structural steel members, that are likely to become energized shall be connected together and to the supply system grounded equipment in a manner that facilitates the use of ground fault detection devices, where used voluntarily.

(4) Ground Fault Detection Devices. Electrical equipment, wiring and other electrically conductive material likely to become energized shall be installed in a manner that creates a permanent, low impedance circuit from any point on the wiring system where a fault may occur the grounded service equipment to facilitate the use of ground fault detection devices, where used voluntarily. The earth shall not be used as the sole equipment grounding conductor or fault current path.

SUBSTANTIATION: At the annual meeting of the Southwestern Section, IAEI, on September 26, 2000, the members in attendance voted unanimously to recommend that the panel accept this proposal as revised.

Grounded and ungrounded systems need separate requirements for grounding and bonding.

On grounded systems, electrical equipment is bonded to create a return path for fault current to the source of supply which will force an overcurrent device to operate when a ground-fault occurs.

On ungrounded system, there is no return path from the point of ground-fault to the source of supply. The only "protection" against ground-fault is some type of ground-fault detection. While the use of ground-fault detection devices is voluntary, equipment must be bonded to assure that such devices will work when used voluntarily.

Bonding of equipment on ungrounded systems also assures that overcurrent devices will operate properly when there is a second fault on the system.

PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Comment 5-26.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16

(Log #1720)

5- 23 - (250-2): Accept in Principle
SUBMITTER: Don Ganiere, Ottawa, IL
COMMENT ON PROPOSAL NO: 5-57
RECOMMENDATION: Accept in principle.
SUBSTANTIATION: The new wording in this proposal makes it easier to understand. The panel should review the substantiation and the negative comments and revise the panel action.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Comment 5-26.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16

(Log #1975)

5- 24 - (250-2): Reject
SUBMITTER: William B. Browwnell, GE Industrial Systems
COMMENT ON PROPOSAL NO: 5-56
RECOMMENDATION: None.
SUBSTANTIATION: These definitions are essential for proper understanding of Article 250. They do add to the usability of the Code.
PANEL ACTION: Reject.
PANEL STATEMENT: This comment does not comply with 4-4.5 of the NFPA Regulations Governing Committee Project. There is no Recommendation provided.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16

(Log #1976)

5- 25 - (250-2): Reject
SUBMITTER: William B. Browwnell, GE Industrial Systems
COMMENT ON PROPOSAL NO: 5-57
RECOMMENDATION: None.
SUBSTANTIATION: This proposal adds welcome and clear description of the required result of grounding and bonding. It adds to the usability of this section.
PANEL ACTION: Reject.

PANEL STATEMENT: This comment does not comply with 4-4.5 of the NFPA Regulations Governing Committee Project. There is no Recommendation provided.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16

(Log #1983)

5- 26 - (250-2): Accept in Principle
SUBMITTER: Charles Mello, Milwaukie, OR
COMMENT ON PROPOSAL NO: 5-57
RECOMMENDATION: Replace the text of 250-2 with the following. [NEW TEXT]

250.2 General Requirements for Grounding and Bonding. The following general requirements identify what grounding and bonding of electrical systems are required to accomplish. The prescriptive methods contained in Article 250 shall be followed to comply with the performance requirements of this section.

(A) Grounded Systems.

(1) Electrical System Grounding. Electrical systems that are grounded shall be connected to earth in a manner that will limit the voltage imposed by lightning, line surges, or unintentional contact with higher voltage lines and that will stabilize the voltage to earth during normal operation.

(2) Ground of Electrical Equipment. Non-current carrying conductive materials enclosing electrical conductors or equipment, or forming part of such equipment, shall be connected to earth so as to limit the voltage to ground on these materials.

(3) Bonding of Electrical Equipment. Non-current-carrying conductive materials enclosing electrical conductors or equipment, or forming part of such equipment, shall be connected together and to the supply system grounded conductor in a manner that establishes an effective ground fault current path.

(4) Bonding of Electrically Conductive Materials and Other Equipment.
Electrically conductive materials, such as metal water piping, metal gas piping, and structural steel members, that are likely to become energized shall be connected together and to the supply system grounded conductor in a manner that establishes an effective ground fault current path.

(5) Effective Ground Fault Current Path. Electrical equipment and wiring and other electrically conductive material likely to become energized shall be installed in a manner that creates a permanent, low impedance circuit capable of safely carrying the maximum ground fault current likely to be imposed on it from any point on the wiring system where a ground fault may occur to the grounded conductor at the service or source of a separately derived system.

The earth shall not be used as the sole equipment grounding conductor or ground fault current path.

(B) Ungrounded Systems.

(1) Grounding of Electrical Equipment. Non-current-carrying conductive materials enclosing electrical conductors or equipment, or forming part of such equipment, shall be connected to earth in a manner that will limit the voltage imposed by lightning or unintentional contact with higher voltage lines and limit the voltage to ground on these materials.

(2) Bonding of Electrical Equipment. Non-current-carrying conductive materials enclosing electrical conductors or equipment, or forming part of such equipment, shall be connected together and to the supply system grounded equipment in a manner that creates a permanent, low impedance path for ground fault current which is capable of carrying the maximum fault current likely to be imposed on it.

(3) Bonding of Electrically Conductive Materials and Other Equipment. Electrically conductive materials, such as metal water piping, metal gas piping, and structural steel members, that are likely to become energized shall be connected together and to the supply system grounded equipment in a manner that creates a permanent, low impedance path for ground fault current which is capable of carrying the maximum fault current likely to be imposed on it.

(4) Path for Fault Current. Electrical equipment, wiring and other electrically conductive material likely to become energized shall be installed in a manner that creates a permanent, low impedance circuit from every point on the wiring system to the grounded service equipment or source of separately derived system:

(a) To facilitate the operation of ground fault detection devices where used voluntarily to detect a fault on the wiring system, and

(b) To facilitate the operation of overcurrent devices should a second fault occur on the wiring system.

The earth shall not be used as the sole equipment grounding conductor or fault current path.

FPN: See Figure 250-2 for information on the organization of Article 250.

Figure 250-2 grounding. (Figure not shown)

SUBSTANTIATION: This proposal should have been accepted in principle and the wording corrected to resolve the panel's issues. The original submitter's substantiation is correct in that the present wording is both confusing and also incorrect. The present wording actually creates the concept of a ground fault current path to an ungrounded system which is impossible. The proposed wording should resolve most of the panel's issues as stated in the panel statement. The four times rating has been removed as it does not have solid technical substantiation. The separation of these performance requirements in to subsets of "grounded systems" and "ungrounded systems" is consistent with other sections in Article 250 where this was done to ensure clarity when dealing with one system or the other.
PANEL ACTION: Accept in Principle.
Revise 1999 NEC Section 250-2 to become new NEC 2002 Section 250.4 and to read as follows:

250.4 General Requirements for Grounding and Bonding. The following general requirements identify what grounding and bonding of electrical systems are required to accomplish. The prescriptive methods contained in Article 250 shall be followed to comply with the performance requirements of this section.

(A) Grounded Systems.

(1) Electrical System Grounding. Electrical systems that are grounded shall be connected to earth in a manner that will limit the voltage imposed by lightning, line surges, or unintentional contact with higher voltage lines and that will stabilize the voltage to earth during normal operation.

(2) Grounding of Electrical Equipment. Non-current carrying conductive materials enclosing electrical conductors or equipment, or forming part of such equipment, shall be connected to earth so as to limit the voltage to ground on these materials.

(3) Bonding of Electrical Equipment. Non-current-carrying conductive materials enclosing electrical conductors or equipment, or forming part of such equipment, shall be connected together and to the electrical supply source in a manner that establishes an effective ground fault current path.

(4) Bonding of Electrically Conductive Materials and Other Equipment. Electrically conductive materials that are likely to become energized shall be connected together and to the electrical supply source in a manner that establishes an effective ground fault current path.

(5) Effective Ground Fault Current Path. Electrical equipment and wiring and other electrically conductive material likely to become energized shall be installed in a manner that creates a permanent, low impedance circuit capable of safely carrying the maximum ground fault current likely to be imposed on it from any point on the wiring system where a ground fault may occur to the electrical supply source. The earth shall not be used as the sole equipment grounding conductor or effective ground fault current path.

(B) Ungrounded Systems.

(1) Grounding of Electrical Equipment. Noncurrent-carrying conductive materials enclosing electrical conductors or equipment, or forming part of such equipment, shall be connected to earth in a manner that will limit the voltage imposed by lightning or unintentional contact with higher voltage lines and limit the voltage to ground on these materials.

(2) Bonding of Electrical Equipment. Noncurrent-carrying conductive materials enclosing electrical conductors or equipment, or forming part of such equipment, shall be connected together and to the supply system grounded equipment in a manner that creates a permanent, low impedance path for ground-fault current which is capable of carrying the maximum fault current likely to be imposed on it.

(3) Bonding of Electrically Conductive Materials and Other Equipment. Electrically conductive materials that are likely to become energized shall be connected together and to the supply system grounded equipment in a manner that creates a permanent, low impedance path for ground fault current which is capable of carrying the maximum fault current likely to be imposed on it.

(4) Path for Fault Current. Electrical equipment, wiring and other electrically conductive material likely to become energized shall be installed in a manner that creates a permanent, low impedance circuit from any point on the wiring system to the electrical supply source to facilitate the operation of overcurrent devices should a second fault occur on the wiring system. The

earth shall not be used as the sole equipment grounding conductor or effective fault current path.

FPN 1: A second fault that occurs through the equipment enclosures and bonding is considered a ground fault.

FPN 2: See Figure 250.4 for information on the organization of Article 250.

Figure 250.4 Grounding.

(Renumber 1999 NEC Figure 250-2 as new Figure 250.4 to be placed here)

PANEL STATEMENT: This panel action addresses the concerns of the submitter. Sections 250.2(A)(4) and 250.2(B)(3) were revised to generalize the requirement.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16

VOTE ON PANEL ACTION:

AFFIRMATIVE: 16

(Log #1984)

5- 27 - (250-2): Accept in Principle

SUBMITTER: Charles Mello, Milwaukie, OR

COMMENT ON PROPOSAL NO: 5-65

RECOMMENDATION: Revise the text as follows.

250.2

c) Bonding of Electrically Conductive Materials and Other Equipment. Electrically conductive materials <u>that are likely to become energized</u>, such as metal water piping, metal gas piping, and structural steel members, ~~that are likely to become energized~~ shall be bonded as specified by this article to the supply system grounded conductor or, in the case of an ungrounded electrical system, to the electrical system grounded equipment, in a manner that establishes an effective path for fault current.

SUBSTANTIATION: The items identified are examples of those electrically conductive materials that are not part of the electrical system that may need bonding. The intent of this performance requirement is that any conductive materials that are likely to be energized need to be adequately bonded to the system so that an effective ground fault current path is established if these items were to become energized by a fault. The revised text makes it clearer that the likely to become energized applies to all cases. It is not the intent to only state that only building steel that is likely to become energized is required to be bonded whereas all other metal parts or structures are required to be bonded without regard to if they are likely to become energized or not. If taken literally all isolated sections for fire sprinkler piping, all ventilation ducting, all gas piping, and any other metal would have to be bonded to the system by some means, but only building steel where it might become energized would have to be bonded. In this general performance section, requirements that are not supported by the prescriptive parts of the Article should not be established.

PANEL ACTION: Accept in Principle.

PANEL STATEMENT: See panel action and statement on Comment 5-26.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16

VOTE ON PANEL ACTION:

AFFIRMATIVE: 16

(Log #2182)

5- 28 - (250-2): Accept in Principle

SUBMITTER: Donald R. Cook, Shelby County Building Inspections

COMMENT ON PROPOSAL NO: 5-57

RECOMMENDATION: Proposal should be accepted in principle. See negative votes for changes in text.

SUBSTANTIATION: Although the proposed text may not include the words that Panel 5 would like to use, the substantiation for a change is compelling. The organization of the requirements does provide clarity and separation of grounded and ungrounded systems would benefit usability of Article 250.

PANEL ACTION: Accept in Principle.

PANEL STATEMENT: See panel action and statement on Comment 5-26.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16

VOTE ON PANEL ACTION:

AFFIRMATIVE: 16

(Log #2183)

5- 29 - (250-2): Accept in Principle

SUBMITTER: Donald R. Cook, Shelby County Building Inspections

COMMENT ON PROPOSAL NO: 5-56

RECOMMENDATION: Proposal should be accepted in principle. If the "four times the trip setting of the overcurrent device" is not substantiated, the value used for testing grounding and bonding devices could be used.

SUBSTANTIATION: Having clearly defined terms will help to clarify and differentiate between system grounding and equipment grounding to operate overcurrent devices. Using defined terms will result in more consistent application of the requirements.

PANEL ACTION: Accept in Principle.

PANEL STATEMENT: See panel action and statement on Comment 5-33.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16

VOTE ON PANEL ACTION:

AFFIRMATIVE: 16

(Log #2299)

5- 30 - (250-2): Accept in Principle

SUBMITTER: Thomas E. Trainor, City of San Diego, CA

COMMENT ON PROPOSAL NO: 5-57

RECOMMENDATION: I respectfully request that the panel reconsider its action on this proposal and accept the proposed changes which have been revised to reflect the concerns identified in the panel statement.

Amend Section 250-2 to read as follows:

250-2. General Requirements for Grounding and Bonding. The following general requirements identify what grounding and bonding of electrical systems are required to accomplish. The prescriptive methods contained in Article 250 shall be followed to comply with the performance requirements of this section.

(A) Grounded Systems.

(1) Electrical System Grounding. Electrical systems that are grounded shall be connected to earth in a manner that will limit the voltage imposed by lightning, line surges, or unintentional contact with higher voltage lines and that will stabilize the voltage to earth during normal operation.

(2) Grounding of Electrical Equipment. Noncurrent carrying conductive materials enclosing electrical conductors or equipment, or forming part of such equipment, shall be connected to earth so as to limit the voltage to ground on these materials.

(3) Bonding of Electrical Equipment. Noncurrent-carrying conductive materials enclosing electrical conductors or equipment, or forming part of such equipment, shall be connected together and to the supply system grounded conductor in a manner that establishes an effective fault current path.

(4) Bonding of Electrically Conductive Materials and Other Equipment. Electrically conductive materials, such as metal water piping, metal gas piping, and structural steel members, that are likely to become energized shall be connected together and to the supply system grounded conductor in a manner that establishes an effective fault current path.

(5) Effective Fault Current Path. Electrical equipment and wiring and other electrically conductive material likely to become energized shall be installed in a manner that creates a permanent, low impedance circuit capable of safely carrying the maximum fault current likely to be imposed on it from any point on the wiring system where a fault may occur to the grounded conductor at the service. The earth shall not be used as the sole equipment grounding conductor or fault current path.

(B) Ungrounded Systems.

(1) Grounding of Electrical Equipment. Noncurrent-carrying conductive materials enclosing electrical conductors or equipment, or forming part of such equipment, shall be connected to earth in a manner that will limit the voltage imposed by lightning or unintentional contact with higher voltage lines and limit the voltage to ground on these materials created by capacitance.

(2) Bonding of Electrical Equipment. Noncurrent-carrying conductive materials enclosing electrical conductors or equipment, or forming part of such equipment, shall be connected together and to the supply system grounded equipment in a manner that creates a permanent, low impedance path for fault current which is capable of carrying the maximum fault current likely to be imposed on it.

(3) Bonding of Electrically Conductive Materials and Other Equipment. Electrically conductive materials, such as metal water piping, metal gas piping, and structural steel members, that are

likely to become energized shall be connected together and to the supply system grounded equipment in a manner that creates a permanent, low impedance path for fault current which is capable of carrying the maximum fault current likely to be imposed on it.

(4) Path for Fault Current. Electrical equipment, wiring and other electrically conductive material likely to become energized shall be installed in a manner that creates a permanent, low impedance circuit from every point on the wiring system to the grounded service equipment:

(a) to facilitate the operation of ground fault detection devices where used voluntarily to detect a fault on the wiring system, and

(b) to facilitate the operation of overcurrent devices should a second fault occur on the wiring system.

The earth shall not be used as the sole equipment grounding conductor or fault current path.

FPN: See Figure 250-2 for information on the organization of Article 250.

Figure 250-2 Grounding. (Figure not shown)

SUBSTANTIATION: This proposal is strictly editorial in nature. It does not propose new requirements for grounding and bonding. It has been amended to address the concerns identified in the panel statement.

The proposed reorganization of Article 250-2 is intended to address two main issues.

The first is the separation of requirements for grounded and ungrounded systems. The performance requirements for these systems are different. Combining them results in long, complicated, "two-part" sentences that are difficult to understand and easily misinterpreted. Separating them allows for shorter, clearer sentences which are much easier to understand. This proposal is consistent with the panel's actions to separate the requirements for grounded and ungrounded systems in Sections 250-24 and 250-30.

The second is the revision of 250-2(b) to separate bonding requirements, which create a return path for fault current to the source of supply, from grounding requirements which create a connection to earth. These are separate performance requirements for connections that perform totally different functions. Identifying them as such will provide for better understanding of the requirements.

The Usability Task Group proposed the rewrite of 250-2 as performance requirements in an effort to make grounding and bonding more understandable to the user of the code. It is important that these requirements be clear and easily understood. It is especially important that the wording used be consistent with the definitions of terms in Article 100. This proposed reorganization and revision of 250-2 is intended to achieve that goal.

At the September 26, 2000 meeting of the Southwestern Section, IAEI, the members in attendance voted unanimously to recommend that the panel accept this proposal as revised.

PANEL ACTION: Accept in Principle.

PANEL STATEMENT: See panel action and statement on Comment 5-26.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16

VOTE ON PANEL ACTION:

AFFIRMATIVE: 16

(Log #1540)

5- 31 - (250-2-Fault Curent Path, Effective Fault Current Path, Ground Fault): Accept in Principle

SUBMITTER: Michael J. Johnston, International Association of Electrical Inspectors

COMMENT ON PROPOSAL NO: 5-56

RECOMMENDATION: This request is that Code Making Panel 5 reconsider the action taken on this proposal. Revise Section 250-2. Definitions, to define technical terms used in Article 250. Adding definitions to define some of the critical performance based terms used in Article 250 can add to the increased understanding of the purposes of grounding and bonding and promote a more user friendly Article 250. The style manual indicates that terms be defined. The proposed new section would read as follows:

Proposal 5-56, 250-2 Revision

Fault Current Path. An electrically conductive path from the point of a ground fault on a wiring system to the grounded conductor at the service. The path may consist of any combination of equipment grounding conductors, metallic raceways, metallic cable sheaths, electrical equipment, and any other electrically conductive material such as metal water and gas piping, steel framing members, stucco mesh, metal ducting, reinforcing steel, phone or TV cables, and the earth itself.

Effective Fault Current Path. An electrically conductive path from the point of a ground fault on a wiring system to the grounded conductor at the service designed and intended to carry current under fault conditions. An effective fault current path is created by effectively bonding together all of the electrically conductive materials that are likely to be energized by the wiring system.

Effective bonding is accomplished through the use of equipment grounding conductors, bonding jumpers or bonding conductors approved metallic raceways, connectors and couplings, approved metallic sheathed cable and cable fittings, and other approved devices. A ground fault path is effective when it is an intentionally constructed, permanent, low impedance circuit that will safely carry the maximum fault likely to be imposed on it.

Ground Fault. An unintentional, electrically conducting connection between an ungrounded conductor of an electrical circuit and the earth or some electrically conductive material which is connected to earth.

SUBSTANTIATION: At the annual meeting of the Southwestern Section, IAEI, on September 26, 2000, the members in attendance voted unanimously to recommend that the panel accept this proposal as revised.

The NEC Style Manual requires definitions of technical terms which are not clearly defined in other codes and standards or standards and reference publications.

The definitions proposed are technical terms used in Article 250 which are not presently defined.

These definitions fo the new terms are clear and accurate. They will be important aids to users of the NEC attempting to (remainder missing)

These definitions of the new terms are clear, complete and accurate. They will be important aids to users of the NEC attempting to (remainder of text not provided with proposal).

PANEL ACTION: Accept in Principle.

PANEL STATEMENT: See panel action and statement on Comment 5-33.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16

VOTE ON PANEL ACTION:

AFFIRMATIVE: 16

(Log #2298)

5- 32 - (250-2-Fault Current Path, Effective Fault Current Parth & Ground Fault (New)): Accept in Principle

SUBMITTER: Thomas E. Trainor, City of San Diego, CA

COMMENT ON PROPOSAL NO: 5-56

RECOMMENDATION: I respectfully request that the panel reconsider its action on this proposal and accept the recommended new definitions which have been amended to reflect the concerns identified in the panel statement.

Add a new Section, 250-2. Definitions, to define technical terms used in Article 250. Present Section 250-2 to be renumbered to 250-3. The proposed new section would read as follows:

250.2. Definitions.

Fault Current Path. An electrically conductive path from the point of a ground fault on a wiring system to the grounded conductor at the service. The path may consist of any combination of equipment grounding conductors, metallic raceways, metallic cable sheaths, electrical equipment, and any other electrically conductive material such as metal water and gas piping, steel framing members, stucco mesh, metal ducting, reinforcing steel, phone or TV cables, and the earth itself.

Effective Fault Current Path. An electrically conductive path from the point of a ground fault on a wiring system to the grounded conductor at the service designed and intended to carry current under fault conditions. An effective fault current path is created by effectively bonding together all of the electrically conductive materials that are likely to be energized by the wiring system. Effective bonding is accomplished through the use of equipment grounding conductors, bonding jumpers or bonding conductors approved metallic raceways, connectors and couplings, approved metallic sheathed cable and cable fittings, and other approved devices. A ground fault path is effective when it is an intentionally constructed, permanent, low impedance circuit that will safely carry the maximum fault current likely to be imposed on it.

Ground Fault. An unintentional, electrically conducting connection between an ungrounded conductor of an electrical circuit and the earth or some electrically conductive material which is connected to earth.

SUBSTANTIATION: The term Fault Current Path is a new technical term used in the 1999 NEC. The term Effective Fault Current Path is a new technical term proposed for the 2002 NEC. The term Ground Fault is a technical term not defined in Article 100 and requires a definition to describe why a fault current path is required.

Definitions of technical terms are supported by both the NEC Style Manual and the Scope of Article 100. Definitions are not required where the term is clearly defined in a related code or standard or can be found in standard reference material. This is not the case with these terms. They are unique to Section 250. Definitions are needed to assist the user in properly applying the requirements of Article 250.

The thrust of the Usability Task Group recommendation to rewrite the present Section 250-2, was to use performance requirements to clearly describe what grounding and bonding are intended to accomplish. Providing definitions of the technical terms used in this Section will certainly make them easier to understand and apply. The action of Code-Making Panel 1 to delete Section 90-1(c) recognizes that the NEC is used by less than fully trained persons. That just adds to the importance of providing the user with clear, well-defined requirements. The proposed definitions are an important part of that effort.

At the September 26, 2000 meeting of the Southwestern Section, IAEI, the members in attendance voted unanimously to recommend that the panel accept this proposal as revised.

PANEL ACTION: Accept in Principle.

PANEL STATEMENT: See panel action and statement on Comment 5-33.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16

VOTE ON PANEL ACTION:

AFFIRMATIVE: 16

(Log #1982)

5- 33 - (250-2-Ground Fault Current Path, Effective Ground Fault Current Path, and Ground Fault): Accept in Principle

Note: The Technical Correlating Committee directs that the second Fine Print Note be deleted because it contains requirements which are not in accordance with the NEC Style Manual.

SUBMITTER: Charles Mello, Milwaukie, OR

COMMENT ON PROPOSAL NO: 5-56

RECOMMENDATION: Add the following definitions to Section 250.2. [NEW TEXT]

250.2. Definitions.

Ground Fault Current Path. An electrically conductive path from the point of a ground fault on a wiring system through normally non-current carrying conductors, equipment or the earth to the electrical supply source.

FPN: Examples of ground fault current paths could consist of any combination of equipment grounding conductors, metallic raceways, metallic cable sheaths, electrical equipment, and any other electrically conductive material such as metal water and gas piping, steel framing members, stucco mesh, metal ducting, reinforcing steel, phone or TV cables and the earth itself.

Effective Ground Fault Current Path. An intentionally constructed, permanent, low impedance electrically conductive path from the point of a ground fault on a wiring system to the power system supply source for the service or a separately derived system designed and intended to carry current under fault conditions.

FPN: An effective fault current path is created by effectively bonding together all of the electrically conductive materials that are likely to be energized by the wiring system. Effective bonding is accomplished through the use of equipment grounding conductors, bonding jumpers or bonding conductors, approved metallic raceways, connectors and couplings, approved metallic sheathed cable and cable fittings, and other approved devices. A ground fault path is effective when it will safely carry the maximum fault current likely to be imposed on it.

Ground Fault. An unintentional, electrically conducting connection between an ungrounded conductor of an electrical circuit and the normally noncurrent carrying conductors, metallic enclosures, metallic raceways, metallic equipment, or earth.

SUBSTANTIATION: The proposal should have been accepted in principle and modified to resolve the few objections the panel had. The technical substantiation provided by the submitter demonstrated the need for these definitions for both existing terms that were undefined or for new terms proposed to clarify the present text.

The term Fault Current Path is a new technical term used in the 1999 NEC. To further clarify its use, the word "Ground" has been added. The term Effective Ground Fault Current Path is a new technical term proposed for the 2002 NEC. The term Ground Fault is a technical term not defined in Article 100 and requires a definition to describe what a ground fault is to explain why a ground fault current path is required.

Definitions of technical terms are supported by both the NEC Style Manual and the Scope of Article 100. Definitions are not required where the term is clearly defined in a related code or standard or can be found in standard reference material. This is not the case with these terms. They are unique to Section 250. Definitions are needed to assist the user in properly applying the requirements of Article 250 and understand the differences between grounding and bonding.

The substantiation of the Usability Task Group recommendations to reorganize and to create Section 250-2 for the 1999 NEC, was to use performance based requirements to clearly describe what grounding and bonding are intended to accomplish. The technical terms used need to be properly defined to make them easier to understand and apply. The basis for many changes accepted over the last two Code cycles have been for clarity and to make the document more user friendly. Specifically in Article 250, the terminology has been stated as confusing and unclear meaning that definitions of the key words or phrases used is clearly needed.

PANEL ACTION: Accept in Principle.

Revise the text to read as follows:

250-2 Definitions.

Ground Fault. An unintentional, electrically conducting connection between an ungrounded conductor of an electrical circuit and the normally non-current carrying conductors, metallic enclosures, metallic raceways, metallic equipment, or earth.

Ground-Fault Current Path. An electrically conductive path from the point of a ground fault on a wiring system through normally non-current carrying conductors, equipment or the earth to the electrical supply source.

FPN: Examples of ground-fault current paths could consist of any combination of equipment grounding conductors, metallic raceways, metallic cable sheaths, electrical equipment, and any other electrically conductive material such as metal water and gas piping, steel framing members, stucco mesh, metal ducting, reinforcing steel, shields of communications cables, and the earth itself.

Effective Ground-Fault Current Path. An intentionally constructed, permanent, low impedance electrically conductive path designed and intended to carry current under ground fault conditions from the point of a ground fault on a wiring system to the electrical supply source.

FPN: An effective ground-fault current path is created by effectively bonding together all of the electrically conductive materials that are likely to be energized by the wiring system. Effective bonding is accomplished through the use of equipment grounding conductors, bonding jumpers or bonding conductors, approved metallic raceways, connectors and couplings, approved metallic sheathed cable and cable fittings, and other approved devices. A ground-fault path is effective when it will safely carry the maximum ground fault current likely to be imposed on it.

PANEL STATEMENT: The definitions of these terms are warranted for a more complete foundation in the performance section of Article 250. Defining the words or terms appearing in Section 250-2 will help the users more readily understand the prescriptive requirements that follow Part A of Article 250. Definitions of technical terms when used in the NEC are supported by the NEC Style Manual. These definitions are in step with the Usability Task Group recommendation to that 250-2 include performance requirements to clearly describe what grounding and bonding is intended to accomplish. The word "grounded" was added in three locations to ensure clarity that this section is dealing with ground faults as opposed to short circuits.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16

VOTE ON PANEL ACTION:

AFFIRMATIVE: 16

(Log #237)

5- 34 - (250-2(c), 250-104): Reject

SUBMITTER: Donald Martin, Sr., DLR Group Architects & Engineers, Inc.

COMMENT ON PROPOSAL NO: 5-64

RECOMMENDATION: Revise as follows:

Electrically conductive materials, such as metal water piping, metal gas piping, <u>metal fences,</u> and structural steel members....

Note: Lightning protection/building grounding system considerations...
SUBSTANTIATION: A situation where a metal fence (chain link) is installed to and or on a building structure.
*Case and point: Prison facility which has a security metal fence installed up and over the roof of the structure, attached to the structure.
PANEL ACTION: Reject.
PANEL STATEMENT: It is not the intent of the panel to itemize all possible electrically conductive materials likely to become energized. If the chain link fence is likely to become energized, it will require bonding as set forth in the panel action of Comment 5-26.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16

(Log #725)

5- 35 - (250-2(c)): Accept in Principle
SUBMITTER: W. Creighton Schwan, Hayward, CA
COMMENT ON PROPOSAL NO: 5-65
RECOMMENDATION: Reconsider, and Reject this proposal.
SUBSTANTIATION: The specifics in 250-104 aside, the phrase "that are likely to become energized" should be retained as applying to all interior priping, etc. The water and gas piping in this section are only examples, as evidenced by the phrase "such as".
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Comment 5-26.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16

(Log #1353)

5- 36 - (250-2(c)): Accept in Principle
SUBMITTER: David P. Brown, Baltimore Gas and Electric Co/EEI
COMMENT ON PROPOSAL NO: 5-64
RECOMMENDATION: This Proposal should be Rejected.
SUBSTANTIATION: It has always been the intent of the panel that the qualifying phrase "that are likely to become energized" applies to interior metal piping in reference to bonding. The submitter is incorrect in stating that structural steel is the only item it should apply to. In light of the panel's action on Proposal 5-229 and based on the wording in 250-104(c), this Proposal should have been rejected.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Comment 5-26.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16

(Log #1354)

5- 37 - (250-2(c)): Accept in Principle
SUBMITTER: David P. Brown, Baltimore Gas and Electric Co/EEI
COMMENT ON PROPOSAL NO: 5-65
RECOMMENDATION: This Proposal should be Rejected.
SUBSTANTIATION: It has always been the intent of the panel that the qualifying phrase "that are likely to become energized" applies to interior metal piping in reference to bonding. The submitter is incorrect in stating that structural steel is the only item it should apply to. In light of the panel's action on Proposal 5-229 and based on the wording in 250-104(c), this Proposal should have been rejected.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Comment 5-26.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16

(Log #1611)

5- 38 - (250-2(c)): Accept in Principle
SUBMITTER: Robert Molde, Xeel Energy
COMMENT ON PROPOSAL NO: 5-65
RECOMMENDATION: Please accept the proposal as modified. Delete the following text from section 250-2(c) including commas: ",such as metal water piping, metal gas piping, and structural steel members,".
The revised text for Section 250-2(c) will read as follows:
"Electrically conductive materials that are likely to become energized shall be bonded as specified by this article to supply grounded conductor or, in the case of an ungrounded electrical system, to the electrical system grounded equipment, in a manner that establishes an effective path for fault current".
SUBSTANTIATION: We believe the submitter is incorrect in stating that the structural steel is the only item the statement, "that are likely to become energized", applies to. Deleting the comma after "and structural steel members" does not improve the intent of the section. Different individuals may still interpret the section differently with or without the comma. Metal water piping, metal gas piping, and structural steel members are all conductive materials so it is not necessary that they be listed here. The general statement "all conductive materials" is sufficient.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Comment 5-26.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16

(Log #2335)

5- 39 - (250-2(c)): Accept in Principle
SUBMITTER: Wayne A. Lilly, Bridgewater, VA
COMMENT ON PROPOSAL NO: 5-65
RECOMMENDATION: Revise Section 250-2(c) to read as follows:
(c) Bonding of Electrically Conductive Materials and Other Equipment. Electrically conductive materials that <u>are likely to become energized</u> such as metal water piping, metal gas piping, and structural steel members, ~~that are likely to become energized~~ shall be bonded as specified by this article to the supply system grounded conductor or, in the case of an ungrounded electrical system, to the electrical system grounded equipment, in a manner that establishes an effective path for fault current.
SUBSTANTIATION: I agree with the comments made by Mr. Mello and Mr. White. The wording in the Draft will require each isolated piece of water piping and gas piping to be bonded regardless of whether it may become energized or not. This means a structure with plastic water lines connected to metallic stub ups at each plumbing fixture will have to have those metallic stub ups bonded.
The location of the phrase "likely to become energized" is critical to the understanding of the requirements of this section. By locating that phrase ahead of the items to be bonded it applies to each of the items. With this proposed wording there is no doubt that metal water piping, metal gas piping, and structural steel members are required to be bonded but only when they "are likely to become energized".
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Comment 5-26.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16

(Log #330)

5- 40 - (250-3): Accept
SUBMITTER: Don B. Ivory, Idaho Electrical JATC
COMMENT ON PROPOSAL NO: 5-67
RECOMMENDATION: Continue to reject Proposal.
SUBSTANTIATION: The Chairman of CMP-1 established a Task Group to represent the Panel in reviewing this proposal. The Task Group consisted of Philip Cox, Michael Anthony, H. Landis Floyd, and H. Brooke Stauffer with Don B. Ivory as Chair.
The Task Group recommends that the proposal continue to be rejected. The Task Group does not agree with the submitter's definition and would like to reiterate CMP-1's position concerning this exact Proposal that was made to CMP-1 during the Proposal

stage of the 2002 NEC revision hearings. This position being that CMP-1 does not accept that a neutral conductor is always a grounded conductor.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16

(Log #60)

5- 41 - (250-4): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 5-68
RECOMMENDATION: The Technical Correlating Committee directs the Panel to reconsider this Proposal and format this section to be consistent with similar sections in other articles. The Technical Correlating Committee directs the panel to relocate this Section to 250-3. This action will be considered by the Panel as a Public Comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16

(Log #1719)

5- 42 - (250-8): Reject
SUBMITTER: Don Ganiere, Ottawa, IL
COMMENT ON PROPOSAL NO: 5-71
RECOMMENDATION: The proposal should be accepted in principle. Add new text: "Machine screws and bolts shall be permitted to secure listed pressure connectors and solid conductors".
SUBSTANTIATION: Machine screws and bolts are used to secure pressure connectors and solid connectors. A machine screw is not a listed means and use of machine screws would be a violation. New wording should be added: "Machine screws and bolts shall be permitted to secure listed pressure connectors and solid conductors".
PANEL ACTION: Reject.
PANEL STATEMENT: The use of a machine screw to secure a listed pressure connector must be installed in accordance with the manufacturers. instruction. Section 110-14(a) does not permit the connection of a solid conductor with an ordinary machine screw.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NEGATIVE: 2
EXPLANATION OF NEGATIVE:
DOBROWSKY: The comment should be accepted in principle and the proposed additional text revised as follows: "Machine screws identified for the purpose shall be permitted to secure 10 AWG or smaller conductors."
This concept is permitted as described in Section 110.14(A). Forming a loop in a 14 AWG through 10 AWG solid conductor and securing it with a screw in compliance with Section 110.14(A) should be acceptable in Section 250.8.
HAMMEL: The comment should be accepted in principle and the proposed additional text revised as follows:
"Machine screws identified for the purpose shall be permitted to secure 10AWG or smaller conductors."
This concept is permitted as described in Section 110.14(A). Forming a loop in a 14AWG through 10AWG solid conductor and securing it with a screw in compliance with Section 110.14(A) should be acceptable in Section 250.8.

(Log #1522)

5- 43 - (250-20(b)(1)): Reject
SUBMITTER: George O. Stiles, Stiles Electric Service
COMMENT ON PROPOSAL NO: 5-73
RECOMMENDATION: Revise text as follows:
250.20 Alternating -Current Circuits and Systems to Be Grounded. Alternating-current circuits and systems shall be grounded as provided for in (A), (B), (C), or (D). Other circuits and systems shall be permitted to be grounded. If such systems are grounded, they shall comply with the applicable provision of this article. (ROP 5-72)
FPN: An example of a system permitted to be grounded is a corner-grounded delta transformer connection. See 250-26(d) for conductor to be grounded.
(B) Alternating-Current Systems of 50 Volts to 1000 Volts. Alternating-current systems of 50 volts to 1000 volts that supply premises wiring and premises wiring systems shall be grounded ~~under any of the following conditions:~~
~~(1) Where the system can be grounded so that the maximum voltage to ground on the ungrounded conductors does not exceed 150 volts~~
~~(2) Where the system is 3-phase, 4-wire, wye connected in which the neutral is used as a circuit conductor~~
~~(3) Where the system is 3-phase, 4-wire, delta connected in which the midpoint of one phase winding is used as a circuit conductor.~~
(This makes this a positive statement. This option would comply with the panel's stated desire to require all 50 to 1000 volt systems to be grounded.)
OR
(B) Alternating-Current Systems of 50 Volts to 1000 Volts. Alternating-current systems of 50 volts to 1000 volts that supply premises wiring and premises wiring systems shall be grounded under any of the following conditions:
(1) Where the system can be grounded so that the maximum voltage to ground on the ungrounded conductors does not exceed ~~150 volts~~.
(2) Where the system is 3-phase, 4-wire, wye connected in which the neutral is used as a circuit conductor.
(3) Where the system is 3-phase, 4-wire, delta connected in which the midpoint of one phase winding is used as a circuit conductor.
(The panel may conclude that constrictions should be placed on allowed voltage and change the 150 volt rating to some other more appropriate value. They could justify their actions positively as exemplified by 250-21 and 250-22 type of language.
SUBSTANTIATION: The unanimous vote of the seventeen members of this Code making Panel indicates that they had s single minded desire to limit their consideration to proposals that further the evolution of the system grounding question. They did not recognize that this proposal deals with the problem of contradictive statements in the text of the code. Failure to address this proposal will cause the voracity of the individual Code Panel members to be impunged and the usefulness of the code will be diminished.
A great problem with understanding and enforcing the code is dealing with avances - statements that are very similar - (example, 120-200 and 120-240) and contradictive statements especially when they are in the same section. There have been contradictions in Article 250 for many code cycles (text illegible) but they are much more apparent when published (text illegible) the 2002 Code. The manner in which a previous panel resolved a similar problem is revealed by referring to proposal 6-60 in the 1998 ROC. Examples of contradictions, (text illegible). How are electricians and inspectors supposed to react?
PANEL ACTION: Reject.
PANEL STATEMENT: The commentor has not provided any substantiation as to why systems that are permitted to be ungrounded and have performed successfully should now be required to be grounded.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16

(Log #331)

5- 44 - (250-20(d)): Accept
SUBMITTER: Don B. Ivory, Idaho Electrical JATC
COMMENT ON PROPOSAL NO: 5-77
RECOMMENDATION: Support the Panel Action to reject the Proposal.
SUBSTANTIATION: The Chairman of CMP-1 established a Task Group to represent the Panel in reviewing this proposal. The Task Group consisted of Philip Cox, Michael Anthony, H. Landis Floyd, and H. Brooke Stauffer with Don B. Ivory as Chair.
The Task Group recommends that the action of CMP-5 is proper in that Fine Print Note No. 1 Section 250-20(d) serves only as an example to the Code text immediately above the Fine Print Note and is not intended to be a fully comparable or differing definition to the NEC definition of "Separately Derived System" contained in Article 100. It is clear that this Fine Print Note as written is

intended to serve only as an example for the text immediately above the Fine Print Note.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16

(Log #621)

5- 45 - (250-20(d)): Accept
SUBMITTER: Steve McNamara, FMK Electric
COMMENT ON PROPOSAL NO: 5-76
RECOMMENDATION: The panel should continue to accept this excellent proposal.
SUBSTANTIATION: None.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16

(Log #388)

5- 46 - (250-20(d), FPN No. 1): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
COMMENT ON PROPOSAL NO: 5-77
RECOMMENDATION: Accept in Principle revised:
FPN No. 1: An alternating-current power source such as an on-site generator is not a separately derived system if ~~the neutral~~ a circuit conductor is solidly connected to a ~~service-supplied system neutral~~ supply conductor originating in another system.
SUBSTANTIATION: If the FPN is not intended to be inclusive it should contain the phrase "for example". It can be misleading. Many Code users may not check the definition of what is a separately derived system.
The proposal is inclusive and covers 2-wire or 3-phase 3-wire generators and those interconnected to a non-service transformer secondary. The definition of separately derived system does not indicate a limitation to service-supplied system interconnection or only neutrals.
PANEL ACTION: Reject.
PANEL STATEMENT: See CMP-1 Task Group substantiation contained in Comment 5-44. CMP-1 and CMP-5 both concur that the FPN is providing explanatory material and the use of "such as" in the FPN is indicating an example of what is not a separately derived system and is directly related to the code text it immediately follows. The FPN is not intended to be a fully comparable or differing definition to the NEC definition of "Separately Derived System". CMP-1 Task Group recommended that the original action of CMP-5 to reject the proposed change to this FPN was proper.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16

(Log #418)

5- 47 - (250-21): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
COMMENT ON PROPOSAL NO: 5-78
RECOMMENDATION: Accept in Principle revised:
The following systems of 50 volts to 1000 volts, nominal, shall be permitted to be grounded. ~~but shall not be required to be grounded.~~
(1) No change
(2) No change
(3) No change
(4) No change
FPN No change
(5) ~~High-impedence grounded neutral systems as specified in 250-36~~ Three phase three-wire systems over 150 volts, nominal, between conductors.
SUBSTANTIATION: Section 250-20 already states other circuits and systems (such as covered in this section) shall be permitted to be grounded. If the systems of (3) are grounded by choice the conditions of (A)(b)(c)(d) still apply are not justified. Removal of the phrase "shall be permitted to be grounded" will clarify that those restrictions only apply where the system in ungrounded, and where grounded by choice other code rules will suffice. Some separately derived systems which don't meet all the conditions may be required to be grounded.
High-impedence grounded systems are grounded systems. How can they be covered by the phrase "shall not be required to be grounded"?
The proposal for (5) covers the common 3-phase 3-wire delta systems of 240 and 480 volts.
PANEL ACTION: Reject.
PANEL STATEMENT: The present text makes it very clear that these systems shall be permitted to be grounded but are not required to be grounded. This Comment misquotes the existing code language. The high impedance grounded system needs to remain as this provides the alternative to a system that might fall under section 250.20(B)(1) or 250.20(B)(3) and was in fact the old exception 5 for section 250-5(b) in the 1996 Code. These exceptions were made positive text and grouped in as section 250-21 for the 1999 Code. Adding 3 phase, three wire systems over 150 volts, nominal, between conductors, serves no purpose as a new item (5) of this section as these systems are already covered in the requirements of Section 250-20(b)(1).
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16

(Log #1223)

5- 48 - (250-21): Accept in Principle
SUBMITTER: Dann Strube, Lanesville, IN
COMMENT ON PROPOSAL NO: 5-78
RECOMMENDATION: Reconsider the proposal and accept.
SUBSTANTIATION: I have been told by installers and some inspectors that ungrounded systems such as 3-phase 3-wire delta systems cannot be operated as ungrounded systems. It was their position that Section 250-21 did not list 3-wire delta systems; therefore, these systems must be grounded. When they were shown the Fine Print Note to Section 250-20 that addresses delta systems, their position was "A Fine Print Note cannot be enforced."
It was quite clear that these individuals did not like ungrounded systems and were willing to stretch the words to prohibit their use. The proposed wording is intended to make it clear that systems not covered by Section 250-20 and the systems in Section 250-21 may be operated as ungrounded systems.
PANEL ACTION: Accept in Principle.
Add to a new Section 250.21(5) of the NEC 2002 draft to read as follows:
(5) Other systems that are not required to be grounded in accordance with the requirements of Section 250.20(B).
PANEL STATEMENT: The revised text meets the intent of the submitter.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16

(Log #417)

5- 49 - (250-24(b)(1)): Accept
SUBMITTER: Dan Leaf, Palmdale, CA
COMMENT ON PROPOSAL NO: 5-86
RECOMMENDATION: Accept in Principle, revise last sentence:
The grounded service entrance conductor of a three-phase three-wire delta service shall have an ampacity not less than be ~~the same size as~~ the ungrounded conductors.
SUBSTANTIATION: Service conductors are not required to be the same size. For example, where different materials (i.e., copper and aluminum) are used or a larger conductor than required may be used by choice.
Present wording literally does not allow a choice of a larger than-phase conductor to be used as the grounded conductor. (See 310-4 third paragraph)
PANEL ACTION: Accept.
Editorially remove the word "be" from the proposed text.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16

(Log #1564)

5- 50 - (250-24(b)(1)): Accept in Principle
SUBMITTER: Paul Dobrowsky, Holley, NY
COMMENT ON PROPOSAL NO: 5-86
RECOMMENDATION: Revise the last sentence as follows:
The grounded service entrance conductor of a three-phase, three-wire delta service shall not be ~~the same size as~~ smaller than the ungrounded conductors.
SUBSTANTIATION: There is no problem if the conductor is larger than the ungrounded conductors.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See action on Comment 5-49.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16

(Log #2246)

5- 51 - (250-24(b)(1)): Accept in Principle
SUBMITTER: Paul Dobrowsky, Holley, NY
COMMENT ON PROPOSAL NO: 5-86
RECOMMENDATION: Revise the last sentence as follows:
The grounded service entrance conductor of a three-phase, three-wire delta service shall not be ~~the same size as~~ smaller than the ungrounded conductors.
SUBSTANTIATION: There is no problem if the conductor is larger than the ungrounded conductors.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See action on Comment 5-49.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16

(Log #622)

5- 52 - (250-30(a)(1)): Accept in Principle
SUBMITTER: Dan Leaf, Palmdale, CA
COMMENT ON PROPOSAL NO: 5-95
RECOMMENDATION: Accept in principle revised: Add to text of (a)(1):
Where the bonding jumper point of connection is not at the source of a separately derived system, neutral conductors which must carry ground-fault current shall not be smaller than the grounding electrode conductor specified in Table 250-66, based on the largest ungrounded phase conductor, but shall not be required to be larger than the largest ungrounded derived phase conductor.
SUBSTANTIATION: Where the grounded (neutral) conductor is bonded at the first system disconnecting means or overcurrent device enclosure located at some distance from the source, the neutral must carry ground-fault current. If the source is a generator, 445-5 imposes a minimum neutral size, but if the source is a generator, for example, there is no specific requirement for a minimum neutral size relating to ground-fault current.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Comment 5-62. The panel concludes that this meets the intent of the submitter.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16

(Log #1222)

5- 53 - (250-30(a)(2)): Reject
SUBMITTER: Dann Strube, Lanesville, IN
COMMENT ON PROPOSAL NO: 5-100
RECOMMENDATION: The proposal should have been accepted.
SUBSTANTIATION: Section 250-24(a)(4) requires two grounding electrode connections where a service transformer is located outside the building. The grounding connection at the transformer is adequate to stabilize the system voltage and provides lightning protection at that point. The second connection at the building provides additional protection if lightning is introduced into the system between the transformer and the building.
The same conditions exist if a derived system transformer is located outdoors. The current code seems to prohibit multiple electrode connections for a separately derived system.
The proposed change would provide the same grounding requirement for services and derived systems.
PANEL ACTION: Reject.
PANEL STATEMENT: Where the transformer of a separately derived system is provided outside the building, grounding shall be in accordance with Section 250.32.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16

(Log #1402)

5- 54 - (250-30(a)(2)): Accept in Principle
SUBMITTER: Kari Barrett, American Chemistry Council
COMMENT ON PROPOSAL NO: 5-101
RECOMMENDATION: Revise the 2nd paragraph (from the draft) as follows: It shall be permissible to connect the grounding electrode conductor of a separately derived system to a continuous grounding electrode conductor that is connected to the building grounding electrode system and extended through the building or structure. All connections shall be made at an accessible location by an irreversible compression connector listed for the purpose, listed connections to copper busbars not less than 6 mm x 50 mm (1/4 in. x 2 in.), or by the exothermic welding process. This continuous grounding electrode conductor shall ~~not~~ be sized in accordance with 250.66 based on the total area of the derived phased conductors smaller than 3/0 AWG copper or 250 Kcmil aluminum. This continuous grounding electrode conductor and the grounding electrode conductor(s) of each separately derived system shall comply with 250.64(A) through (E).
SUBSTANTIATION: The term structures should be added for consistency with 250-50 and to allow this method in other types of construction. Requiring a 3/0 AWG conductor for all separately derived systems is excessive. The NEC should not have requirements for what could occur in the future.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Comment 5-55.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16

(Log #1527)

5- 55 - (250-30(a)(2)): Accept in Principle
SUBMITTER: Michael J. Johnston, International Association of Electrical Inspectors
COMMENT ON PROPOSAL NO: 5-101
RECOMMENDATION: Revise as follows:
Where the grounding electrode specified in 250-30(a)(3)(1) is not available it shall be permissible to connect the grounding electrode conductor of a separately derived system to a continuous grounding electrode conductor that is connected to the building grounding electrode system and extended through the building. All connections shall be made at an accessible location by an irreversible compression connector listed for the purpose, listed connections to copper busbars not less than mm x 50 mm (1/4 in. X 2 in.), or by the exothermic welding process. This continuous grounding electrode conductor shall not be smaller than 3/0 AWG copper or 250 kcmil aluminum. This continuous grounding electrode conductor and the grounding electrode conductor(s) of each separately derived system shall comply with 250-64(a) through (e). If the electrode in 250-30(a)(3)(1) is available and the continuous grounding electrode conductor is also installed, as indicated above, then the electrodes shall be bonded together as near as practicable to the separately derived system.
SUBSTANTIATION: The original proposal addresses a valid concern and problem in the field that resulted from the new requirements added to separately derived systems using the effectively grounded metal water pipe as the electrode, and having to make this connection within 5 feet of the entry to the building structure. The proposed change that has been accepted should also be adjusted to address a possible problem of having a difference of potential when effectively grounded building steel is available and in the same area as the separately derived system. By adding these two new sentences as requirements, the possible difference of potential should be eliminated. The proposal as originally accepted would have allowed the continuous conductor to be used even if effectively grounded building steel was available and in the same area as the separately derived system. The

adjusted wording is to clarify that effectively grounded building steel is available, and in the same area as the separately derived system, then it should be used as the electrode for the system. If the alternative method given in 250-30(a)(2), as accepted, is used and effectively grounded building steel is near the separately derived system, then the two should be bonded together.
PANEL ACTION: Accept in Principle.
Revise the text of Section 250.30(A)(2) of the 2002 NEC draft and add revised Section 250.30(A)(3) to read as follows. Renumber existing Section 250.30(A)(3) to become Section 250.30(A)(4).
(2) Grounding Electrode Conductor. The grounding electrode conductor shall be installed in accordance with (a) or (b). Where taps are connected to a common grounding electrode conductor, the installation shall comply with Section 250.30(A)(3).
(a) Single Separately Derived System. A grounding electrode conductor for a single separately derived system shall be sized in accordance with Section 250.66 for the derived phase conductors and shall be used to connect the grounded conductor of the derived system to the grounding electrode as specified in Section 250.30(A)(4). Except as permitted by Sections 250.24(A)(3) or (A)(4), this connection shall be made at the same point on the separately derived system where the bonding jumper is installed.
Exception: A grounding electrode conductor shall not be required for a system that supplies a Class 1, Class 2, or Class 3 circuit and is derived from a transformer rated not more than 1000 volt-amperes, provided the system grounded conductor is bonded to the transformer frame or enclosure by a jumper sized in accordance with Section 250.30(A)(1), Exception No. 2, and the transformer frame or enclosure is grounded by one of the means specified in Section 250.134.
(b) Multiple Separately Derived Systems. Where more than one separately derived system is connected to a common grounding electrode conductor as provided in Section 250.30(A)(3), the common grounding electrode conductor shall be sized in accordance with Section 250.66 based on the total area of the largest derived phase conductor from each separately derived system.
(3) Grounding Electrode Conductor Taps. It shall be permissible to connect taps from a separately derived system to a common grounding electrode conductor. Each tap conductor shall connect the grounded conductor of the separately derived system to the common grounding electrode conductor.
(a) Tap Conductor Size. Each tap conductor shall be sized in accordance with Section 250.66 for the derived phase conductors of the separately derived system it serves.
(b) Connections. All connections shall be made at an accessible location by an irreversible compression connector listed for the purpose, listed connections to copper busbars not less than 6 mm x 50 mm (1/4 in. x 2 in.), or by the exothermic welding process. The tap conductors shall be connected to the common grounding electrode conductor as specified in Section 250.30(A)(2)(b) in such a manner that the common grounding electrode conductor remains without a splice or joint.
(c) Installation. The common grounding electrode conductor and the taps to each separately derived system shall comply with Section 250.64(A), (B), (C) and (E).
(d) Bonding. Where exposed structural steel that is interconnected to form the building frame or interior metal piping exists in the area served by the separately derived system, it shall be bonded to the grounding electrode conductor in accordance with Section 250.104.
PANEL STATEMENT: The concept of grounding electrode conductor tap conductors was found in Section 250.64(d) but that section does not cover separately derived systems. The original proposal was revised to be consistent in concept and language for permitting grounding conductor taps for separately derived systems. The words "or structure" were added to correlate action from Comment 5-54. The panel concludes the new section on bonding of structural steel meet the intent of the submitter.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16
COMMENT ON AFFIRMATIVE:
BOKSINER: While I affirm the Panel Action, I would like to point out that the accepted language can be interpreted to restrict the application of "listed connection to copper busbars not less than 6 mm X 50 mm" to cases of multiple separately derived systems. In many applications, a common grounding electrode conductor and a tap may be provided for a single system in order to allow subsequent systems to tap to the same common conductor. While, the initial conductor may be considered a grounding electrode conductor in accordance with new (2)(a), it would not be able to include "listed connection to copper busbars not less than 6 mm X 50 mm" since this is only permitted for installations of multiple systems. Thus, the accepted language might preclude an important application of this useful new rule.

(Log #1066)

5- 56 - (250-30(a)(3)): Accept in Principle
SUBMITTER: Lanny McMahill, Rep. IAEI SW Section
COMMENT ON PROPOSAL NO: 5-101
RECOMMENDATION: Continue to accept this proposal.
SUBSTANTIATION: This is a reasonable solution to a long standing problem of providing a grounding electrode conductor for separately derived systems throughout large buildings and structures.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Comment 5-55.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16

(Log #2080)

5- 57 - (250-30(a)(3)): Reject
SUBMITTER: Henry A. Jenkins, Wake County /Rep. NC Ellis Cannady Chapter IAEI
COMMENT ON PROPOSAL NO: 5-101
RECOMMENDATION: None
SUBSTANTIATION: The distance and/or size of the building or structure should make no difference in applying this new section. Smaller buildings would be less likely to use this method. The reason for the 3/0 conductor is to prevent major problems for future expansion. We therefore support the proposal.
PANEL ACTION: Reject.
PANEL STATEMENT: This comment does not comply with 4-4.5 of the NFPA Regulations Governing Committee Project. There is no recommendation provided.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16

(Log #2210)

5- 58 - (250-30(a)(3)): Accept in Principle
SUBMITTER: Robert H. Keis, Dover, DE
COMMENT ON PROPOSAL NO: 5-101
RECOMMENDATION: This proposal should be modified as stated in Mr. Dobrowsky's comment.
SUBSTANTIATION: I see no justification for the 3/0 minimum size of the GEC for this use and restriction of the connection method. Nor is there any reason to limit the use to "high-rise" buildings or "large manufacturing facilities". There are many times in small to medium size manufacturing buildings and other buildings (large and small, including malls) with step down transformers installed where running a GEC to a water pipe within 5 ft. of its entry into the building is bad enough but to have to run a 3/0 copper wire when a No. 1/0 or even a No. 2 conductor would be sufficient does not make any sense. Some of these conductors could be several hundred feet long. We are permitted to install a single equipment grounding conductor for multiple circuits in Section 250-122(c). Why can't a GEC that extends from a transformer to a water pipe or even building steel be utilized that same way. Also, if a No. 2 (just for example) is all that is required, then this wire can be run to the water pipe with no problem and no other restriction. But if I want to use it for say two transformers, I must install a 3/0. As for the restriction of how this conductor is connected to the "3/0", again this makes no sense when compared to other code requirements. Example: When grounding services, Section 250-64(d) allows conductors to be "tapped" to the grounding electrode conductor. There is no restriction on how this tap can be made, except for section 110-14 which requires proper connections, Section 250-8 lists proper connections for "Grounding and Bonding Jumpers", and Section 250-70 lists acceptable methods of connecting to electrodes, and these sections permit "listed pressure connectors" among the connection methods. Is the grounding of a separately derived system on the load side of the main service more important than

the grounding of the service equipment that has no protection ahead of it. This don't make any sense.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Comment 5-55.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16

(Log #1536)

5- 59 - (250-30(a)(3)b, Exception): Reject
SUBMITTER: Michael J. Johnston, International Association of Electrical Inspectors
COMMENT ON PROPOSAL NO: 5-103
RECOMMENDATION: This proposal should be accepted in principle and revised as follows:
Exception: In industrial ~~and commercial~~ buildings, as defined by the applicable building code, where conditions of maintenance and supervision ensure that only qualified persons will service the installation and the entire length of the interior metal water pipe that is being used for the grounding electrode is exposed, the connection shall be permitted at any point on the water pipe system.
SUBSTANTIATION: I agree with the panel statement that there are many instances where the conditions of maintenance and supervision do ensure that only qualified persons service the installation, however, in many commercial buildings conditions of maintenance and supervision do not exist to the extent and degree they do in the industrial buildings. Therefore, I feel by limiting this alternative to more controlled conditions which usually exist in most qualified industrial occupancies, reduces the possibility of deficiencies and safety hazards related to the submitter's concerns.
PANEL ACTION: Reject.
PANEL STATEMENT: The type of building is only part of the requirement, conditions of maintenance and supervision are also necessary to apply this exception, regardless of the occupancy type. Some other facilities such as universities, colleges, communication firms, utilities, etc. use this exception under the stated conditions.
The introduction of building codes interjects a problem where local jurisdiction adoptions of the National Electrical Code have included definitions of commercial and industrial facilities in their statutes.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16

(Log #1919)

5- 60 - (250-30(a)(3)b, Exception): Reject
SUBMITTER: Michael I. Callanan, International Brotherhood of Electrical Workers
COMMENT ON PROPOSAL NO: 5-103
RECOMMENDATION: Accept this proposal in principle, revised as follows:
Exception: In industrial ~~and commercial~~ buildings, as defined by the applicable building code, where conditions of maintenance and supervision ensure that only qualified persons will service the installation and the entire length of the interior metal water pipe that is being used for the grounding electrode is exposed, the connection shall be permitted at any point on the water pipe system.
SUBSTANTIATION: We agree with the panel statement that there are many instances where the conditions of maintenance and supervision do ensure that only qualified person's service the installation. However in the majority of typical commercial buildings conditions of maintenance and supervision do not exist to the extent and degree they do in the industrial buildings.
This comment represents the official position of the International Brotherhood of Electrical Workers Codes & Standards Committee.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Comment 5-59.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16

(Log #1132)

5- 61 - (250-30(a)(4)): Accept in Principle
SUBMITTER: Paul Dobrowsky, Holley, NY
COMMENT ON PROPOSAL NO: 5-105
RECOMMENDATION: Insert the following to replace the deleted text:
(4) Grounded Conductor. If a grounded conductor is installed and where the bonding jumper is not located at the separately derived system the following shall apply:
(a) Routing and Sizing. This conductor shall be routed with the phase conductors and shall not be smaller than the required grounding electrode conductor specified in Table 250-66, but shall not be required to be larger than the largest ungrounded ~~service entrance~~ phase conductor. In addition, for ~~service entrance~~ phase conductors larger than 1100 kcmil copper or 1750 kcmil aluminum, the grounded conductor shall not be smaller than 12 1/2 percent of the area of the largest ~~service entrance~~ phase conductor. The grounded ~~service entrance~~ conductor of a three-phase, three-wire delta ~~service~~ system shall be the same size as the ungrounded conductors.
(b) Parallel Conductors. Where the ~~service entrance~~ phase conductors are installed in parallel, the size of the grounded conductor shall be based on the total circular mil area of the parallel conductors as indicated in this section. Where installed in two or more raceways, the size of the grounded conductor in each raceway shall be based on the size of the ungrounded ~~service entrance~~ conductor in the raceway but not smaller than 1/0 AWG.
FPN: See 310.4 for grounded conductors connected in parallel.
(c) High Impedance. The grounded conductor on a high-impedance grounded neutral system shall be grounded in accordance with 250.36.
SUBSTANTIATION: Specific sizing requirements are necessary for grounded conductors if they are installed. If the bonding jumper is installed at the source then other fault current return paths will be provided by the EGC.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Comment 5-62.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16

(Log #1563)

5- 62 - (250-30(a)(4)): Accept in Principle
Note: The Technical Correlating Committee directs that 250.30(A)(4) be renumbered to 250.30(A)(6). This action is consistent with Section 4-4.7.1 of the NFPA Regulations Governing Committee Projects.
SUBMITTER: Paul Dobrowsky, Holley, NY
COMMENT ON PROPOSAL NO: 5-105
RECOMMENDATION: Insert the following to replace the deleted text:
(4) Grounded Conductor. If a grounded conductor is installed and where the bonding jumper is not located at the separately derived system the following shall apply:
(a) Routing and Sizing. This conductor shall be routed with the phase conductors and shall not be smaller than the required grounding electrode conductor specified in Table 250.66, but shall not be required to be larger than the largest ungrounded ~~service entrance~~ phase conductor. In addition, for ~~service entrance~~ phase conductors larger than 1100 kcmil copper or 1750 kcmil aluminum, the grounded conductor shall not be smaller than 12 1/2 percent of the area of the largest ~~service entrance~~ phase conductor. The grounded ~~service entrance~~ conductor of a three-phase, three-wire delta ~~service~~ system shall not be ~~the same size as~~ smaller than the ungrounded conductors.
(b) Parallel Conductors. Where the ~~service entrance~~ phase conductors are installed in parallel, the size of the grounded conductor shall be based on the total circular mil area of the parallel conductors as indicated in this section. Where installed in two or more raceways, the size of the grounded conductor in each raceway shall be based on the size of the ungrounded ~~service entrance~~ conductor in the raceway but not smaller than 1/0 AWG.
FPN: See 310.4 for grounded conductors connected in parallel.
(c) High Impedance. The grounded conductor on a high-impedance grounded neutral system shall be grounded in accordance with 250.36.
SUBSTANTIATION: Specific sizing requirements are necessary for grounded conductors if they are installed. If the bonding

jumper is installed at the source then other fault current return paths will be provided by the EGC.

Note: Another comment was submitted without referencing a proposal number and without all of the changes in the last sentence of (a).

PANEL ACTION: Accept in Principle.

Add a new 250.30(A)(4) to the 2002 NEC draft to read as follows:

(4) Grounded Conductor. Where a grounded conductor is installed and where the bonding jumper is not located at the source of the separately derived system, the following shall apply:

(a) Routing and Sizing. This conductor shall be routed with the derived phase conductors and shall not be smaller than the required grounding electrode conductor specified in Table 250.66, but shall not be required to be larger than the largest ungrounded ~~service entrance~~ derived phase conductor. In addition, for ~~service entrance~~ phase conductors larger than 1100 kcmil copper or 1750 kcmil aluminum, the grounded conductor shall not be smaller than 12 1/2 percent of the area of the largest derived ~~service entrance~~ phase conductor. The grounded ~~service entrance~~ conductor of a three-phase, three-wire delta ~~service~~ system shall have an ampacity not less than ~~be the same size as~~ the ungrounded conductors.

(b) Parallel Conductors. Where the ~~service entrance~~ derived phase conductors are installed in parallel, the size of the grounded conductor shall be based on the total circular mil area of the parallel conductors as indicated in this section. Where installed in two or more raceways, the size of the grounded conductor in each raceway shall be based on the size of the ungrounded ~~service entrance~~ conductors in the raceway but not smaller than 1/0 AWG.

FPN: See 310.4 for grounded conductors connected in parallel.

(c) High Impedance. The grounded conductor on a high-impedance grounded neutral system shall be grounded in accordance with 250.36.

PANEL STATEMENT: The last sentence of Section 250.30(A)(4)(a) was changed to correlate with the action on Comment 5-49 (Log #417). The word "derived" was added to be consistent with the terminology for conductors coming from separately derived systems.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16

VOTE ON PANEL ACTION:

AFFIRMATIVE: 16

COMMENT ON AFFIRMATIVE:

MELLO: The panel action for this comment presents a conflict with the final panel actions from Comment 5-55.

The action in Comment 5-55 revised the text to 250.30(A)(2) for the grounding electrode conductor in the draft and added a new section numbered 250.30(A)(3) for the grounding electrode conductor taps. The panel action also renumbered the existing 250.30(A)(3) dealing with the grounding electrode in the draft to 250.30(A)(4).

The panel action on Comment 5-65 creates a new section for the interconnecting bond jumper sizing and numbers it as 250.30(A)(5).

The panel action on Comment 5-62 creates a new section numbered 250.30(A)(4) dealing with sizing of the grounded circuit conductor where it may have to act to carry ground fault current. This section as numbered conflicts with the previous action and the panel action should be revised to number this as 250.30(A)(6) since it deals with the case where the conductor in 250.30(A)(5) is not present.

(Log #2247)

5- 63 - (250-30(a)(4)): Accept in Principle

SUBMITTER: Paul Dobrowsky, Holley, NY

COMMENT ON PROPOSAL NO: 5-105

RECOMMENDATION: Insert the following to replace the deleted text:

(4) Grounded Conductor. If a grounded conductor is installed and where the bonding jumper is not located at the separately derived system the following shall apply:

(a) Routing and Sizing. This conductor shall be routed with the phase conductors and shall not be smaller than the required grounding electrode conductor specified in Table 250.66, but shall not be required to be larger than the largest ungrounded ~~service entrance~~ phase conductor. In addition, for ~~service entrance~~ phase conductors larger than 1100 kcmil copper or 1750 kcmil aluminum, the grounded conductor shall not be smaller than 12 1/2 percent of the area of the largest ~~service entrance~~ phase conductor. The grounded ~~service entrance~~ conductor of a three-phase, three-wire delta ~~service~~ system shall not be ~~the same size~~ as smaller than the ungrounded conductors.

(b) Parallel Conductors. Where the ~~service entrance~~ phase conductors are installed in parallel, the size of the grounded conductor shall be based on the total circular mil area of the parallel conductors as indicated in this section. Where installed in two or more raceways, the size of the grounded conductor in each raceway shall be based on the size of the ungrounded ~~service entrance~~ conductor in the raceway but not smaller than 1/0 AWG.

FPN: See 310.4 for grounded conductors connected in parallel.

(c) High Impedance. The grounded conductor on a high-impedance grounded neutral system shall be grounded in accordance with 250.36.

SUBSTANTIATION: Specific sizing requirements are necessary for grounded conductors if they are installed. If the bonding jumper is installed at the source then other fault current return paths will be provided by the EGC.

Note: Another comment was submitted without referencing a proposal number and without all of the changes in the last sentence of (a).

PANEL ACTION: Accept in Principle.

PANEL STATEMENT: See panel action and statement on Comment 5-62 (Log #1563).

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16

VOTE ON PANEL ACTION:

AFFIRMATIVE: 16

(Log #1059)

5- 64 - (250-30(a)(5)): Accept in Principle

SUBMITTER: Lanny McMahill, Rep. IAEI SW Section

COMMENT ON PROPOSAL NO: 5-106

RECOMMENDATION: Accept new text as proposed.

SUBSTANTIATION: The new subsection number (5) text will clarify the size of the equipment-bonding jumper on the secondary side of a separately derived system. I agree with the negative comments by panel members Mr. Johnston and Mr. Mello.

PANEL ACTION: Accept in Principle.

PANEL STATEMENT: See panel action and statement on Comment 5-65.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16

VOTE ON PANEL ACTION:

AFFIRMATIVE: 16

(Log #1530)

5- 65 - (250-30(a)(5)): Accept in Principle

SUBMITTER: Michael J. Johnston, International Association of Electrical Inspectors

COMMENT ON PROPOSAL NO: 5-106

RECOMMENDATION: Add new text to read as follows:

(5) Equipment Bonding Jumper Size. The bonding jumper run with the derived phase conductors from the source of a separately derived system to the first disconnecting means shall be sized in accordance with Section 250.28(a) through (d) based on the size of the derived phase conductors.

SUBSTANTIATION: The bonding or grounding conductor that is installed between the source of a separately derived system such as a transformer and the first disconnecting means is not specifically defined by a name and there are not clear requirements for the size. Some individuals consider this strictly as an equipment grounding conductor sized per Section 250-122. Others consider it like a bonding jumper sized per Table 250-66. This conductor may have to carry a ground fault current for some time until the short circuit and ground fault protection on the primary of the source is able to operate. By defining what this conductor is and providing requirements for sizing, this issue in the code is clarified. By using the same sizing criteria as for the main bonding jumper for the derived system, the conductor sizing is adequate to perform its intended function. I agree with the submitter that a problem exists in the field. This change would clarify any confusion. I disagree with the Panel's statement that the wording does not add clarity to this section.

By accepting this proposal, it would be clear how to accomplish the sizing of this conductor and add a proper term for this conductor. The new subsection number (5) text will clarify the size of the equipment bonding jumper on secondary side of separately derived systems.

PANEL ACTION: Accept in Principle.

Add new text to read as follows:

(5) Equipment Bonding Jumper Size. Where a bonding jumper is run with the derived phase conductors from the source of a separately derived system to the first disconnecting means, it shall

be sized in accordance with Section 250.28(a) through (d) based on the size of the derived phase conductors.
PANEL STATEMENT: Editorial revisions were made to add clarity.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16

(Log #1718)

5- 66 - (250-30(a)(5) (New)): Accept in Principle
SUBMITTER: Don Ganiere, Ottawa, IL
COMMENT ON PROPOSAL NO: 5-106
RECOMMENDATION: This proposal should be accepted.
SUBSTANTIATION: When I teach grounding classes, there is always much confusion on how to size this conductor. The new Part 5 would make it very clear on how this bonding jumper is to be sized.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Comment 5-65.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16

(Log #2074)

5- 67 - (250-30(a)(5)): Accept in Principle
SUBMITTER: Phil Simmons, Simmons Electrical Services
COMMENT ON PROPOSAL NO: 5-106
RECOMMENDATION: Accept the proposal.
SUBSTANTIATION: The proposal needs to be accepted to plug a hole in the present Code language. Nothing in the present language indicates how to size an equipment bonding jumper between a transformer or other source of a separately derived system and the first disconnecting means or overcurrent device.
Without clear guidance, some are using Table 250-122 for sizing and others are using Table 250-66. I feel the latter is correct since there is no overcurrent protection on the supply side of the ungrounded conductors.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Comment 5-65.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16

(Log #1996)

5- 68 - (250-32(a), Exception): Reject
SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc./Rep. Massachusetts Electrical Code Advisory Committee
COMMENT ON PROPOSAL NO: 5-113
RECOMMENDATION: The proposal should be accepted.
SUBSTANTIATION: The Advisory Committee assumes that Proposal 5-123 will end up accepted in form that effectively sets a No. 8 conductor as the smallest GEC allowable at any given installation (see companion comment). The advisory Committee reiterates its original substantiation, to which Code-Making Panel 5 offered no technical rebuttal, and calls Code-Making Panel 5's attention to the fact that the problems discussed in the original substantiation will be exacerbated under the likely final form of the 2002 NEC. If a feeder arrives at a second building, it will terminate in an enclosure inherently capable of accommodating a reasonable termination of a GEC. If only a branch circuit arrives at the same building, and something requires grounding (the usual case), the outcome will be installers attempting to terminate No. 6 GECs on receptacle grounding terminals or in twist-on wire connectors (No. 8 being unused because it would require raceway). The panel should revisit the sequence of events that resulted in the exception assuming its present form, and then reconsider the merits of this proposal.
PANEL ACTION: Reject.
PANEL STATEMENT: It continues to be the panel's intent the exception only apply to buildings or structures supplied by one branch circuit that includes an equipment grounding conductor for grounding noncurrent carrying metal parts of all equipment at the building or structure.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16

(Log #1876)

5- 69 - (250-32(b)(1)): Accept
SUBMITTER: Ronald P. O'Riley, Innovative Education, Inc.
COMMENT ON PROPOSAL NO: 5-114
RECOMMENDATION: This proposal needs to be accepted.
SUBSTANTIATION: With the changing of the sizing of the grounding electrode conductor at the separate building, how to size this conductor needs to be made clear.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16

(Log #2107)

5- 70 - (250-32(c)): Reject
SUBMITTER: Truman C. Surbrook, Michigan State University
COMMENT ON PROPOSAL NO: 5-118a
RECOMMENDATION: Change Accept to Accept in Principle.
SUBSTANTIATION: I do not disagree with the Panel's action to move this requirement to Article 547, but it is not adequately covered in Section 547-4(f). That section is obviously making reference to grounding equipment in buildings. Section 250-32(e) deals with the equipment grounding conductor supplying a building when the neutral and equipment grounds have been separated.
This section should be moved to Section 547-4(f) as a second paragraph to make sure it is clear that any equipment grounding conductors supplying agricultural buildings when installed underground are to be copper and either covered or insulated
This action needs to be coordinated with Panel 19.
PANEL ACTION: Reject.
PANEL STATEMENT: This comment does not comply with 4-4.5 of the NFPA Regulations Governing Committee Project. There is no Recommendation text provided.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16

(Log #1679)

5- 71 - (250-32(e)): Reject
SUBMITTER: Scott Heyboer, Nashville, MI
COMMENT ON PROPOSAL NO: 5-119 & 5-118a
RECOMMENDATION: Change reject to accept. For proposal 5-118a, change accept to reject.
SUBSTANTIATION: Section 547-4(f) is dealing with equipment grounding conductors after the disconnecting means. Section 250-32(e) is dealing with equipment grounding conductors supplying the building. It is important that equipment grounding conductors be copper, and covered or insulated, to prevent corrosion. Also, the proposal uses the word agricultural to include all buildings on farms, not just those with livestock.
PANEL ACTION: Reject.
PANEL STATEMENT: See proposal 19-18a of the 2001 NEC ROP. The requirements have been moved to Section 547.9(C) of the 2002 NEC draft.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16

(Log #1997)

5- 72 - (250-32(e)): Accept
SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc./Rep. Massachusetts Electrical Code Advisory Committee
COMMENT ON PROPOSAL NO: 5-123
RECOMMENDATION: The proposal as the panel accepted it in principle should be further modified as follows: "The size of the grounding electrode conductor to the grounding electrode(s) shall not be less than given in 250.66 based on ~~and shall not be required to be larger than~~ the largest ungrounded supply conductor. The installation shall comply with Part III of this article."
SUBSTANTIATION: The Advisory Committee agrees with the proposal substantiation, but panel action seems to be at cross

purposes to that substantiation. The substantiation indicated that GEC sizing should be based on the same considerations in second buildings as apply to primary buildings. Those considerations involve mechanical permanence and voltage limitation during high voltage events such as lightning surges. The actual wording, however, reduces the GEC to the size of the supply conductors, which might not exceed No. 14. That puts the section close to where it was in the 1999 cycle.

The Advisory Committee assumes that something close to this comment will be accepted, because the panel statement took no issue with the proposal substantiation. Therefore the Committee sees the ROP text as to some degree inadvertent. The Committee offers this comment because if the size does go up, that will have a practical bearing on the eventual Code-Making Panel 5 disposition of Proposal 5-113, on which we are submitting a companion comment.

PANEL ACTION: Accept.

Editorially change the word "less" to "smaller" to read as follows: The size of the grounding electrode conductor to the grounding electrode(s) shall not be smaller ~~less~~ than given in 250.66 based on ~~and shall not be required to be larger than~~ the largest ungrounded supply conductor. The installation shall comply with Part III of this article.

PANEL STATEMENT: These changes are made to comply with the NEC Style manual.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16

VOTE ON PANEL ACTION:

AFFIRMATIVE: 16

(Log #2215)

5- 73 - (250-32(f)):

Note: The Technical Correlating Committee directs that this Comment be reported as "Reject" since the word "Section", as an identifier, will no longer be used in the Code.

SUBMITTER: Robert H. Keis, Dover, DE

COMMENT ON PROPOSAL NO: 5-123

RECOMMENDATION: Correction of typo. The word "Section" should be inserted before 250-66 in statement of "Panel Action"

SUBSTANTIATION: Correction of typo.

PANEL ACTION: Accept in Principle.

PANEL STATEMENT: The panel reaffirms the panel statement in Proposal 5-123 and intends to refer to the entire Section 250-66, and also intends to delete the word "Table". The panel notes that the word "Section" is not to be used in accordance with the Style Manual. However, the panel prefers that the word "Section" appear in this case due to possible confusion between the Section and the table that have identical number. Upon review, the panel discovered an editorial error in the NEC draft, where the word "Table" remains.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16

VOTE ON PANEL ACTION:

AFFIRMATIVE: 16

(Log #61)

5- 74 - (250-34(c)): Accept

SUBMITTER: Technical Correlating Committee National Electrical Code

COMMENT ON PROPOSAL NO: 5-131

RECOMMENDATION: The Technical Correlating Committee directs the Code-Making Panel to reconsider the use of the words "grounded conductor" in 250-34(c) relative to two-wire generators.

This action will be considered by the Panel as a Public Comment.

SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.

PANEL ACTION: Accept.

PANEL STATEMENT: The panel has reconsidered the use of the words "grounded conductor." The panel concludes that the words "grounded conductor" are correct because the frame of the generator serves in place of earth.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16

VOTE ON PANEL ACTION:

AFFIRMATIVE: 16

(Log #383)

5- 75 - (250-34(c)): Reject

SUBMITTER: Dan Leaf, Palmdale, CA

COMMENT ON PROPOSAL NO: 5-131

RECOMMENDATION: Accept in principle revised: (c) GROUNDED CONDUCTOR BONDING. An alternating current ~~A~~ system conductor that is required to be grounded by Section ~~250-26~~ 250-20 shall be bonded to the generator frame by a bonding jumper in accordance with 250-30(a)(1) where the generator is a component of a separately derived system.

FPN No.1: For grounding of separately derived ac systems supplied by portable or vehicle-mounted generators supplying fixed wiring systems see ~~Section 250-20(d)~~ 250-30.

FPN No.2: For grounding of separately derived systems supplied from portable or vehicle-mounted direct-current generators see 250-162 and 250-169.

SUBSTANTIATION: The reference to 250-26 is incorrect in that no conductor is required to be grounded by that section; it only designates the conductor to be grounded, if grounding is provided, while 250-20 designates the system or circuit that shall be grounded. A reference to bonding jumper requirements would be helpful to Code users.

Vehicle-mounted generators should be included in FPN No.1 since portable (not defined) and vehicle-mounted generators could be identical in kW, voltage, etc. The demarcation between the two is not clear; a generator transported by a vehicle and unloaded by a crane can be deemed portable.

Proposed FPN No. 2 would clarify that this section does not apply to dc generators.

PANEL ACTION: Reject.

PANEL STATEMENT: See panel statement on Comment 5-74.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16

VOTE ON PANEL ACTION:

AFFIRMATIVE: 16

(Log #2027)

5- 76 - (250-36(g) (New)): Accept in Principle

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

COMMENT ON PROPOSAL NO: 5-134

RECOMMENDATION: Revise as follows:

(1) Where the equipment bonding jumper location does not preclude its function as a component of a potential fault current path, it shall be sized per 250.66 based on the size of the service entrance conductors for a service or the derived phase conductors for a separately derived system.

(2) Where the equipment bonding jumper location precludes its function as a component of a potential fault current path, it shall be sized not less than the size required in 250.36(B) for the neutral conductor.

(3) In making the determinations required in (1) and (2), the potential fault current path shall be assumed to be over the equipment grounding system common to equipment supplied by any potential combination of differing ungrounded phase conductors.

SUBSTANTIATION: The proposal is technically well-motivated, but the wording is confusing because 250.36(F) allows a grounding electrode connection "from the grounded side of the grounding impedance to the equipment grounding connection at the service equipment or the first system disconnecting means." Any allowable such connection will fall, in the electrical sense, on the grounded side of the impedance. It would be a code violation [250.36(C) prohibits grounding connections on the line side of the impedance, and this is reflected in 250.24(A)(2) Exception], and the system wouldn't work properly if it were otherwise. Therefore, an inspector would be within his rights to always ask for a full-sized bonding jumper per the literal wording of (1), negating the intent of the proposal.

This comment addresses the safety issue directly. A safety issue only arises if, under a condition of two simultaneous ground faults on different phases, when the equipment grounding system becomes part of a phase-to-phase short circuit, the bonding jumper is a link in that path. Most applications of these systems should qualify for (2), as the original proposal apparently intended.

PANEL ACTION: Accept in Principle.

Revise 250.36(G) to read as follows:

(G) Equipment Bonding Jumper Size. The equipment bonding jumper shall be sized in accordance with (1) or (2).

(1) Where the grounding electrode conductor connection is made at the grounding impedance, the equipment bonding jumper shall be sized in accordance with 250.66 based on the size of the service entrance conductors for a service or the derived phase conductors for a separately derived system.
(2) Where the grounding electrode conductor is connected at the first system disconnecting means or overcurrent device, the equipment bonding jumper shall be sized the same as the neutral conductor in 250.36(B).
PANEL STATEMENT: The panel concludes the revised text meets the intent of the submitter and adds clarity to the section.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16

(Log #293)

5- 77 - (250-50): Reject
SUBMITTER: Victoria Valentine, National Fire Sprinkler Association
COMMENT ON PROPOSAL NO: 5-143
RECOMMENDATION: Accept Proposal 5-143.
SUBSTANTIATION: The Panel's statement for rejection is not responsive to the proposal substantiation. A direct conflict exists between NFPA 24 and NFPA 70, which the panel has failed to recognize or resolve. For reasons outlined in the proposal, including the use of plastic underground, the use of fire protection piping as a portion of the grounding electrode system is ill advised.
The article by Mr. Caloggero referenced by the panel in Proposals 5-153 and 5-165 helps to prove our point. In the third to the last paragraph he states, "A 6-inch sprinkler main would be a good electrode, but Section 8-3.5 of NFPA 24 prohibits using it as such. Sprinkler systems with a dielectric isolator in the main sprinkler supply wouldn't satisfy the requirements for a grounding electrode, either ...". Since almost all sprinkler systems use dielectric isolators (in the form of flexible couplings) Mr. Caloggero is confirming that sprinkler systems would be poor choices for inclusion in the grounding electrode system.
We recognize that correct interpretation of the NEC in many circumstances would solve the problem, but too many people in the field are not interpreting the NEC correctly. Without an explicit prohibition, sprinkler systems are being relied upon for the grounding electrode system and they simply cannot perform that function adequately or safely.
PANEL ACTION: Reject.
PANEL STATEMENT: The proposal addresses interior metal water piping which is required to be bonded by Section 250-104(a). This interior piping is not currently permitted to be used as an electrode beyond the first 5 feet of the entry of the water piping system to the building. If the metal water piping system supplying the building for the sprinkler system qualifies as an electrode in accordance with Section 250-50(a), then it is required to be part of the grounding electrode system. Not including this electrode as part of the grounding electrode system introduces the possibilities of differences of potential between the grounding electrode system and an available grounding electrode that is not bonded to and made part of the grounding electrode system. See Panel statement to proposal 5-143 in 2001 ROP.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16

(Log #580)

5- 78 - (250-50): Accept in Principle
SUBMITTER: Robert A. McCullough, Ocean County Construction Insp. Dept., NJ
COMMENT ON PROPOSAL NO: 5-134a
RECOMMENDATION: Revise recommendation as follows:
If available on the premises at each building or structure served, each item in 250-52(a)(1) through (a)~~(6)~~(3) shall be bonded together to form the grounding electrode system. Where none of these electrodes ~~is~~ are available, one or more of the electrodes specified in 250-52(a)(4) through (a)(7) shall be used.
SUBSTANTIATION: The section as proposed requires everything listed in 250-52(a), except item (7), to be used as the grounding electrode system if they are available on premises. The second sentence then states that if none of them are available (items 1-6) you then use some of the electrodes that weren't available in the first place, or item (7), as the grounding electrode system. This overlapping of list items needs to be corrected. Additionally, English weren't my strong point but the singular "is" should be changed to "are" since we are talking about the plural "electrodes" in items 1-3. Also, the panel's action on Proposal 5-162a adds the title "Electrodes Permitted for Grounding" to 250-52. Since the language here in 250-50 says "each item in 250-52(a) shall..." is there the possibility of confusion with the term "permitted" in 250-52?
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Comment 5-80.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16

(Log #623)

5- 79 - (250-50): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
COMMENT ON PROPOSAL NO: 5-135
RECOMMENDATION: Accept in part as follows:
Except for connections to concrete-encased, driven, or buried electrodes, the points of attachment of the bonding jumper shall be accessible.
SUBSTANTIATION: Since the bonding jumper is required to comply with other requirements for a grounding electrode conductor (250-64(a)(b)(e)) the points of attachment should be accessible, as is required in 250-24(a)(1)(d); 250-68(a); and 250-104(a). The points of bonding in (a)(2) do not preclude a connection to a GEC concealed in a wall or to a grounded service raceway installed in or under a building concrete slab.
PANEL ACTION: Reject.
PANEL STATEMENT: The method of connection of the bonding jumper that ties the electrodes of the grounding electrode system together is covered in Section 250.68(A) relative to accessibility.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16

(Log #1224)

5- 80 - (250-50): Accept in Principle
SUBMITTER: Dann Strube, Lanesville, IN
COMMENT ON PROPOSAL NO: 5-134a
RECOMMENDATION: Revise the last sentence as follows:
"...of the electrode specified in Section 250-52(a)(4) through (A)(7) shall be ~~used~~ installed.
SUBSTANTIATION: If an electrode is not installed, it cannot be used.
PANEL ACTION: Accept in Principle.
Revise 250.50 of the 2002 NEC ROP draft to read as follows:
250.50 Grounding Electrode System. If available on the premises at each building or structure served, each item in 250.52(A)(1) through (A)(6) shall be bonded together to form the grounding electrode system. Where none of these electrodes ~~is~~ are available, one or more of the electrodes specified in 250.52(A)(4) through (A)(7) shall be installed and used.
PANEL STATEMENT: The text was edited to add clarity and correlate with Comments 5-78.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16

(Log #1538)

5- 81 - (250-50): Reject
SUBMITTER: Michael J. Johnston, International Association of Electrical Inspectors
COMMENT ON PROPOSAL NO: 5-141
RECOMMENDATION: Revise the first sentence as follows:
If installed or present on the premises at each building or structure served, each item (a) through (d), and any made electrodes in accordance with Section 250-52(c) and (d) shall be bonded together to form the grounding system.
SUBSTANTIATION: My original vote on this proposal was a negative vote, but after considerable thought, the proposal has

merit and should be reconsidered by the panel. The whole concept of using the metal water pipe, effectively grounded structural steel and the concrete encased electrode based on one or more of these being installed as part of the construction of the building or structure. The word "available" is not enforceable and per the NEC Style Manual for 2000 is to be avoided. This situation is an excellent example of why the word "available" is not enforceable. The concept and use of the concrete encased electrode has been a proven excellent electrode in any region. The nature of this electrode and the fact that it can be installed as part of most construction of buildings or structures should warrant its use in all buildings. The years of service on some of the first sites as this electrode was developed in Arizona lasted without failure for years and some are even in use today. After serving in the code enforcement part of the industry for over 10 years in the Phoenix, Arizona jurisdiction, the value and reliability of the concrete encased electrode is exceptional. This would be an excellent area in the code to address the word "available" and its use in this section to resolve the controversy that it creates in the field. Requiring buildings with concrete footings to include a concrete encased electrode as part of the grounding electrode system will enhance safety. The concrete encased electrode is able to be included as part of the grounding electrode system of any building or structure with concrete and rebar footings. This proposal is well intended and worth a closer look.

PANEL ACTION: Reject.

PANEL STATEMENT: The panel recognizes the effectiveness of the concrete encased electrode and that it should be used when present and accessible. However, the panel concludes that, although it may be present, it may not be accessible to the installer because of construction coordination and scheduling issues. The footings may be in place prior to the electrical construction commencing.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16

VOTE ON PANEL ACTION:

AFFIRMATIVE: 13
NEGATIVE: 2
ABSTENTION: 1

EXPLANATION OF NEGATIVE:

BOKSINER: If this comment were accepted, the requirements of the NEC would force building and electrical contractors to address the coordination and scheduling issues.

SKUGGEVIG: With the introduction of plastic piping and the loss of metal water piping systems as a reliable, low-impedance grounding electrode, other types of electrodes are needed to serve as part of the grounding electrode system. Concrete-encased electrodes are among the best types to serve this important role. Concrete-encased electrodes should be required to be used along with other electrodes that are likely to have low impedance to earth and that are installed on the premises to improve the likelihood of getting a reliable, low-impedance grounding electrode system.

COMMENT ON AFFIRMATIVE:

BRETT: I agree with the panel's action and statement. The electrician has little control over the availability issue for a number of reasons however, through the joint efforts of interested parties a proposal can be submitted, to the International Building Codes (IBC), to make "available" the concrete encased electrode. I agree with Mr. Johnston that "...including a concrete encased electrode as part of the grounding electrode system will enhance safety." While difficult to address within the NEC, I believe the IBC is the correct forum to affect this change.

EXPLANATION OF ABSTENTION:

JOHNSTON: The spirit and intent of the original proposal and the comment appear to be worth of additional consideration. The word "available" is not enforceable and per the NEC Style Manual for 2000 is recommended that it be avoided. The word available relative to the coordination of installation concrete encased electrode is a matter of a point in time when the building is being constructed. The issue of the word "available" being replaced with the term "if installed and present" is a concept that needs further review. The comment to the negative regarding the IEEE papers written by H.G. Ufer confirming the validity, reliability, and effectiveness of concrete encased electrodes has both value and merit. History and data have proven the worthiness of the concrete encased electrode. Numerous States and municipalities amend the NEC by requiring a concrete encased electrode to be included as part of the grounding electrode system. A current grounding electrode study is under way to monitor grounding electrode connection resistance values to ground are being monitored season to season. The panel affirms that data gathered from the on going testing program of grounding electrodes might have an impact on the mandate of its use in every structure of new construction. The panel is sensitive to the impact to current industry practices relative to requiring a concrete encased electrode on all new installations. The word "available" and the word "existing" work against each other where buildings are constructed without installing a concrete encased electrode in the building footing. An example is where the building construction is started and all footings and foundations are completed before the electrical construction is started or the electrical contractor is onsite to install a concrete encased electrode. If the footings are poured, then they are existing and no longer available. The panel concludes that this appears to be a trade coordination problem, although a trade coordination issue in the field should not serve as a basis for allowing it to be installed only when there is "availability" or "access" to a foundation of a building or structure that is not poured. If the word "existing" were defined in the code it might serve to eliminate a gray area between when trying to meet the intent of the word "available". Proposed definitions for the word "existing" have been rejected in previous code cycles. Clearly the intent is to not require that existing building structural footings be disturbed to install a concrete encased electrode. It should also be noted that in most cases, effectively grounded building steel is effectively grounded through the concrete encased rebar. IAEI agrees that the concept of "If installed and present" relative to the concrete encased electrode and its use and requirements in future editions of the NEC should be further studied. IAEI is interested in the gathering of reliable data on the subject.

(Log #1717)

5- 82 - (250-50): Reject

SUBMITTER: Don Ganiere, Ottawa, IL

COMMENT ON PROPOSAL NO: 5-141

RECOMMENDATION: This proposal should be accepted.

SUBSTANTIATION: With what has been the most effective grounding electrode (metal underground water pipe) rapidly disappearing due to the wide spread use of nonmetallic water distribution systems, it is time to require the use of the concrete encased electrode on all structures where it exists.

PANEL ACTION: Reject.

PANEL STATEMENT: See panel action and statement on Comment 5-81.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16

VOTE ON PANEL ACTION:

AFFIRMATIVE: 15
NEGATIVE: 1

EXPLANATION OF NEGATIVE:

SKUGGEVIG: See my Explanation of Negative vote on Comment 5-81.

(Log #2028)

5- 83 - (250-50): Accept in Principle

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

COMMENT ON PROPOSAL NO: 5-134a

RECOMMENDATION: Revise the second sentence to read as follows:

"Where none of these electrodes is available, an electrode specified in (A)(7) shall be used, or one or more electrodes specified in (A)(4) through (A)(6) shall be provided and used, or both. 5-134a 250-50, panel reorganization of the section. {lists traditional made electrodes here, so they get drawn into the grid. OK, like before. However the text says if none are available, then one (including (a)(4) - ground ring) must be used. Must say (a)(7) (other underground structure) to be used, or one or more (a)(4) through (a)(6) electrodes to be provided and used, or both.}

SUBSTANTIATION: The panel action did a good job of reorganizing the presentation of the section, however, it inadvertently failed to properly incorporate a distinction that separates other underground structures from other made electrodes. In the 1999 NEC, an (A)(7) electrode is optional, but fully qualified if available and elected to be used. It is not something that is provided merely for grounding purposes, unlike ground rings, plates, and rods. In this sense it is akin to a metal water lateral. Remember also, that the second sentence assumes that (A)(4-6) electrodes must be provided because by the literal text they are assumed to not have been available during the original evaluation. That is not true of (A)(7) electrodes.

This comment requires (A)(4-6) electrodes to be provided and used, or (A)(7) electrodes can be used if available and so elected,

or you could do both (this construction being the Style Manual version of and/or.) This appears to better reflect panel intent.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Comment 5-80. The panel concludes this meets the intent of the submitter.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16

(Log #2181)

5- 84 - (250-50): Reject
SUBMITTER: Donald R. Cook, Shelby County Building Inspections
COMMENT ON PROPOSAL NO: 5-141
RECOMMENDATION: Panel should accept this proposal.
SUBSTANTIATION: Present language prevents authorities having jurisdiction from requiring the best electrode on the premises to be used. If the concrete encased electrode is at the site there is no additional cost to building owner, other than a short piece of conductor and a termination, to use this effective electrode. If it were required, the general contractor would make it available.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Comment 5-81.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
SKUGGEVIG: See my Explanation of Negative vote on Comment 5-81.

(Log #2214)

5- 85 - (250-50): Accept in Principle
SUBMITTER: Robert H. Keis, Dover, DE
COMMENT ON PROPOSAL NO: 5-149
RECOMMENDATION: This proposal should remain "accepted in principle" per the panel action.
SUBSTANTIATION: This proposal will clarify that supplemental electrodes, which are usually installed near equipment, are not required to be connected to the grounding electrode system, but only to the equipment grounding system. When the words "and any made electrodes" were added to Section 250-50 the requirement became confusing. This will clear up the intent of Section 250-54.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action on Comment 5-87.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16

(Log #2235)

5- 86 - (250-50): Reject
SUBMITTER: Andre R. Cartal, Bldg Dept., Princeton Borough, NJ
COMMENT ON PROPOSAL NO: 5-141
RECOMMENDATION: Please reconsider the proposal.
SUBSTANTIATION: Actual field experience indicates that the concrete-encased electrode is not taken seriously because of the "if available" wording. Electrical Inspectors could be hard pressed to explain the "unavailability" of this electrode on new construction to a jury, especially ignoring provisions in Section 90-1(a) that are considered necessary for safety. I don't think the word "available" is considered user friendly by the Style Manual.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Comment 5-81.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
SKUGGEVIG: See my Explanation of Negative vote on Comment 5-81.

(Log #1401)

5- 87 - (250-50, Exception (New 250.53 (c))): Accept in Principle
SUBMITTER: Kari Barrett, American Chemistry Council
COMMENT ON PROPOSAL NO: 5-149
RECOMMENDATION: The following should be added:
Exception: Where a supplementary electrode(s) is connected to the equipment grounding conductor in accordance with 250-54 a bonding jumper sized according to 250-66 shall not be required.
SUBSTANTIATION: Section 250.53(C) provides sizing requirements for bonding jumpers and needs an exception to remove confusion between this section and 250.54. Presently 250.53(C) requires a 250.66 jumper and 250.54 allows an equipment grounding conductor presumably sized according to 250.122.
PANEL ACTION: Accept in Principle.
Revise 250.54 to read as follows:
250.54 Supplementary Grounding Electrodes. Supplementary grounding electrodes shall be permitted to be connected to the equipment grounding conductors specified in 250.118 and shall not be required to comply with the electrode bonding requirements of 250.50 or 250.53(C), or the resistance requirements of 250.56, but the earth shall not be used as the sole equipment grounding conductor.
PANEL STATEMENT: The panel concludes that this meets the intent of the submitter.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
BRENDER: Present Code language in 250-54 adequately addresses the subject.

(Log #2073)

5- 88 - (250-50, Exception): Accept
SUBMITTER: Phil Simmons, Simmons Electrical Services
COMMENT ON PROPOSAL NO: 5-162a
RECOMMENDATION: Revise text as follows:
Exception: In industrial and commercial buildings or structures where conditions of maintenance and supervision ensure that only qualified persons will service the installation, interior metal water piping located more than 1.52 m (5 ft) from the point of entrance to the building shall be permitted as a part of the grounding electrode system or as a conductor to interconnect electrodes that are part of the grounding electrode system provided that the entire length, other than short sections passing perpendicular through walls, floors or ceilings, of the interior metal water pipe that is being used for the conductor is exposed.
SUBSTANTIATION: These changes are necessary to make the Exception a complete sentence to comply with the NEC Style Manual. In addition, the complete sentence is necessary as the paragraph above the exceptions contains more than one requirement.
Finally, the words, "or structures" are included in accordance with Mr. Dobrowsky's comment on affirmative vote.
PANEL ACTION: Accept.
PANEL STATEMENT: The panel understands this text replaces 250.52(A)(1), Exception of the 2002 ROP draft.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16

(Log #520)

5- 89 - (250-50 Exception No. 1 (New)): Reject
SUBMITTER: David A. Kerr, Jr., Friendsville, PA
COMMENT ON PROPOSAL NO: 5-148
RECOMMENDATION: Accept.
SUBSTANTIATION: This proposal has a ton of technical substantiation. Clearly, Fred Hartwell has access to a ground rod tester, which I don't. The Code-Making Panel's concern about the inductive reactance of 4 AWG bare copper is the craziest thing I have ever heard. Bare copper buried 4 ft. deep in a trench is a good ground all by itself. A steel well casing is the single best form of lightning protection. Lightning travels for miles in the country. People have been using plastic water pipe for half a century. I believe it is possible for lightning to melt the 12 AWG commonly used as an equipment grounding conductor to the well casing.
PANEL ACTION: Reject.

PANEL STATEMENT: See panel action on Comment 5-90.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NEGATIVE: 2
EXPLANATION OF NEGATIVE:
BRENDER: A well casing has been shown to be an effective electrode in most cases where it supplements the electrodes required elsewhere in Article 250. The proposal as submitted lists several limitations as to the Exception's applicability in the grounding electrode system under specific limitations of new buildings or structures directly supplied by a well, and thus is not an onerous requirement, and could enhance safety at minimal cost.
The original proposal has merit, and the vote to reject the comment should be reconsidered.
SKUGGEVIG: See my Explanation of Negative vote on Comment 5-90.

(Log #2029)

5- 90 - (250-50 Exception No. 1): Reject
SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc.
COMMENT ON PROPOSAL NO: 5-148
RECOMMENDATION: The proposal should be accepted in principle. Accept the concept of the proposal as written but reorganize it to correlate with the panel action on the parent section, and then add two sentences to the end as follows:
"Where located on the premises and within 60 m (200 ft) of a new building or structure directly supplied by a well, and where none of the electrodes specified in 250.52(A)(1) through (A)(4) or (A)(7) are available, metallic well casings in direct contact with the earth for not less than 10 3.0 m (10 ft) shall be included in the grounding electrode system. Where the length of the grounding electrode conductor between the building or structure served and the metallic well casing exceeds 6.0 m (20 ft), the grounding electrode conductor shall be additionally bonded to another electrode specified in 250.52(A)(5) or (A)(6). The installation shall be arranged so that the distance between the building or structure and the nearest grounding electrode does not exceed 6.0m (20 ft)."
SUBSTANTIATION: The Advisory Committee wishes to commend Code-Making Panel 5 for its thoughtful and careful review of this proposal. The Committee agrees that as written the proposal failed to adequately address di/dt issues that come into play in the case of a lightning event. The proposal did address, however, the issue of utility crosses, as the panel noted. This comment responds to those concerns by effectively assuring that a made electrode would be placed near the building. In high-resistance soil areas, the additional made electrode would be admittedly marginal in terms of medium voltage utility crosses, but in terms of a lightning strike at millions of volts to ground, the self-inductance of a long conductor becomes more of a limiting factor than the resistance of a poor electrode. This comment bridges the two technical issues. The Committee continues to believe that well casings should be mandatory in instances when one or even two made electrodes become the only alternative. The 20 ft dimension correlates with the Code-Making Panel 16 action on Proposal 16-212, which addresses a similar issue.
With respect to the panel statement that this is not an exception, the Committee respectfully disagrees. The Committee is aware that well casings are permissible electrodes [falling in the rewrite under 250.52(A)(7)], however, they are never mandatory under present Code. This proposal is a mandatory exception, obliging the use of a well casing in a particular circumstance (namely, the only alternative being made electrodes without supplementation). As such, it is an exception to the language of 250.50.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement to proposal 5-148. Submitter did not substantiate the need for a reversal by the panel on the original rejection of the proposal. Section 250.52(A)(7) permits the well casing to be used as a grounding electrode already. Requiring the well casing under 60 meters will require additional substantiation.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NEGATIVE: 3
EXPLANATION OF NEGATIVE:
BOKSINER: It seems the submitter has addressed the concerns expressed in the Panel Statement during the ROP. Therefore, even if the 60 m distance is somewhat arbitrary, the concept of the proposal, as revised, has merit and deserves to be included into the NEC.
BRENDER: See my Explanation of Negative vote in Comment 5-89.
SKUGGEVIG: With the introduction of plastic piping and the loss of metal water piping systems as a reliable, low-impedance grounding electrode, other types of electrodes are needed to serve as part of the grounding electrode system. In many installations, there is a good chance that the well casing will already be connected to the system by means of a smaller, more fragile equipment grounding conductor between the service equipment and the well pump motor frame. However, by including the well casing in the grounding electrode system, the well casing would be connected directly to the service equipment enclosure through a larger conductor that can better withstand the damaging effects of lightning surges.

(Log #295)

5- 91 - (250-50(a)): Reject
SUBMITTER: Victoria Valentine, National Fire Sprinkler Association
COMMENT ON PROPOSAL NO: 5-153
RECOMMENDATION: Accept Proposal 5-153.
SUBSTANTIATION: The Panel's statement for rejection is not responsive to the proposal substantiation. A direct conflict exists between NFPA 24 and NFPA 70, which the panel has failed to recognize or resolve. For reasons outlined in the proposal, including the use of plastic underground, the use of fire protection piping as a portion of the grounding electrode system is ill advised.
The article by Mr. Caloggero referenced by the panel helps to prove our point. In the third to the last paragraph he states, "A 6-inch sprinkler main would be a good electrode, but Section 8-3.5 of NFPA 24 prohibits using it as such. Sprinkler systems with a dielectric isolator in the main sprinkler supply wouldn't satisfy the requirements for a grounding electrode, either ...". Since almost all sprinkler systems use dielectric isolators (in the form of flexible couplings) Mr. Caloggero is confirming that sprinkler systems would be poor choices for inclusion in the grounding electrode system.
We recognize that correct interpretation of the NEC in many circumstances would solve the problem, but too many people in the field are not interpreting the NEC correctly. Without an explicit prohibition, sprinkler systems are being relied upon for the grounding electrode system and they simply cannot perform that function adequately or safely.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Comment 5-77.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16

(Log #389)

5- 92 - (250-50(c)): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
COMMENT ON PROPOSAL NO: 5-160
RECOMMENDATION: Accept in Principle revised as follows:
"CONCRETE-encased electrode. An electrode encased by ~~at least~~ not less than 50.8 mm (2 in.) of concrete, located within and near the bottom of a concrete foundation or footing, not less than 6.1 m (20 ft) in length that is in direct contact with the earth..."
(remainder unchanged)
SUBSTANTIATION: The proposal is intended to require a lineal 20 ft distance. Five 4 ft lengths assembled together side-by-side within in. of each other is tantamount to permitting the additional electrodes of 250-56 to be installed side-by-side. The present text doesn't prohibit 20 ft of tightly coiled wire as the electrode. I believe the intent and earlier testing of these electrodes was based on a run lengthwise in the concrete.
"Not less than" is a standard Code Manual term.
PANEL ACTION: Reject.
PANEL STATEMENT: This proposal introduces unsubstantiated technical changes. The intent of the submitter is not clear.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16

(Log #624)

5- 93 - (250-51 (New)): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
COMMENT ON PROPOSAL NO: 5-162
RECOMMENDATION: Accept in principle revised:

250-51 Grounding Alternate or Standby Power Systems other Than Separately Derived Systems. Where a premises wiring system is supplied by an alternate or standby power source such as a battery, a solar photovoltaic system, a generator, a transformer or converter winding, and has a direct circuit conductor connection to a circuit conductor originating in another system, grounding shall be in accordance with (a), (b), and (c).

(a) Alternating-current Systems. Where the alternate or standby power source connection is to a conductor that has a direct electrical connection to a service-supplied system the service grounding system shall be used for grounding the alternate or standby system. Where the alternate or standby system power source connection is to a conductor of a system that does not have a direct electrical connection to a service-supplied system, such as the secondary of an isolating type transformer, a bonding jumper in accordance with 250-28 based on the largest derived phase conductor of the systems shall be used to connect the equipment grounding conductors of the systems to the grounded conductor of the system with the largest derived phase conductor. This connection shall be made at any point from the system source to the first disconnecting means or overcurrent device(s), or it shall be made at the source of a system that has no disconnecting means or overcurrent devices. A grounding electrode conductor sized in accordance with Table 250-66 based on the largest derived phase conductor of the systems shall be used to connect the conductor to be grounded to the grounding electrode(s). This connection shall be made at the same point on the system where the bonding jumper is installed. Neutral conductors which must carry ground-fault current shall not be smaller than the size of the bonding jumper.

(b) Direct-Current Systems. Where the alternate or standby power source connection is to a conductor supplied by a service, the grounding system (off-premises source) shall be used for grounding the alternate or standby power system. Where the alternate or standby power connection is to a conductor supplied by a source located on the premises, a bonding jumper shall be used to connect the equipment grounding conductors of the systems to the largest conductor to be grounded of the systems. This connection shall be made at any point from the system source to the first disconnecting means or overcurrent device(s), or it shall be made at the source of a system that has no disconnecting means or overcurrent devices. A grounding electrode conductor shall be used to connect the grounded conductor to a grounding electrode(s). This connection shall be made at the same point where the bonding jumper is installed. The size of the bonding jumper and the grounding electrode conductor shall be in accordance with 250-166 and 250-168. Neutral conductors which must carry ground-fault current shall not be smaller than the largest ungrounded conductor of the systems.

(c) Grounding Methods. In all other respects, grounding methods shall comply with applicable requirements prescribed in other parts of this code.

SUBSTANTIATION: The panel statement was these systems are already covered in the code and referred to Article 100 definition of Separately Derived Systems. This proposal has nothing to do with separately derived systems since it covers power sources with a direct conductor interconnection (usually a neutral). Where, for example, a generator source has a neutral conductor connection to a transformer secondary neutral conductor neither system is covered by the definition of separately derived system and there does not appear to be grounding and bonding rules specifically for grounding such interconnected systems. Section 250-24 does not apply since they are not services. Section 250-30 does not apply since they are not separately derived systems as defined in Article 100. Section 250-20 may require grounding of such systems and 250-26 specifies the conductor to be grounded, which can be interpreted to require separate bonding and grounding of each such interconnected system. Separate individual grounding and bonding of interconnecting systems may cause problems and seems to violate 250-24(a)(5) since any service-supplied transformer secondary interconnected to a generator source is not covered by 250-30.

A generator with a direct neutral connection to an in-plant transformer secondary may be used to augment a service-supplied transformer for peak load periods, or used as the power source during service outages to supply the total load or a portion of the load such as critical loads. The transformer kVA and generator kVA may differ, with a difference in size of the source supply conductors. Is each system to be bonded and grounded in accordance with sizing of the source conductors per 250-28 or 250-30 if they are not services or separately derived systems? Or is only one source system to be directly bonded and grounded, using the system with the largest phase conductor to determine bonding jumper and grounding electrode conductor size?

The proposal assumes that single-point grounding and bonding is preferable and offers specifics for sizing and point of connection of grounding and bonding conductors, determined by the system with the largest phase conductor, and specifies that the service grounding system is to be used where a derived system is interconnected to a service-derived conductor.

A requirement for neutral which must carry ground-fault current is proposed since a reduced-in-size neutral run to a remote disconnecting means or overcurrent device enclosure and bonded at that location will carry ground-fault current. There is such a requirement in 445-5 for generators but none for transformer neutrals.

PANEL ACTION: Reject.
PANEL STATEMENT: Where two systems exist on a premises that may become interconnected, the first system is to be selected for grounding and the other system may be treated as a separately derived system depending on connection and usage.

The proposed text is confusing and does not add any clarity.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16

(Log #294)

5- 94 - (250-52(a)): Reject
SUBMITTER: Victoria Valentine, National Fire Sprinkler Association
COMMENT ON PROPOSAL NO: 5-165
RECOMMENDATION: Accept Proposal 5-165.
SUBSTANTIATION: The Panel's statement for rejection is not responsive to the proposal substantiation. A direct conflict exists between NFPA 24 and NFPA 70, which the panel has failed to recognize or resolve. For reasons outlined in the proposal, including the use of plastic underground, the use of fire protection piping as a portion of the grounding electrode system is ill advised.

The article by Mr. Caloggero referenced by the panel helps to prove our point. In the third to the last paragraph he states, "A 6-inch sprinkler main would be a good electrode, but Section 8-3.5 of NFPA 24 prohibits using it as such. Sprinkler systems with a dielectric isolator in the main sprinkler supply wouldn't satisfy the requirements for a grounding electrode, either ...". Since almost all sprinkler systems use dielectric isolators (in the form of flexible couplings) Mr. Caloggero is confirming that sprinkler systems would be poor choices for inclusion in the grounding electrode system.

We recognize that correct interpretation of the NEC in many circumstances would solve the problem, but too many people in the field are not interpreting the NEC correctly. Without an explicit prohibition, sprinkler systems are being relied upon for the grounding electrode system and they simply cannot perform that function adequately or safely.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Comment 5-77.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16

(Log #1226)

5- 95 - (250-53): Accept
SUBMITTER: Dann Strube, Lanesville, IN
COMMENT ON PROPOSAL NO: 5-171a
RECOMMENDATION: Reconsider the wording in Section 250-53(b) and revise as follows:

Where more than one <u>of the electrodes of the type specified in Section 250-52(a)(5) or (6) are used</u>...

SUBSTANTIATION: The proposed wording would require the six-foot distance between any of the electrode types. If a ground ring is installed at a 2 1/2 foot depth, the water pipe would need to be 8 1/2 feet deep. The situation would be even worse with a concrete-encased electrode. In previous codes, the six-foot rule was only for rods, pipes and plates. No substantiation was given to change to a more restrictive rule.
PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16

(Log #1957)

5- 96 - (250-53): Accept in Principle
SUBMITTER: Phil Simmons, Simmons Electrical Services
COMMENT ON PROPOSAL NO: 5-171a
RECOMMENDATION: Make the following changes:
Move Section 250.53(D) to become part of Section 250.64. Make appropriate changes to the titles of Section 250.64. In so doing, delete Section 250.53(D)(3) as it says the same thing as Section 250.64(C).
In Section 250.53(E) change "When" to "Where."
Delete Section 250-53(F).
Renumber 250.53(E) to (D), (G) to (E), and (H) to (F).
Change the text of Section 250.53(H) [renumbered to (F)] to read as follows:
The electrode shall be installed such that at least 2.44 m (8 ft) of length is in contact with the soil. It shall be driven to a depth of not less than 2.44 m (8 ft) except that, where rock bottom is encountered, the electrode shall be driven at an oblique angle not to exceed 45 degrees from the vertical or, where rock bottom is encountered, the electrode shall be permitted to be buried in a trench that is at least 2 1/2 ft (762 mm) deep. The upper end of the electrode shall be flush with or below ground level unless the aboveground end and the grounding electrode conductor attachment are protected against physical damage as specified in Section 250.10."
SUBSTANTIATION: For moving Section 250.53(D) to become part of Section 250.64; doing so will improve the organization of these sections. At the present time, rules on the connection, sizing and splicing of the grounding electrode conductor are located in the middle of the section that deals with installation of the grounding electrode system. Other rules on installing the grounding electrode conductor(s) are found in Section 250.64. After moving the text of 250.53(D) to Section 250.64, Section 250.53(D)(3) can be deleted as it says the same thing as Section 250.64(C). In addition, Section 250.64(C) has an Exception which does not appear in 250.53(D)(3).
Section 250.64 will then read or be organized as follows:
"250.64. Grounding Electrode Conductor Installation.
Grounding electrode conductors shall be installed as specified in (A) through (G) ~~(E)~~.
(A) Aluminum or Copper-Clad Aluminum Conductors (Present text remains)
(B) Securing and Protecting~~Grounding Electrode Conductors~~. (See Comment on Proposal 5-177 for this change.) [Present text from 250.64(B)].
(C) Continuous. [Present text from 250.64(C)].
(D) Grounding Electrode Conductor Taps. [Present text from 250.64(d)].
(E) Enclosures for Grounding Electrode Conductors [Present text from 250.64(E)].
(F) To Electrode(s). ~~Connection.~~ [Present text from 250.53(d)(1)]. The present title of Connection should be improved upon. Section 250.70 covers the connection methods to grounding electrodes so that the title of this section should be changed to more accurately relate to the requirements of the section.
(G) Sizing. [Present text from 250.53(D)(2)].
For the change to Section 250.53(E); this is an editorial change to comply with the NEC Style Manual.
For deleting Section 250-53(F); this is identical language to that found in 250.66(A). The size rules for other grounding electrode conductors is not repeated in Section 250.53 so it appears unnecessary to have the size for the grounding electrode conductor for a rod, pipe or plate repeated here.
For the proposed change to the text of Section 250.53(H); this clarifies that only where an 8 ft rod cannot be driven to full length on an oblique angle it is permitted to bury the rod in a trench. This helps ensure compliance with 250.53(A) which requires "Where practicable, rod, pipe, and plate electrodes shall be embedded below permanent moisture level." This revised language does not introduce a new concept in this article as similar language has been in the Code for many editions.
For deleting Section 250.53(F); this section is not needed as identical language is contained in Section 250.66(A). In addition, Section 250.53(C) covers the size of the bonding jumper and makes proper reference to 250.66 for the proper size.
PANEL ACTION: Accept in Principle.
Make the following changes:
Move Section 250.53(D) to become part of Section 250.64. Make appropriate changes to the titles of Section 250.64. In so doing, delete Section 250.53(D)(3) as it says the same thing as Section 250.64(C).
In Section 250.53(E) change "When" to "Where."
Renumber 250.53(E) to (D), (F) to (E), (G) to (F), (H) to (G), and (I) to (H).
Change the text of Section 250.53(H) [renumbered to (G)] to read as follows:
The electrode shall be installed such that at least 2.44 m (8 ft) of length is in contact with the soil. It shall be driven to a depth of not less than 2.44 m (8 ft) except that, where rock bottom is encountered, the electrode shall be driven at an oblique angle not to exceed 45 degrees from the vertical or, where rock bottom is encountered at an angle up to 45 degrees, the electrode shall be permitted to be buried in a trench that is at least 2 1/2 ft (762 mm) deep. The upper end of the electrode shall be flush with or below ground level unless the aboveground end and the grounding electrode conductor attachment are protected against physical damage as specified in Section 250.10."
PANEL STATEMENT: The "45 degrees" was added to ensure that a horizontally buried rod will not be a second choice but rather a third choice. Section 250.53(F) is not being deleted because of DC systems. See panel Comment 5-100a (Log #CC503) which incorporates the action on Section 250.64 as accepted in this comment.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16

(Log #993)

5- 97 - (250-54): Reject
SUBMITTER: Andrew T. Crescuillo, Rochester, NY
COMMENT ON PROPOSAL NO: 5-172
RECOMMENDATION: Revise text to read as follows:
Supplementary Grounding Electrodes. Supplementary Grounding Electrodes shall be permitted to be connected to the equipment grounding conductors specified in Section 250-118 and shall not be required to comply with the electrode bonding requirements of Section 250-50, ~~or the resistance requirements of Section 250-56.~~ but the earth shall not be used as the sole equipment grounding conductor.
SUBSTANTIATION: This conflicts with Section 250-53(E)(2) which states that the supplementary electrode shall be permitted bonded to the nonflexible grounded service raceway. Section 250-18 lists rigid metal conduit - intermediate metal conduit - electrical metal tubing - etc. These are raceways permitted to be used as part of the service. See: Definitions for Services and Equipment.
PANEL ACTION: Reject.
PANEL STATEMENT: The substantiation is unclear and confusing and does not relate to the proposed change.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16

(Log #2212)

5- 98 - (250-54): Reject
SUBMITTER: Robert H. Keis, Dover, DE
COMMENT ON PROPOSAL NO: 5-172
RECOMMENDATION: This proposal should be rejected.
SUBSTANTIATION: This proposal is confusing. Reject this proposal and accept Proposal 5-149. Proposal 5-149 says basically the same thing, only it can be understood.
PANEL ACTION: Reject.
PANEL STATEMENT: No substantiation provided to reverse the panel's decision in accepting the original proposal 5-172. The panel concludes that additional clarification is provided relative to the maximum resistance of made electrodes and when Section 250-56 applies.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
BRENDER: See my Explanation of Negative on Comment 5-87.

(Log #62)

5- 99 - (250-56): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 5-173
RECOMMENDATION: It was the action of the Technical Correlating Committee that further consideration be given to the comments expressed in the voting. This action will be considered by the panel as a public comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
Change "Section 250-50(b), (c), or (d) or Section 250-52" to "250-52(a)(2) through (a)(7)" in Proposal 5-173.
PANEL STATEMENT: The panel accepts the direction of the Technical Correlating Committee. The panel has made editorial corrections to proposal 5-173.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16

(Log #1262)

5- 100 - (250-56): Reject
SUBMITTER: David A. Kerr, Jr., Friendsville, PA
COMMENT ON PROPOSAL NO: 5-173
RECOMMENDATION: Reject.
SUBSTANTIATION: This circular proposal is impossible to read. It seems to require water plus two. That proposal was rejected in 5-1-56, which at least has the merit of being comprehensibly written. Water plus one rod is fine. How many angels can dance on the head of a ground rod? What we need is clear language requiring real electrodes such as rebar building steel and well casings. Rebar in the footer is better than low cost; it's free. In the course of five years I've come across zero concrete-encased electrodes. Two ground rods are twice as good as one, VIZ nearly worthless.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel concludes that no substantiation is provided that accepted Proposal 5-173 does not clarify the requirements. The requirement to augment a supplemental made electrode that does not have a resistance of less than 25 ohms has not changed from the 1999 NEC. The submitter has not provided substantiation or reasons to reverse the panel action in the 1999 NEC. The panel concurs with the submitter's rational that the supplemental electrode(s) should be able to act as the sole electrode in the event that the water pipe electrode is disrupted at a later date. See the substantiation of Proposal 5-173.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16

(Log #CC503)

5- 100a - (250.64): Accept
Note: The Technical Correlating Committee understands that 250.53(D) as it appears in Comment 5-100a is not to be included as the last section in the revision of 250-64. See Panel Action on Comment 5-96.
SUBMITTER: CMP 5
COMMENT ON PROPOSAL NO: 5-260, 177, 178, 179, 171a
RECOMMENDATION: Revise as follows:

250.64 Grounding Electrode Conductor Installation.
Grounding electrode conductors shall be installed as specified in (A) through (F) ~~(E)~~.

(A) Aluminum or Copper-Clad Aluminum Conductors. ~~Insulated or~~ Bare aluminum or copper-clad aluminum grounding conductors shall not be used where in direct contact with masonry or the earth or where subject to corrosive conditions. Where used outside, aluminum or copper-clad aluminum grounding conductors shall not be terminated ~~installed~~ within 450 mm (18 in.) of the earth. **C 5-101**

(B) Securing and Protection from Physical Damage. ~~Protecting Grounding Electrode Conductor.~~ A grounding electrode conductor or its enclosure shall be securely fastened to the surface on which it is carried. A 4 AWG copper or aluminum, or larger conductor shall be protected if exposed to severe physical damage. A 6 AWG grounding conductor that is free from exposure to physical damage shall be permitted to be run along the surface of the building construction without metal covering or protection where it is securely fastened to the construction; otherwise, it shall be in rigid metal conduit, intermediate metal conduit, rigid nonmetallic conduit, electrical metallic tubing, or cable armor. Grounding conductors smaller than 6 AWG shall be in rigid metal conduit, intermediate metal conduit, rigid nonmetallic conduit, electrical metallic tubing, or cable armor. **C 5-103**

(C) Continuous. The grounding electrode conductor shall be installed in one continuous length without a splice or joint, unless spliced only by irreversible compression-type connectors listed for the purpose or by the exothermic welding process.

Exception: Sections of busbars shall be permitted to be connected together to form a grounding electrode conductor. ~~Busbars shall be permitted to have splices.~~ **C 5-105**

~~**250.53(D)(3) Splicing.** The grounding electrode conductor shall be unspliced or spliced by means of irreversible compression-type connectors listed for the purpose or by the exothermic welding process.~~

(D) Grounding Electrode Conductor Taps. Where a service consists of more than a single enclosure as permitted in 230.40, Exception No. 2, it shall be permitted to connect taps to the grounding electrode conductor. Each such tap conductor shall extend to the inside of each such enclosure. The grounding electrode conductor shall be sized in accordance with 250.66, but the tap conductors shall be permitted to be sized in accordance with the grounding electrode conductors specified in 250.66 for the largest conductor serving the respective enclosures. The tap conductors shall be connected to the grounding electrode conductor in such a manner that the grounding electrode conductor remains without a splice.

(E) Enclosures for Grounding Electrode Conductors. Metal enclosures for grounding electrode conductors shall be electrically continuous from the point of attachment to cabinets or equipment to the grounding electrode, and shall be securely fastened to the ground clamp or fitting. Metal enclosures that are not physically continuous from cabinet or equipment to the grounding electrode shall be made electrically continuous by bonding each end to the grounding electrode conductor. Where a raceway is used as protection for a grounding electrode conductor, the installation shall comply with the requirements of the appropriate raceway article. **C 5-104**

(F) To Electrode(s). ~~250-53(D)(1) Connection.~~ A grounding electrode conductor shall be permitted to be run to any convenient grounding electrode available in the grounding electrode system or to one or more grounding electrode(s) individually. ~~**(G) Sizing. 250-53(D) (2) Sizing.**~~ The grounding electrode conductor ~~It~~ shall be sized for the largest grounding electrode conductor required among all the electrodes connected to it.
C 5-96

250-53(D) Grounding Electrode Conductor.

(1) Connection. A grounding electrode conductor shall be permitted to be run to any convenient grounding electrode available in the grounding electrode system or to one or more grounding electrode(s) individually.

(2) Sizing. It shall be sized for the largest grounding electrode conductor required among all the electrodes connected to it.

(3) Splicing. The grounding electrode conductor shall be unspliced or spliced by means of irreversible compression-type connectors listed for the purpose or by the exothermic welding process.

SUBSTANTIATION: This action is intended to combine CMP 5 actions on Comments 5-96, 101, 102, 103, 104, and 105.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NEGATIVE: 2
EXPLANATION OF NEGATIVE:
BOKSINER: See my Explanation of Negative vote on Comment 5-105.
RAPPAPORT: This panel proposal combines actions on several comments, not all of which are acceptable. Comments 5-101 and 5-102 propose permitting all insulated aluminum or copper-clad aluminum grounding conductors to be installed in direct contact with masonry or the earth or where subject to corrosive conditions. There are no limitations on the type of insulation or whether listing is necessary. The substantiation for this change was that one type of cable is listed for this purpose. However not all insulated aluminum or copper-clad aluminum conductors are listed for this purpose and the proposed text is too broad. The concept of permitting these aluminum conductors to be used in corrosive

conditions is new material that was not included in the original Proposal 5-260 and, therefore has no had public review. Small pinholes in insulation can result in conductor deterioration and disintegration. If a power conductor fails, this can result in circuit failure but if a grounding conductor fails, there is no indication and safety is compromised. This change is too broad and potentially dangerous to be made without public comment and review by technical organizations.

COMMENT ON AFFIRMATIVE:

DOBROWSKY: The text as provided on page 2 of Log #CC503, beginning with 250.53(D) should be struck through. Comparable text is already in proposed 250.64(C) and (F).

MELLO: The text or the proposed language as presented on the ballot included at the end the text that was derived from the 2002 Draft 250.53(D). The panel action in Comment 5-96 was to relocate the text from 250.53(D) in the Draft and incorporate into 250.64. This was done in 250.64(C) and in 250.64(F) as presented on the ballot and need not be repeated again.

This comment suggests accepting the balloted text up to and including the proposed section 250.64(F) and the remainder beginning with "250.53(D)..." be deleted.

(Log #1125)

5- 101 - (250-64(a)): Accept in Principle

SUBMITTER: Paul Dobrowsky, Holley, NY

COMMENT ON PROPOSAL NO: 5-260

RECOMMENDATION: Revise as follows:

(a) Aluminum or Copper-Clad Aluminum Conductors. ~~Insulated or bare~~ Bare aluminum or copper-clad aluminum grounding conductors shall not be used where in direct contact with masonry or the earth or where subject to corrosive conditions. Where used outside, aluminum or copper-clad aluminum grounding conductors shall not be ~~installed~~ terminated within 18 in. (457 mm) of the earth.

SUBSTANTIATION: Aluminum conductors that are listed as suitable for direct burial in the earth (such as USE) are readily available and have been successfully and safely used. The issue is the termination points.

PANEL ACTION: Accept in Principle.

PANEL STATEMENT: See panel Comment 5-100a which incorporates the action on this comment.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16

VOTE ON PANEL ACTION:

AFFIRMATIVE: 14

NEGATIVE: 2

EXPLANATION OF NEGATIVE:

BRENDER: There has been no statistical or other evidence presented to substantiate this change in the Code. Discussions with cable manufacturers has indicated that they do not have data related to absolute or relative failure rates of aluminum USE cable compared to other conductors. Therefore, the words used in the substantiation "have been successfully and safely used" are without merit and are unjustified.

Elimination of the words "Insulated or" from the first sentence of this section represents a substantial change from present Code language for which no statistical or technical substantiation has been provided. The presence of the words "shall not be used where in direct contact with..." are currently present in the Code for the reason that aluminum and copper-clad aluminum are not very corrosion resistant when used under the listed circumstances. Especially when used as a grounding electrode conductor, a safety-related end use, the most corrosion-resistant conductors should be stipulated.

RAPPAPORT: This comment is new material and has not had public review. The comment is related to Proposal 5-260 that is for Section 250-120(b) but the comment proposes changing 250-64(a). The comment proposes permitting all insulated aluminum or copper-clad aluminum grounding conductors to be installed in direct contact with masonry or the earth or where subject to corrosive conditions. There are no limitations on the type of insulation or whether listing is necessary. The substantiation for this change was that one type of cable is listed for this purpose. However not all insulated aluminum or copper-clad aluminum conductors are listed for this purpose and the proposed text is too broad. The concept of permitting these aluminum conductors to be used in corrosive conditions is new material that was not included in the original Proposal 5-260 and, therefore has not had public review. Small pinholes in insulation can result in conductor deterioration and disintegration. If a power conductor fails, this can result in circuit failure but if a grounding conductor fails, there is no indication and safety is compromised. This change is too broad and potentially dangerous to be made without public comment and review by technical organizations.

(Log #1553)

5- 102 - (250-64(a)): Accept in Principle

SUBMITTER: Ravindra H. Ganatra, Alcan Cable

COMMENT ON PROPOSAL NO: 5-260

RECOMMENDATION: To correlate with Panel Action on Proposal 5-260 (to revise 250-120(b)) and a comment with affirmative vote on Proposal 5-260, 250-64(a) (or 250.64(A) for 2002 NEC) should be revised to read:

(a) Aluminum or Copper-Clad Aluminum Conductors. Insulated or bare<u>Bare</u> aluminum or copper-clad aluminum grounding conductors shall not be used where in direct contact with masonry or the earth or where subject to corrosive conditions. Where used outside, aluminum or copper-clad aluminum grounding conductors shall not be installed<u>terminated</u> within 18 in. (457 mm)<u>457 mm (18 in.)</u> of the earth.

SUBSTANTIATION: Panel Action and TCC Comment in ROP on Proposal 5-260 to revise 250-120(b) are satisfactory. Thank you.

This comment recommends a similar correction (based on the comment provided with affirmative vote by Mr. Dobrowsky) for 250-64. Insulated aluminum conductors identified in Table 310-13, such as Type USE (or USE-2), are recognized and used for direct burial application. Example: A mobile home feeder cable consist of four USE conductors, to comply with 550-24, and one of them is identified by green color for grounding purpose. Bare and insulated aluminum conductors, such as Type XHHW, THWN, etc., are part of a cable assembly, such as MC and TC, which are marked suitable for direct burial. In all cases these conductors do not terminate within 18 in. of the earth.

PANEL ACTION: Accept in Principle.

PANEL STATEMENT: See panel Comment 5-100a (Log #CC503).

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16

VOTE ON PANEL ACTION:

AFFIRMATIVE: 14

NEGATIVE: 2

EXPLANATION OF NEGATIVE:

BRENDER: See my Explanation of Negative vote on Comment 5-101.

RAPPAPORT: See my explanation of negative vote on Comment 5-101.

(Log #1958)

5- 103 - (250-64(b)): Accept in Principle

SUBMITTER: Phil Simmons, Simmons Electrical Services

COMMENT ON PROPOSAL NO: 5-177

RECOMMENDATION: Change the title of this Section to <u>"Securing and Protecting"</u> from ~~Grounding Electrode Conductor.~~

SUBSTANTIATION: The proposed subsection title is more descriptive of the requirements in the subsection.

PANEL ACTION: Accept in Principle.

Revise the title as follows: (B) Securing and Protection from Physical Damage.

PANEL STATEMENT: The panel concludes the title revision clarifies what is meant by "protection" of the grounding electrode conductor. The panel concludes that the change in the title to this subsection is more appropriate to the requirements covered in the section. The term grounding electrode conductor is too open ended; being specific to "Securing and Protecting" is in step with what is covered in the rule. See panel Comment 5-100a (Log #CC503) which incorporates the action on this comment.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16

VOTE ON PANEL ACTION:

AFFIRMATIVE: 16

(Log #1959)

5- 104 - (250-64(e)): Accept in Principle

SUBMITTER: Phil Simmons, Simmons Electrical Services

COMMENT ON PROPOSAL NO: 5-179

RECOMMENDATION: Make the following changes to the existing text of the Code.

(E) Enclosures for Grounding Electrode Conductors. Metal enclosures for grounding electrode conductors shall be electrically continuous from the point of attachment to cabinets or equipment to the grounding electrode, and shall be securely fastened to the

ground clamp or fitting. Metal enclosures that are not physically continuous from cabinet or equipment to the grounding electrode shall be made electrically continuous by bonding each end of the grounding electrode conductor. Where a raceway is used as protection for a grounding electrode conductor, the installation shall comply with the requirements of the appropriate raceway article.
SUBSTANTIATION: Since changes were made to the name of the conductor used to connect the grounding electrode(s) at additional buildings or structures in Proposal 5-123, the above changes need to be made to this section for correlation.
PANEL ACTION: Accept in Principle.
Editorially correct the second sentence to change the "of" to "to" and read as follows:
Metal enclosures that are not physically continuous from cabinet or equipment to the grounding electrode shall be made electrically continuous by bonding each end of to the grounding electrode conductor.
PANEL STATEMENT: See panel Comment 5-100a (Log #CC503) which incorporates the action on this comment.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16

(Log #2256)

5- 105 - (250-64(e)): Accept in Principle
SUBMITTER: Noel Williams, Noel Williams Consulting
COMMENT ON PROPOSAL NO: 5-178
RECOMMENDATION: The proposal should have been accepted.
SUBSTANTIATION: Apparently the panel did not understand the intent of the proposal. Contrary to the panel statement, the title of the section is "Grounding Electrode Conductor Installation." The current language is often interpreted to mean that a busbar may be used to splice two sections of another type of grounding electrode conductor. The proposal should simply clarify that it's a busbar used as a grounding electrode conductor that can be spliced.
PANEL ACTION: Accept in Principle.
Revise existing exception from Section 250.64(C) to read as follows:
Sections of busbars shall be permitted to be connected together to form a grounding electrode conductor.
PANEL STATEMENT: Editorially revised proposed language to add clarity. See panel Comment 5-100a (Log #CC503) which incorporates the action on this comment.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
BOKSINER: The revised wording, if read literally, is more restrictive than previous code language. The revised wording seems to imply that if busbars are used, then the entire grounding electrode conductor must consist only of sections of busbars. However, presently, there is no prohibition of connecting a busbar or spliced busbar sections to another type of conductor as long as the connection uses an irreversible compression-type connector listed for the purpose or exothermic welding process.

(Log #2030)

5- 106 - (250-66(d)): Reject
SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc.
COMMENT ON PROPOSAL NO: 5-190
RECOMMENDATION: The proposal should be accepted.
SUBSTANTIATION: Although metal well casings are much better than made electrodes, they are unlikely to approach the low impedance of an entire building frame or a cast iron traditional water supply network. The No. 4 size in the proposal is a legitimate trade-off that makes the companion proposal (5-148) workable. There are several precedents in Article 250 for this sort of treatment. The largest conductor that need be run to a made electrode is No. 6, the largest to a ufer ground No. 4, and the largest to a ground ring No. 2 (unless the ring itself is thicker). Remember also, that the minimum size would follow normal rules at the time of the original installation. Regardless, the impedance presented by a well casing is unlikely to be lower than a ufer ground, making this provision at least the equal of 250.66(B).
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement of Proposal 5-106 in the 2001 ROP. The submitter provided no additional technical substantiation to warrant accepting the proposed action.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16

(Log #2180)

5- 107 - (250-68 Exception No. 2 (New)): Reject
SUBMITTER: Donald R. Cook, Shelby County Building Inspections
COMMENT ON PROPOSAL NO: 5-140 and 5-145
RECOMMENDATION: Renumber existing 250-68 exception and make it Exception No. 1.
Add new Exception No. 2 to read:
"Exception No. 2: A concealed connection to the interior metal water pipe within 5 ft from the point of entrance to the building.
SUBSTANTIATION: Since the connection of the conductor to the first 5 ft is critical to the integrity of the electrode, and the accessibility is not (if it were connected outside and underground the current exception would allow it to not be accessible) the new exception would solve the problem. If the connection were concealed it would lessen the likelihood of it being disconnected also.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel reaffirms its intention to have the connection to the interior metal water pipe accessible and the connection made within the first five feet.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16

(Log #374)

5- 108 - (250-70): Accept in Principle
Note: The Technical Correlating Committee directs that the word "approved" be deleted from the first sentence of the Panel Action text. The Technical Correlating Committee understands that the list in 250-70 (1-4) remains unchanged from the 1999 Code.
SUBMITTER: Dan Leaf, Palmdale, CA
COMMENT ON PROPOSAL NO: 5-192
RECOMMENDATION: Accept proposal.
SUBSTANTIATION: Since bonding jumpers are also connected to electrodes they should be noted as covered by the requirements. The technical substantiation to delete item No. 2 is that all connection devices as indicated in the first sentence are required to be listed. The definition of "approved" is not the same as "listed". The UL "white book" does not indicate pipe fittings, plugs, etc. as grounding or bonding equipment. There seems to be a conflict within this section.
PANEL ACTION: Accept in Principle.
250.70 Methods of Grounding and Bonding Conductor Connection to Electrodes. The grounding or bonding conductor shall be connected to the grounding electrode by exothermic welding, listed lugs, listed pressure connectors, listed clamps, or other listed approved means. Connections depending on solder shall not be used. Ground clamps shall be listed for the materials of the grounding electrode and the grounding electrode conductor and, where used on pipe, rod, or other buried electrodes, shall also be listed for direct soil burial or concrete encasement. Not more than one conductor shall be connected to the grounding electrode by a single clamp or fitting unless the clamp or fitting is listed for multiple conductors. One of the following methods shall be used:
(continue with all of the remaining existing text)
PANEL STATEMENT: This action satisfies the intent of the submitter.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16

(Log #1546)

5- 109 - (250-86 Exception No. 3): Accept in Principle
SUBMITTER: Michael J. Johnston, International Association of Electrical Inspectors
COMMENT ON PROPOSAL NO: 5-196
RECOMMENDATION: This proposal should be accepted in principle and revised as follows:
Exception No. 3: A metal elbow that is installed in an ~~underground~~ run of rigid nonmetallic conduit and is isolated from

possible contact by a minimum burial cover of 18 in. (457 mm) or 2 in. (50.8 mm) of concrete cover to any part of the elbow shall not be required to be grounded.

SUBSTANTIATION: This change would not limit the exception to underground installations only. Rigid metallic elbows are commonly installed in runs of nonmetallic raceways to prevent undue stress on both the conductors and the raceway. This change would bring the code in line with actual practices currently happening in the field where metal elbows are installed for this reason. The previous exception limited the relief in the exception to only underground installations. The revision would offer equal and effective safety anticipated by the code for this particular condition. This revision should meet the intent of the submitter.

This section should be looked at for revision to eliminate the exceptions and turn the requirements in the exceptions to rules and follow the NEC Style Manual.

PANEL ACTION: Accept in Principle.

Revise proposed text to read as follows:

Exception No. 3: A metal elbow shall not be required to be grounded where it is installed in a nonmetallic raceway and is isolated from possible contact by a minimum cover of 450 mm (18 in.) to any part of the elbow or is encased in not less than 50 mm (2 in.) of concrete.

PANEL STATEMENT: The revised text meets the intent of the submitter.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16

VOTE ON PANEL ACTION:

AFFIRMATIVE: 15

NEGATIVE: 1

EXPLANATION OF NEGATIVE:

RAPPAPORT: This is new material, not included in the original proposal and has not had public review. The existing exception requires that the elbow be isolated by 18 in. of cover. The proposed change would permit the 2 in. of concrete to be exposed. Concrete is not an insulator especially when it is wet. An extreme example of the use of concrete as a conductor is in its application as a concrete encased grounding electrode (250-50(c)). Consider an application where nonmetallic conduit with metal elbows is placed in a poured floor that is part of a shower room. The 2 in. cover may exist but a fault of an energized conductor to the elbow will certainly result in fault current through the concrete. Perhaps the example is not what was intended but it certainly could happen with the change as accepted by the panel.

(Log #1963)

5- 110 - (250-92(b)): Accept in Principle

SUBMITTER: Phil Simmons, Simmons Electrical Services

COMMENT ON PROPOSAL NO: 5-200

RECOMMENDATION: Revise text as follows:

(b) Bonding to Other Systems. An accessible means external to enclosures for connecting intersystem bonding and grounding conductors shall be provided at the service equipment and at the disconnecting means for an additional building or structure by at least one of the following means:

1. Exposed nonflexible grounded metallic ~~service~~ raceways.
2. Exposed grounding electrode conductor.
3. Approved means for the external connection of a copper or other corrosion-resistant bonding or grounding conductor to the grounded ~~service~~ raceway or equipment.

~~For the purposes of providing an accessible means for intersystem bonding, the disconnecting means at a separate building or structure as permitted in Section 250-32 and the disconnecting means at a mobile home as permitted in Section 550-23(a) shall be considered the service equipment.~~

FPN No. 1: A 6 AWG copper conductor with one end bonded to the grounded nonflexible metallic ~~service~~ raceway or equipment and with 150 mm (6 in.) or more of the other end made accessible on the outside wall is an example of the approved means covered in (B)(3).

FPN No. 2: See 800.40, 810.21, and 820.40 for bonding and grounding requirements for communications circuits, radio and television equipment, and CATV circuits.

SUBSTANTIATION: Changes to this section are intended to incorporate the concept included in Comment 5-149 for the 1999 NEC which was accepted in principle by Code Making Panel 5. The comment was rejected by the Technical Correlating Committee with the comment that "Items (1), (2) and (3) may not be available at separate buildings and mobile homes." It should be noted however, all three provisions for intersystem bonding are not required at every service or building or structure disconnecting means. One of the three provisions must be made.

Further, changes are proposed to this section since the Panel, in its Statement on Proposal 5-118, indicates it is the Panel's intention to keep all the intersystem bonding requirements in Section 250.92(B).

This provision for intersystem bonding ensures that other electrical systems, where installed, can be safely bonded to the electrical distribution system grounding electrode system and other electrical equipment regardless of whether the other systems are at the building or structure having the service equipment or at a remote building or structure.

In addition, changes to this section are intended to remove the confusing reference to disconnecting means for remote buildings or mobile homes being referred to as service equipment. In fact, these remote buildings are most likely supplied by a feeder or branch circuit and not be a service.

PANEL ACTION: Accept in Principle.

Relocate the existing Section 250.94 to become Section 250.92(B).

Insert the following text (taken from existing Section 250.92(B)) as a new Section 250.94 to read as follows:

250.94 Bonding for Other Systems. An accessible means external to enclosures for connecting intersystem bonding and grounding conductors shall be provided at the service equipment and at the disconnecting means for an additional buildings or structures by at least one of the following means:

(1) Exposed nonflexible metallic raceways

(2) Exposed grounding electrode conductor

(3) Approved means for the external connection of a copper or other corrosion-resistant bonding or grounding conductor to the grounded raceway or equipment

FPN No. 1: A 6 AWG copper conductor with one end bonded to the grounded nonflexible metallic raceway or equipment and with 150 mm (6 in.) or more of the other end made accessible on the outside wall is an example of the approved means covered in (B)(3).

FPN No. 2: See 800.40, 810.21, and 820.40 for bonding and grounding requirements for communications circuits, radio and television equipment, and CATV circuits.

PANEL STATEMENT: The panel concludes the revised text meets the intent of the submitter. The sections were interchanged to add clarity.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16

VOTE ON PANEL ACTION:

AFFIRMATIVE: 16

(Log #1960)

5- 111 - (250-97 (d)): Accept

SUBMITTER: Phil Simmons, Simmons Electrical Services

COMMENT ON PROPOSAL NO: 5-207

RECOMMENDATION: Revise the existing text of the Code to read as follows:

"d. Listed fittings that are identified for the purpose."

SUBSTANTIATION: There are lots of conduit fittings such as insulating bushings that are not suitable for the purpose of bonding over 250 volts to ground connections. The present requirement to use "listed fittings" does not ensure that proper fittings will be used.

The reference to Section 300-15(a) which specifies "Fittings and connectors shall be used only with the specific wiring methods for which they are designed and listed" would allow any fitting to be used so long as it is suitable for the wiring method employed. It does not ensure that the proper fitting is used for the bonding required here. An example is a insulating bushing that is designed and listed to be installed on rigid metal conduit.

Including the requirement that "identified" fittings be used incorporates the definition of "identified" in Article 100 which reads, "Recognizable as suitable for the specific purpose, function, use, environment, application, etc., where described in a particular Code requirement." It seems the use of this term ensures the proper fitting(s) will be used.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16

VOTE ON PANEL ACTION:

AFFIRMATIVE: 14

NEGATIVE: 2

EXPLANATION OF NEGATIVE:

SKUGGEVIG: To say in the Code "listed fittings that are identified for the purpose" may imply that each fitting is marked to indicate the details related to its proper use. This is not practical

in an all-inclusive and comprehensive way. Instead, all the information needed for a designer, installer, or Authority to identify a listed fitting as suitable for a particular application is contained in the product information published in UL's General Information Directory (white book). The white book is readily available, and in addition, the guide information is available free through the Internet at www.ul.com. "Identified" as defined in the NEC, presently includes the information provided as part of a Listing, such as the UL guide information.

STEINMAN: The substantiation does not include any field experiences where users have misunderstood this requirement. The addition of the requirement "that are identified for the purpose" is not necessary. It will cause confusion as some authorities having jurisdiction may expect fittings to be marked suitable for grounding. This is unnecessary, as UL 514B requires fittings to be suitable for grounding.

(Log #685)

5- 112 - (250-100): Reject
SUBMITTER: William E. Bickner, Stillwater, MN
COMMENT ON PROPOSAL NO: 5-208
RECOMMENDATION: This proposal should be accepted.
SUBSTANTIATION: The panel states that special occupancies are covered in Chapter 5 and requirements for such occupancies need not be covered in Article 250. However, the heading of the section to which it is proposed to add this text is "Bonding in Hazardous (Classified) Locations," which states some, but not all of the bonding requirements for classified locations. To avoid errors by the Code user, this section should either provide complete information, or it should only refer the user to the applicable Code sections (which seems unnecessarily repetitive, since the requirements are the same for all classified locations).
PANEL ACTION: Reject.
PANEL STATEMENT: The panel concludes that the general requirements for bonding in hazardous (classified) locations as specified in Section 250-100 should remain as a general requirement and that it should be expanded upon in Chapter 5 as it presently is. The panel also concludes that repeating the requirement in Section 250-100 is unnecessary. Section 250-100 also serves to require that the bonding should be by any of the methods specified for services, which is not mentioned in Sections 501-16(a), 502-16(a), or 503-16(a).
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16

(Log #382)

5- 113 - (250-102(d)): Accept
SUBMITTER: Dan Leaf, Palmdale, CA
COMMENT ON PROPOSAL NO: 5-211
RECOMMENDATION: Accept in principle revised: SIZE - EQUIPMENT BONDING JUMPER on LOAD Side of SERVICE. The equipment bonding jumper on the load side of the service overcurrent devices shall be sized, as a minimum, in accordance with the sizes listed in Table 250-122, but shall not be required to be larger than the largest ungrounded circuit conductors supplying the equipment and shall not be smaller than ~~NO.~~ 14 AWG.
SUBSTANTIATION: If one conductor of a circuit is "oversized", which is not prohibited by Code, which conductor is to be used? Can it be a reduced in size neutral? A neutral is a circuit conductor. The words and intent should be clear.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16
COMMENT ON AFFIRMATIVE:
DOBROWSKY: The word "conductors" should be changed to "conductor".

(Log #1355)

5- 114 - (250-102(e)): Reject
SUBMITTER: David P. Brown, Baltimore Gas and Electric Co/EEI
COMMENT ON PROPOSAL NO: 5-212
RECOMMENDATION: This proposal should have been rejected.
SUBSTANTIATION: This proposal would regulate and impose requirements upon the serving utility. The NEC does not control the installation requirements of the serving utility. The inclusion or acceptance of this proposal will not resolve the submitter's concern, but will create conflict in the field. The submitter's concern must be addressed via the appropriate entity which regulates the utility practices and the NESC installation requirements, not via the NEC. Ultimately, it remains an issue for the utility, to either connect or not connect the bonding jumper.
PANEL ACTION: Reject.
PANEL STATEMENT: This additional provision does not change the existing grounding or bonding requirements but permits a longer bonding jumper under the stated conditions. See panel action on Comment 5-117.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16

(Log #1534)

5- 115 - (250-102(e)): Accept in Principle
SUBMITTER: Michael J. Johnston, International Association of Electrical Inspectors
COMMENT ON PROPOSAL NO: 5-212
RECOMMENDATION: Add a new sentence after the current second sentence.

An equipment bonding jumper longer than six feet shall be permitted at utility pole and other pole locations for the purpose of bonding or grounding isolated sections of metal raceways or elbows installed in ~~a run~~ exposed risers of ~~rigid~~ metal conduit or raceways.
SUBSTANTIATION: My original vote was a negative, but I agree with nature, spirit, and intent of the proposal. It should have been accepted in principle and adjusted as adjusted above. The original proposal limited the permission for the bonding jumper longer than six feet to utility pole locations only. It should include those pole-types of installations other than utility poles. The code already requires metal enclosures for service conductors and other conductors to be grounded. Although the metal raceways and conduits that enclose service conductors are required to be bonded in Part E of Article 250, there is room for the allowance for the bonding jumpers in these situations to exceed the six feet length as currently limited by Section 250-102(e). The scope of what the code covers is outlined in Section 90-2. In many cases the metal conduits or raceways at utility poles would not be covered under the scope of the NEC and the authority having jurisdiction would have difficulty enforcing the requirement. However, the problem is real, regardless of who has jurisdiction. The problem is with not only 600 volt and less installations, but also exists with medimum and high voltage pole risers also. The acceptance of the proposal is a step in the right direction and I support the panel's decision to accept and recommend adjusting as indicated above.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Comment 5-117.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16

(Log #1731)

5- 116 - (250-102(e)): Accept in Principle
SUBMITTER: Mark R. Hilbert, Wolfeboro, NH
COMMENT ON PROPOSAL NO: 5-212
RECOMMENDATION: Add a new sentence after the current second sentence.

"An equipment bonding jumper longer than six feet shall be permitted at utility pole and other pole locations for the purposes of bonding or grounding of isolated sections of metal raceways or elbows installed in a run of rigid nonmetallic conduit.
SUBSTANTIATION: My original proposal limited the permission for the bonding jumper longer than six feet to utility pole locations only. It should have included those pole-types of installations other than utility poles.

The proposal as written is permissive and does not mandate that the bonding jumper be installed. Therefore, no hardship would be placed on the installer or inspector in situations were efforts could not be coordinated. The acceptance of this proposal allows isolated sections of metal raceways and elbows to be bonded or grounded in situations where they many not with the current language in Section 250-102(e) The situation addressed by this

proposal is a very real problem in many locations and the acceptance of the proposal is a step in the right direction toward solving the problem.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Comment 5-117.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16

(Log #994)

5- 117 - (250-102(e), Exception and FPN): Accept in Principle
SUBMITTER: Joseph A. Ross, Ross Electrical Assessments
COMMENT ON PROPOSAL NO: 5-212
RECOMMENDATION: Add an Exception and a FPN as follows:
Exception: Where installed on the outside, an equipment bonding jumper shall be permitted to be longer than 1.83 (6 ft) at pole locations to bond isolated sections of metal raceways or elbows installed in a run of rigid nonmetallic conduit.
FPN: See 250.80.
SUBSTANTIATION: There are times when an Exception and an explanatory FPN are needed to clearly define the text of a Code requirement. This may be the place. In many cases, in an underground installation of rigid nonmetallic conduit, metal raceways and elbows are used at pole locations for physical protection. The present requirement of "no longer than 6 ft" mandates that the metal raceway is to be run to the top of the pole so as to be within 6 ft of the bonding connection. Most will balk at a bonded metal raceway in such a close proximity to pole-top high-voltage conductors. Hence, it will be more safe to bring a bonding conductor, rather than a metal raceway, to the pole-top vicinity.
PANEL ACTION: Accept in Principle.
Revise the proposed text for Section 250.102(E) of the 2002 NEC draft by
1.) deleting the third sentence, and
2.) add an exception to read as follows:
Exception: An equipment bonding jumper longer than six feet shall be permitted at outside pole locations for the purpose of bonding or grounding isolated sections of metal raceways or elbows installed in exposed risers of metal conduit or other metal raceway.
PANEL STATEMENT: The concept from the original proposal has merit for those parts of the system governed under the NEC. Depending on the establishment of the "service point" this may include a utility pole where the raceways belongs to the premises wiring and does fall under the NEC. The panel concludes the revised text meets the intent of the submitter. The FPN proposed did not add clarity.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16

(Log #1533)

5- 118 - (250-104): Accept
SUBMITTER: Michael J. Johnston, International Association of Electrical Inspectors
COMMENT ON PROPOSAL NO: 5-219
RECOMMENDATION: Revise text as follows:
250-104(A) metal Water Piping. The ~~interior~~ metal water piping system shall be bonded as required in (1), (2), (3) OR (4) to this section. The bonding jumper (s) shall be installed in accordance with 250.64(A), (B), and (E). The points of connection on the bonding jumper(s) shall be accessible.
SUBSTANTIATION: As written in the draft of the 2002 NEC, the above adjustments need to be made to reflect the changes that were made in the subsections to that section. Strike the word "interior" and add the (s) to the first "jumper" in the section. This should correlate with the accepted changes that were accepted to that section.
PANEL ACTION: Accept.
Editorially, delete the word "interior" from Section 250.104(A) of the 2002 NEC draft and change the word "jumper" to "jumper(s)".
PANEL STATEMENT: This action meets the intent of the submitter.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16

(Log #2213)

5- 119 - (250-104): Accept in Principle
SUBMITTER: Robert H. Keis, Dover, DE
COMMENT ON PROPOSAL NO: 5-212
RECOMMENDATION: This proposal should remain accepted.
SUBSTANTIATION: Regardless of what some of the panel members feel, this proposal is needed. The comment that these installations are owned by the utility is not always true. Many times, especially on commercial installations, the customers service raceway is installed "up" the pole on standoffs. This raceway is the owner's responsibility even when it goes up the utility pole. As the submitter states, there are times when metal raceways and fittings are installed in this service raceway and it is very difficult to properly bond these metal sections and keep within code rules of 6 feet. Any type of bonding will be better than not bonding at all because of the 6 ft restriction. As for Mr. Mello's comment that "there is no method to ensure this proposed bonding wire will ever be connected...". This seems like a poor excuse for not at least trying to make a safe installation. Most utilities know the purpose of this wire, and they will connect it if it is there.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Comment 5-117.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16

(Log #819)

5- 120 - (250-104(a)): Reject
SUBMITTER: Jamie McNamara, Hastings, MN
COMMENT ON PROPOSAL NO: 5-215
RECOMMENDATION: The panel should reconsider this proposal and accept it.
SUBSTANTIATION: The current wording in 250.104(a) Metal Water Piping, The interior metal water piping system shall be bonded as required in (1), (2), (3), or (4) of this section. Requires that 1, 2, 3, or 4 be done if any one of the four is done, that is all that is required. It may be advisable to change (as required) to (if available).
PANEL ACTION: Reject.
PANEL STATEMENT: The panel concludes that the proposed changes are not necessary and that the present code text is clear. Insufficient substantiation provided by the submitter. The present wording in Section 250-104(a) is the same as with other code sections written in similar fashion and is intended that where any of conditions 1, 2, 3, or 4 exist then the requirements are applicable in accordance with that section. The change would require bonding of something that may not exist as stated in the original rejected Proposal 5-215.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16

(Log #1002)

5- 121 - (250-104(a)(1)): Reject
SUBMITTER: David A. Kerr, Jr., Friendsville, PA
COMMENT ON PROPOSAL NO: 5-219
RECOMMENDATION: Reject.
SUBSTANTIATION: The present code has worked fine for decades. There has been no substantiation that mysterious other piping systems are causing a problem. There is no technical reason to require wire sized to Table 66. Wire that size costs real money.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel concludes that the proposal addresses a concern of the literal meaning of the rule with the use of the word "interior". The intent is that all metal water piping systems whether interior or on the exterior are required to be bonded for effective safety. The wording in the 1999 NEC was limited literally to interior water piping systems only and if taken and enforced literally could lead a concern of unbonded metal water piping systems on the exterior and attached to the building or structure. Insufficient substantiation has been provided for the panel to reverse its decision or to change the reference for the size of the bonding conductor from Section 250.66.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16

(Log #1407)

5- 122 - (250-104(a)(1)): Reject
SUBMITTER: Kari Barrett, American Chemistry Council
COMMENT ON PROPOSAL NO: 5-219
RECOMMENDATION: Insert the word "potable" before "water piping...").
Delete the word "interior" and insert the word "potable" before "water piping...) in 250.104(A) also for consistency.
SUBSTANTIATION: There are many piping systems in industry that may contain aqueous solutions that could be interpreted as being water piping. Examples are sprinkler, de-ionized water, waste, cooling, steam, heating, etc. Some process piping has corrosion protection that would be compromised by bonding.
We suggest that a task group be formed to investigate shock incidents form ungrounded piping.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel contends that replacing the word "interior" with the word "potable" is not substantiated and would not enhance safety. The present language covers all water piping systems and is not limited to one. Replacing the word interior with the word potable is reducing the minimum requirements of this section.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
DOBROWSKY: This comment should be accepted. By removing the word "interior", this section applies to all types of exterior piping systems that contain water, or aqueous solutions that may be interpreted as being water, where they are attached to structures.

(Log #1406)

5- 123 - (250-104(a)(2)): Reject
SUBMITTER: Kari Barrett, American Chemistry Council
COMMENT ON PROPOSAL NO: 5-220
RECOMMENDATION: Insert the word "potable" before "water piping...").
SUBSTANTIATION: There are many piping systems in industry that may contain aqueous solutions that could be interpreted as being water piping. Examples are sprinkler, de-ionized water, waste, cooling, steam, heating, etc. Some process piping has corrosion protection that would be compromised by bonding.
We suggest that a task group be formed to investigate shock incidents from ungrounded piping.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel contends that adding the word "potable" is not substantiated and would not enhance safety. The present language covers all water piping systems and is not limited to one. Adding the word potable reduces the minimum requirements of this section.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
DOBROWSKY: See my explanation of negative vote on Comment 5-122.

(Log #1405)

5- 124 - (250-104(a)(3)): Reject
SUBMITTER: Kari Barrett, American Chemistry Council
COMMENT ON PROPOSAL NO: 5-221
RECOMMENDATION: Insert the word "potable" before "water piping...").
SUBSTANTIATION: There are many piping systems in industry that may contain aqueous solutions that could be interpreted as being water piping. Examples are sprinkler, de-ionized water, waste, cooling, steam, heating, etc. Some process piping has corrosion protection that would be compromised by bonding.
We suggest that a task group be formed to investigate shock incidents from ungrounded piping.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Comment 5-123.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
DOBROWSKY: See my explanation of negative vote on Comment 5-122.

(Log #1001)

5- 125 - (250-104(a)(4)): Accept in Principle
SUBMITTER: David A. Kerr, Jr., Friendsville, PA
COMMENT ON PROPOSAL NO: 5-223
RECOMMENDATION: Accept this proposal as rewritten by Mr. Dobrowsky.
SUBSTANTIATION: Superfluous bonding wires waste real money, especially when oversized to Table 66.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Comment 5-126.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16

(Log #1404)

5- 126 - (250-104(a)(4), Exception (New)): Accept in Principle in Part
SUBMITTER: Kari Barrett, American Chemistry Council
COMMENT ON PROPOSAL NO: 5-223
RECOMMENDATION: Revise the proposed exception as follows:
Exception: A separate bonding jumper shall not be required where the effectively grounded metal frame of a building or structure, used as the grounding electrode for separate systems, is bonded to the metal potable water piping in the area served by the separately derived system.
SUBSTANTIATION: Where the grounded metal frame of a building or structure is used as the grounding electrode for a separately derived system installing a second conductor (bonding jumper) to the water piping "in the area" is not necessary. No substantiation was given for making this change in the 1999 NEC. See Mr. Dobrowsky's negative ballot comment in the May 2001 ROP for further information.
PANEL ACTION: Accept in Principle in Part.
Revise the proposed to add an exception to Section 250-104(A)(4) to read as follows:
Exception: A separate water piping bonding jumper shall not be required where the effectively grounded metal frame of a building or structure is used as the grounding electrode for a separately derived system and is bonded to the metallic water piping in the area served by the separately derived system.
PANEL STATEMENT: The panel concludes the revised text meets the intent of the submitter. The panel did not accept the term "potable". See panel action and statement on Comment 5-123.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16

(Log #518)

5- 127 - (250-104(b)): Accept in Principle
SUBMITTER: David A. Kerr, Jr., Friendsville, PA
COMMENT ON PROPOSAL NO: 5-225
RECOMMENDATION: Accept.
SUBSTANTIATION: I think it is a mistake to delete all reference to fuel gas piping of the numerous proposals, this one sounds best to me. Fuel gas piping is far more dangerous than other kinds of piping.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Comment 5-132.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16

(Log #923)

5- 128 - (250-104(b)): Accept in Principle in Part
SUBMITTER: Joseph A. Ross, Ross Electrical Assessments
COMMENT ON PROPOSAL NO: 5-236
RECOMMENDATION: Delete the superscript letter "x" and revise (b) as follows:

(b) Metal Fuel Gas Piping. Each above ground portion of a fuel gas piping system upstream from the equipment shutoff valve shall be electrically continuous and bonded to the grounded electrode system. The bonding conductor shall be sized in accordance with Table 250.66 and installed in accordance with 250.64.a, .b and .e.

SUBSTANTIATION: Section 250-104(b) continues to be one of the most controversial sections of the 1999 NEC and it needn't be. Simple references for proper sizing and installations were needed. As revised, it is no longer considered an extract. It does not need to be. As revised, it does not conflict with paragraph 3.14(a) of the National Fuel Gas Code, NFPA 54. The addition of the word "fuel" further harmonizes the text with NFPA 54 and separates fuel gas requirements from other gas piping systems, e.g., medical gas piping systems that only would require to be sized in accordance with Table 250-122 as covered in Section 250-104(c).

The reference for Table 250-66 sizing of the bonding conductor is the most practical and obvious choice. Consider, e.g., that a building contains a mass of metal water piping, a mass of exposed and likely to be energized structural steel, and a mass of fuel gas piping. If the service were rated at 200 amperes, does it make sense to bond a 4 AWG CU conductor to the metal water pipe and to the structural steel, but [as proposed, group fuel gas piping into 250-104(c)] with a 15-ampere circuit in the vicinity, run a 14 AWG in a raceway to bond the fuel gas piping? Wouldn't it be more practical to size the bonding conductor for the three systems with one size and one rule, i.e., one conductor, one size and run it to the first system and keep it running to the other two systems. Reject the deletion of 250-104(b)! Making (b) go away will not stop the controversies and it will create mass confusion.
PANEL ACTION: Accept in Principle in Part.
PANEL STATEMENT: See panel action and statement on Comment 5-132. The panel did not accept the use of Section 250.66. The panel disagrees with the substantiation.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16

(Log #1000)

5- 129 - (250-104(b)): Accept in Principle
SUBMITTER: David A. Kerr, Jr., Friendsville, PA
COMMENT ON PROPOSAL NO: 5-229
RECOMMENDATION: Reject.
SUBSTANTIATION: How can you accept a proposal when the substantiation is 180° off the mark? A stopped clock has the right time twice a day. The code must specifically call for fuel gas pipe bonding precisely to stop these dangerous ideas.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Comment 5-132.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16

(Log #1716)

5- 130 - (250-104(b)): Accept in Principle
SUBMITTER: Don Ganiere, Ottawa, IL
COMMENT ON PROPOSAL NO: 5-229
RECOMMENDATION: This proposal should be rejected.
SUBSTANTIATION: Both Code-Making Panel 5 and Fuel Gas Code agree that interior gas piping must be bonded. Deletion of this section of the code will result in gas piping systems that are not bonded. Many installers, like the submitter of Proposal 5-229, believe that bonding the gas pipe increases the hazard. Few in the field will agree with the panel statement that 250-104(c) covers the gas pipe bonding requirement. If the bonding of the gas piping is required for a safe installation, 250-104(b) must remain in the code. However, it should be modified to specify the required size of the bonding conductor.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Comment 5-132.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16

(Log #771)

5- 131 - (250-104(c) and c): Accept in Principle
SUBMITTER: Richard E. Loyd, Perryville, AR
COMMENT ON PROPOSAL NO: 5-231
RECOMMENDATION: Revise 250-104(c) as follows:

(c) Other Metal Piping. Interior metal piping <u>such as interior gas piping</u> that may become energized shall be bonded to the service equipment enclosure, the grounded conductor at the service, the grounding electrode conductor where of sufficient size, or to the one or more grounding electrodes used. The bonding jumper shall be sized in accordance with Table 250-122 using the rating of the circuit that may energize the piping.

The equipment grounding conductor for the circuit that may energize the piping shall be permitted to serve as the bonding means. <u>The points of attachment of the bonding jumpers shall be accessible.</u>

FPN: Bonding all piping and metal air ducts within the premises will provide additional safety.

SUBSTANTIATION: I agree with the panel action, however, I feel the panel should have placed a reference in 250-104(c) in addition to the reference in 250-2 to make it clear that it is still the intent of the panel to require gas piping to be bonded for safety. This proposed change will make the code more user friendly. The deletion of 250-104(b) may give the user the impression that bonding gas piping is no longer required. By adding the requirement that the terminations of the bonding jumpers be accessible makes this section consistent with 250-104(a).
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Comment 5-132.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16

(Log #2072)

5- 132 - (250-104(c)): Accept in Principle
SUBMITTER: Phil Simmons, Simmons Electrical Services
COMMENT ON PROPOSAL NO: 5-238
RECOMMENDATION: Revise text as follows:

(c) Other Metal Piping. <u>Where installed in or attached to a building or structure,</u> metal piping system(s) ~~installed in or attached to a building or structure~~ that may become energized shall be bonded to the service equipment enclosure, the grounded conductor at the service, the grounding electrode conductor where of sufficient size, or to the one or more grounding electrodes used. The bonding jumper(s) shall be sized in accordance with Table 250-122 using the rating of the circuit that may energize the piping system(s). The equipment grounding conductor for the circuit that may energize the piping system(s). The equipment grounding conductor for the circuit that may energize the piping shall be permitted to serve as the bonding means.

FPN: Bonding all piping and metal air ducts within the premises will provide additional safety.

SUBSTANTIATION: Editorial improvement. The intention of this section is not to require bonding of the building or structure but of the metal piping that might become energized.
PANEL ACTION: Accept in Principle.
Revise Section 250.104(B) of the 2002 NEC ROP draft to read as follows:
(B) Other Metal Piping. Where installed in or attached to a building or structure, metal piping system(s), including gas piping, that may become energized shall be bonded to the service equipment enclosure, the grounded conductor at the service, the grounding electrode conductor where of sufficient size, or to the one or more grounding electrodes used. The bonding jumper(s) shall be sized in accordance with 250.122 using the rating of the circuit that may energize the piping system(s). The equipment grounding conductor for the circuit that may energize the piping shall be permitted to serve as the bonding means. The points of attachment of the bonding jumper(s) shall be accessible.
FPN: Bonding all piping and metal air ducts within the premises will provide additional safety.

PANEL STATEMENT: The panel concludes that the revised wording meets the submitters intent. Additionally, the concepts of Comment 5-131 are included in this revision.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16

(Log #2390)

5- 133 - (250-104(d)): Reject
SUBMITTER: Arthur Burbaum, City of San Diego
COMMENT ON PROPOSAL NO: 5-239
RECOMMENDATION: Revise text to read:
(d) Structural ~~Steel~~ Metal. Exposed interior structural ~~steel~~ metal that is interconnected to form a ~~steel~~ building frame, and any ancillary part located within 30 in. (0.732 m), thereof ~~and~~ that is not intentionally grounded and may become energized shall be bonded to the service equipment enclosure, the grounded conductor at the service, the grounding electrode conductor where of sufficient size, or to one or more grounding electrodes used. The bonding jumper shall be sized in accordance with Table 250-66 and installed in accordance with Sections 250-64(a), (b) and (e). The points of attachment of the bonding jumpers shall be accessible.
SUBSTANTIATION: I agree with Mr. Bender's comment that the wording is best stated as now revised and will try to answer the other questions asked by the panel. Essentially the installation would have complied with the present wording of the 1993 to present NEC without this added wording. While I can not discuss all aspects of the case at this time, suffice to state as you view picture #1 you can note the difference of voltage going to ground via the concrete by the level of the metal flow. The bench as you will note is a separate structure from the shelter. It is always difficult to figure a safe distance, therefore the 30 in. spacing from a parallel structure was selected using half the distance of an average spread of a person between two points and then determining a maximum reach. The change of wording to bond the various metal parts together now places all the reachable parts at the same (equal) potential and a flow of current is then limited to the amounts of resistive values between the parts and/or a person. The rule of electrical flow is an equation with the higher resistance causing the lesser flow. Body resistance is generally higher than the bonded parts. The bonding of these parts together results in generally a lesser resistance, generally not enough to be fatal to the average person in contact with them. Incidents involving metal patio covers and other metallic structures would also benefit. While there would still be the slight hazard of a possible electrical shock, it would generally not be fatal. I have provided pictures that demonstrate the condition that caused the fatality. This type of structure is in common use throughout the country. This similar condition of separated metallic parts has been known to cause problems in animal shelters. We cannot totally prevent accidents, but we must learn from them. To reply to Mr. Johnson's comment, in most states contractors install structures and electrical installations to a standard. In the Electrical field the standard used is the NEC. In short, if this installation had been bonded together it is doubtful the severe consequences would have occurred.
Note: Supporting material is available for review at NFPA Headquarters.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel recognizes the concerns of the submitter. The panel concludes that to properly mitigate the hazards cited by the submitter during the presentation as well as in the written proposal, each installation has to be evaluated by a qualified person to determine safety measures necessary for protection. The general solution proposed in this comment may not be adequate in all cases.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
BRENDER: The original proposal and subsequent comment seek to address a safety hazard that resulted in a fatality. While the proposed solution may not be adequate in all cases, it represents a significant improvement that should prove adequate in most similar cases, at bare minimum cost.
The Panel Statement that "to properly mitigate the hazards cited...each installation has to be evaluated by a qualified person to determine safety measures..." could apply to the entire Code. The requirement for bonding ancillary structures with 30 in. of a structure will enhance safety and provide language necessary for electrical inspectors to enforce this requirement.

(Log #999)

5- 134 - (250-104(e) (New)): Reject
SUBMITTER: David A. Kerr, Jr., Friendsville, PA
COMMENT ON PROPOSAL NO: 5-241
RECOMMENDATION: Accept.
SUBSTANTIATION: This proposal contains abundant documentation that metal studs are dangerous. The combination of metal studs, NM cable and plastic boxes is a time bomb. Bonding should be required by a bonding wire or the simple use of metal boxes, why do you worry about other metal piping systems and ignore this clear and present danger.
PANEL ACTION: Reject.
PANEL STATEMENT: No additional substantiation was provided. CMP-5 reaffirms the original panel statement of Proposal 5-241.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
BRENDER: The original proposal and subsequent comment identify a present hazard that could be easily and inexpensively rectified through the use of a bonding jumper or a metallic junction box. This comment should be accepted.

(Log #2223)

5- 135 - (250-106): Accept in Principle
SUBMITTER: Robert H. Keis, Dover, DE
COMMENT ON PROPOSAL NO: 5-106
RECOMMENDATION: This proposal should be accepted instead of rejected.
SUBSTANTIATION: Regardless of how some panel members feel about this proposal not adding clarity or causing confusion. This proposal is needed for clarification. I have been an inspector for over 30 years and I have problems figuring this out. This proposal clears up what size jumper is required. As for the panel statement that "the term may be misunderstood to require an additional conductor", if the conductor is needed, this new wording will clarify the size requirements. If the bonding jumper is not needed, then the installer has no problem.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Comment 5-65.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16

(Log #1177)

5- 136 - (250-114): Reject
SUBMITTER: Frank Martucci, Fort Lee, NJ
COMMENT ON PROPOSAL NO: 5-247
RECOMMENDATION: Please accept this proposal. Exposed noncurrent-carrying metal parts of cord and plug-connected equipment likely to become energized shall be "redundantly" grounded.
(a) Two grounding conductors shall be installed in cord and cord sets with the branch circuit conductors supplying the unfixed equipment.
(b) Component Grounding poles. Cord connectors and attachment plugs shall be provided with two separate wiring sites at the existing grounding pole. Cord female connectors, and male attachment plugs shall be designed so that only the grounding pole can be wired with two conductors.
SUBSTANTIATION: For the past thirteen years I have submitted proposals for the 1990, 1993, 1996, 1999, and the forthcoming 2002 National Electrical Code that will prevent thousands of electricians and fiery deaths each and every year. Yet, despite my serious admonitions and allegations, code panels continue to reject my proposals sight unseen, without any demonstrations or testing whatsoever.
It boggles my mind that members of code making panels, most with no cord expertise whatsoever, can display such an indifference to human life. What if my system works? Don't they have any fear

of being liable for thousands of deaths these past 13 years? Don't they have any fear of being liable for the loss of hundreds of thousands of homes each and every year?

I, for one, would demand extensive tests before I rejected a system that may indeed save thousands of lives each and every year.

My reaction to a single electrocution bordered on the fanatical. I immediately replaced undersized 3 conductor cords with 4 conductor cords to provide two #14, (15 amapacity) grounding conductors for all medical devices.

In addition, costly, and time consuming, outlet modifications were made to provide the redundancy every other federal agency, or responsible engineer, resorts to whenever lives are at stake. The design also provided a wiring safeguard that prevented miswired cords from causing electrocutions and current flow through raceways.

The same redundancy, and safeguard, I propose that will prevent thousands of electrocutions and fiery deaths each and every year.

The same redundancy and wiring safeguard code panel members have unanimously rejected, time and again, the past 13 years. They not only reject the concept of redundancy, but they adamantly defend the use of conductors sized up to 50 percent less than required by our original National Electrical Code.

The original code, written under the influence of insurance companies, distinctly states the equipment grounding conductor shall be no smaller than #14 (15 ampacity) when used on a typical 15 ampere branch circuit.

However, when the NFPA took over the code making process in 1911, they established exceptions to the code whereby a #18 (7 ampacity) conductor is permitted to protect our people from line drop, shock , and electrocution.

This is a clear violation of our electrical code and detrimental to the electrical safety of every, man, woman, and child in our nation.

And it boggles my mind that, during the past 13 years, not a single panel member ever endorsed the use of redundancy. How can code panel members dedicated to electrical and fire safety fight so vehemently to keep our people protected with a grounding conductor sized less than required by our original electric code?

If code panels see fit to jeopardize the lives of our people with undersized, rarely tested, equipment grounding conductors then at least provide two of them.

And this is what my proposal accomplishes. And to boot, a bonus wiring safeguard that will make our grounding system electrocution-proof and fire-proof.

It's bad enough that code panels saw fit to reduce our protective equipment grounding conductor over 50 percent in our cord and plug connected equipment.

But worse than that is complete elimination of grounding conductors in our electrical distribution system.

Article 250-95 in the original code document, written under the influence of insurance companies, states "the equipment grounding conductor shall be copper, copper clad, or aluminum."

However, when the National Fire Protection Association took over the code making process in 1911, members of the electrical industrial complex established exceptions to the code, permitting inappropriate outlet mounting screws, metal outlet boxes, outlet connectors, and metal raceways, to be used as the grounding conductor.

This may be adequate for the short time it takes to clear ground faults, but what are the consequences if excessive current from a hotplate, heater, or air conditioner should flow through corrosive, steel screws, 100 feet of metal raceways, and up to 16 raceway outlet box connectors for lengthy periods of time?

During heater and hotplate current tests, I was horrified to find the temperatures of outlet mounting screws exceeding the 250 degree limit of my electronic thermometer. In addition, the metal raceway temperature measured 150 degrees.

The temperatures were taken in open air and should be considerably higher inside sealed walls and ceilings, where the outlet mounting screws, and raceways, are located.

At times the outlet mounting screws were glowing at the threads of the outlet box and tissue paper smoldered or ignited when placed on them.

The consequences are quite obvious. Should excessive current ever flow for lengthy periods of time through this ill-conceived grounding system, "unseen" fires could develop and rage inside the walls and ceilings; fires that flashover into rooms and incinerate occupants and contents within seconds.

And excessive current can be made to flow through inappropriate screws and metal raceways if an appliance cord, or extension cord, is inadvertently wired with reversed green and white conductors; a wiring error especially possible when repairing the cords flooding our nation without any color coding whatsoever. The white, black, and green conductors are similarly colored black, gray, yellow, or brown.

There is no doubt in my mind that the sudden inferno that killed three students at (name deleted) was caused by our ill-conceived grounding system. What else could explain the sudden flashover that incinerated two students at the very same time the smoke alarms sounded and an extreme amount of smoke and heat poured down the corridors.

But panels don't believe in scenarios or theories and the carnage will continue unless they accept my proposal that prevents fires inside walls.

Panels reject my proposals because they think it will necessitate drastic changes in cord components. This is simply not true. And if they would only ask for a demonstration I can prove it to them.

They reject my proposal because they think GFCIs and assured grounded programs are more effective than a wiring safeguard or a second, redundant ground. This, despite the fact that over a hundred workers were electrocuted on construction sites in 1992 where GFCIs and assured grounding programs are extensively used.

And the reason for rejection is flawed because GFCIs and assured grounding programs are only mandated for construction sites. What about other workplaces, homes, and hospitals?

I urge the panels to adopt the use of redundancy every responsible engineer resorts to when lives are at stake. If our lives must be protected with an undersized, rarely tested, equipment grounding conductor, than at least provide two of them.

And please mandate the slight no cost change to cord components as described in this proposal to provide a wiring safeguard that prevents electrocutions and fiery deaths.

PANEL ACTION: Reject.

PANEL STATEMENT: The panel has again reviewed the submitter's substantiation and reaffirms its position and previous statements on this subject.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16

VOTE ON PANEL ACTION:

AFFIRMATIVE: 16

(Log #412)

5- 137 - (250-118): Reject

SUBMITTER: Dan Leaf, Palmdale, CA

COMMENT ON PROPOSAL NO: 5-253

RECOMMENDATION: Accept in Principle, revised:

(6)(c) The combined length of flexible metal conduit and flexible metallic tubing and liquidtight flexible metal conduit (excluding lengths with a bonding jumper) in the same ground return path shall not exceed 1.83 m (6 ft).

SUBSTANTIATION: Where bonding jumpers are used, unqualified length restrictions are not warranted. If this comment is accepted the same proposed phrase should be incorporated into (7)(d) and (8) (b).

PANEL ACTION: Reject.

PANEL STATEMENT: The proposal does not add clarity to this section. This section lists what qualifies as an equipment grounding conductor and not was doesn't. That is evident by what is not listed in Section 250-118. The panel concludes that this change is unnecessary and would not serve to add clarity to the section.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16

VOTE ON PANEL ACTION:

AFFIRMATIVE: 16

(Log #975)

5- 138 - (250-118): Accept

SUBMITTER: Larry F. Miller, National Electrical Manufacturers Association (NEMA)

COMMENT ON PROPOSAL NO: 5-251

RECOMMENDATION: The Panel should continue to Reject this proposal.

SUBSTANTIATION: The submitter states "installation practices today cannot assure that all connections are made properly." Using that same logic, one could say that if a grounding conductor were installed in the raceway, it, too, could be improperly connected. When metal raceways are installed in accordance with the requirements of the National Electrical Code, they provide a low-impedance path to ground and, as the Panel states: "have safely been used as an equipment grounding conductor for many years."

The submitter is addressing a workmanship issue that cannot be solved by writing another code requirement. The NEC does not prohibit the use of a supplementary grounding conductor if the building owner/designer decides to require one. This should remain a design decision.

Steel Conduit manufacturers are in the process of finishing an Installation Guide that will provide information on the proper installation of steel conduit. This will be published before the new Code is. The NEMA Fittings Section (5-FB) has already completed an installation guide on fittings, the primary element of connections, which is available from NEMA. Both publications are written to encourage good workmanship, proper installation, and maintenance.

In his negative comment, Mr. Rappaport mentions a Factory Mutual report. This report was prepared as substantiation for several proposals for the 1990 NEC.

NEMA submitted a comment to reject the proposal. The Panel voted unanimously to accept the NEMA comment. In NEMA's substantiation the following points were made:
- The FM loss reports contained a statement that "the exact ignition scenarios for these fires are open to discussion and speculation."
- The installations cited in the loss reports had an average age of 40 years and did not reflect current products, code requirements, etc.
- Several Code violations were described including improper grounding, no overcurrent protection, etc.
- Inadequate maintenance was cited.

Another negative comment submitted during that code cycle stated that the submitter had had an independent consulting engineering firm TEC, Inc. review the FM report. Their conclusion was that "the FM technical report does not relate a completely fair analysis of all aspects of electrical equipment grounding and "true life" installation practices."

PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NEGATIVE: 2
EXPLANATION OF NEGATIVE:

BRENDER: Continuity of the grounding path under real field conditions cannot be assured without the use of a continuous copper equipment grounding conductor. Numerous recognized outside sources have stated that they insist on such a conductor, irrespective of the conduit material.

Indeed, Mr. Renscok, in Comment 5-139, points out that the State of Oklahoma and many cities in Arizona and elsewhere require the use of a separate equipment grounding conductor in all raceways.

This comment should be rejected and the original proposal accepted.

RAPPAPORT: See my explanation of negative vote on Comment 5-139.

(Log #1193)

5- 139 - (250-118): Reject
SUBMITTER: Joel A. Rencsok, Scottsdale, AZ
COMMENT ON PROPOSAL NO: 5-251
RECOMMENDATION: This proposal should have been accepted.
SUBSTANTIATION: I agree with Mr. Brender, Mr. Rappaport, and Mr. Toomer on their statements to the panel's action.

See also Proposal 8-3 on page 315 of the ROP which shows that the state of Oklahoma requires an equipment grounding conductor in all raceways. Many cities around the country are also requiring this conductor including many in Arizona.

The Georgia Tech professor will not comment to existing installations because maintenance and work installation vary as due soil conditions.

PANEL ACTION: Reject.
PANEL STATEMENT: When metal raceways are installed in accordance with the requirements of the National Electrical Code, they provide a low-impedance path to ground and have safely been used as an equipment grounding conductor for many years. Workmanship issues cannot be solved by writing another code requirement. The NEC does not prohibit the use of an additional equipment grounding conductor. This should remain a design decision.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NEGATIVE: 2
EXPLANATION OF NEGATIVE:

BRENDER: See my Explanation of Negative vote on Comment 5-138.

RAPPAPORT: The panel consistently refuses to listen to comments from the field concerning the inadequacy of metal raceways as equipment grounding conductors, especially electrical metallic tubing. Even when installed correctly, there are many applications where conduits move and, as a result, the couplings and connectors are loosened. Many of the workmanship issues could be solved by requiring the additional equipment grounding conductor in the metal raceways. There has been adequate substantiation from inspectors and contractors in the field to warrant accepting the original proposal.

(Log #63)

5- 140 - (250-118(1)): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 5-253a
RECOMMENDATION: It was the action of the Technical Correlating Committee that further consideration be given to the comments expressed in Mr. Rappaport's Explanation of Negative. This action will be considered by the panel as a public comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
PANEL STATEMENT: The panel accepts the direction of the Technical Correlating Committee to reconsider the negative comment expressed in the voting. See panel action on Comment 5-141.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15
NEGATIVE: 1
EXPLANATION OF NEGATIVE:

BRENDER: I will reiterate that aluminum is not a particularly corrosion-resistant conductor, witness the numerous restrictions on its use in contact with the earth, in agricultural premises and other locations. It is inappropriate to specifically denote aluminum in this section and diminishing the discretion of the Authority Having Jurisdiction in exercising judgment as to the appropriate application.

(Log #1712)

5- 141 - (250-118(1)): Accept
SUBMITTER: Charles M. Trout, Maron Electric Co. Inc.
COMMENT ON PROPOSAL NO: 5-253(a)
RECOMMENDATION: This proposal should be accepted as written.
SUBSTANTIATION: I'm not sure of the meaning of the action taken by the Technical Correlating Committee and the reference to Mr. Rappaport's explanation of negative as indicated in the ROP. Rather than assume an error in printing, I am sending this comment in favor of the panel's action. Mr. Brender's negative comment referring to an un-named previous panel member's assertions that the omission of aluminum from Section 250-118(1) was intentional is to say the least "anecdotal" in light of the fact that Sections 250- 64, 250-120, and Table 250-122 permit the use of aluminum and copper-clad aluminum. It appears to me that it would have been reprehensible for the panel to knowingly incorporate conflicting requirements in the same Article.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15
NEGATIVE: 1
EXPLANATION OF NEGATIVE:

BRENDER: See my Explanation of Negative vote on Comment 5-140.

(Log #1920)

5- 142 - (250-118(11)): Accept in Principle
SUBMITTER: Michael I. Callanan, International Brotherhood of Electrical Workers
COMMENT ON PROPOSAL NO: 5-254
RECOMMENDATION: Continue to Accept this proposal.
SUBSTANTIATION: Substantiation as provided by the submitter adequately demonstrates the need for clarification of grounding

methods of type MC Cable. Comments in the negative suggest that the installer needs to rely upon product standards to dictate the safe installation of MC Cable. It is a simple fact that most installers have either no knowledge of, or access to individual product standards.

This comment represents the official position of the International Brotherhood of Electrical Workers Codes & Standards Committee.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel Comment 5-142a (Log #CC502).
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16

(Log #CC502)

5- 142a - (250.118(11)): Accept
Note: The Technical Correlating Committee understands that the action is to revise 250-118(11) as shown in the Recommendation.
SUBMITTER: CMP 5
COMMENT ON PROPOSAL NO: 5-254
RECOMMENDATION: (11) Type MC Cable where listed and identified for grounding in accordance with the following:
(a) The combined metallic sheath and grounding conductor of interlocked metal tape type MC Cable.
(b) The metallic sheath or the combined metallic sheath and grounding conductors of the smooth or corrugated tube Type MC Cable.
SUBSTANTIATION: The panel concludes that this action provides clarity and addresses the issues raised by the submitters both in the ROP and by the comments. The panel recognizes that there have been problems in the field with the identification of Type MC Cable that is suitable for grounding and encourages suitable marking requirements to be included in the appropriate product standards.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16

(Log #1922)

5- 143 - (250-118(11)): Accept in Principle
SUBMITTER: Michael I. Callanan, International Brotherhood of Electrical Workers
COMMENT ON PROPOSAL NO: 7-5a
RECOMMENDATION: Accept this proposal in principle as accepted by Panel 5 on proposal 5-254.
SUBSTANTIATION: This issue belongs in the domain of CMP-5. The substantiation provided in ROP 5-254 clearly states the need to change 250-118(11).

This comment represents the official position of the International Brotherhood of Electrical Workers Codes & Standards Committee.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel Comment 5-142a (Log #CC502).
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16

(Log #1924)

5- 144 - (250-118(11)): Accept in Principle
SUBMITTER: James T. Dollard, Jr., Philadelphia, PA
COMMENT ON PROPOSAL NO: 5-254
RECOMMENDATION: Continue to Accept this proposal.
SUBSTANTIATION: I agree with the Panel action to accept this proposal. The present text of 250-118(11) is misleading, not user friendly and not in line with the product standards. I would like to address the negative comments as written in the ROP.

All three negative comments state that the product standards already address this issue. Included with this comment are copies of from the "UL White Book General Information for Electrical Equipment 2000" pages 62, 63 and 64. This includes the listing information for: "METAL CLAD CABLE (PJAZ)" "METAL CLAD CABLE CLASSIFIED IN ACCORDANCE WITH IEC PUBLICATIONS (PJHY)" and "METAL CLAD CABLE, CLASSSIFIED IN ACCORDANCE WITH UL 1569,WITH METRIC CONDUCTOR SIZES (PJPJ)". Also included is page 37 and 38 of the "UL Wire and Cable marking Guide 2000". This includes the listing information for "METAL CLAD CABLE FOR HAZARDOUS LOCATIONS (PJPP)". UL provides these documents to users and inspectors to facilitate the application, installation and inspection of electrical equipment. However not all users of this code own or even know what a UL White Book is or how to apply it.

The product standards do not recognize the armor of the interlocking type jacketed type MC cable as an equipment-grounding conductor. The product standards do not recognize the combination of the interlocking jacket of type MC cable with the REQUIRED internal equipment-grounding conductor as an equipment-grounding conductor. The only combination that is recognized is the jacket of the smooth or corrugated type MC cable and an internal equipment grounding conductor which in most cases is not required. See (PJAZ), (PJHY) which refers you to PJAZ, and (PJPJ). The Product Standards are clear, yet the present text of 250-118(11) is not. This proposed change will clearly point out to the user that the interlocking jacket of type MC cable may never be used as an equipment grounding conductor in accordance with the product standards.

Mr. Steinman states that "The present wording accurately reflects the grounding characteristics of the sheath of MC cable." This is not true. The present wording is directed at only the smooth or corrugated type MC cable.

Mr. Stienman also states that "The implication of the proposed wording would imply that the sheath of the smooth tube or corrugated tube must always be suitable as an equipment grounding conductor. This is not always the case." Mr. Steinman is correct that the corrugated tube of one type of MC cable not permitted to serve as an equipment-grounding conductor. See (PJPP) "METAL CLAD CABLE FOR HAZARDOUS LOCATIONS (PJPP)". Mr. Steinman is not correct however in his statement that "The implication of the proposed wording would imply that the sheath of the smooth tube or corrugated tube must always be suitable as an equipment grounding conductor." The proposed text is to section 250-118(11) in Chapter # 2. This requirement is a general requirement as it exists in Chapter # 2. The only type MC cable in which the corrugated tube is not permitted as equipment grounding is specifically designed and listed only for use in hazardous locations. These are special locations and exist in Chapter # 5. The first paragraph of Section 90-3 Code Arrangement reads as follows:
This Code is divided into the introduction and nine chapters. Chapters 1, 2, 3, and 4 apply generally; Chapters 5, 6, and 7 apply to special occupancies, special equipment, or other special conditions. These latter chapters supplement or modify the general rules. Chapters 1 through 4 apply except as amended by Chapters 5, 6, and 7 for the particular conditions. While the user of this code may not own or have access to product standards section 90-3 clearly states that Chapters 1 through 4 apply generally and the special Chapters 5, 6 and 7 may supplement or modify the first four chapters.

The proposed text would apply generally. Chapter # 5 presently addresses the use of type MC cable in hazardous locations. In exceptions # 2 to section 501-4 this cable is presently addressed as follows:

Exception No. 2: In industrial establishments with restricted public access, where the conditions of maintenance and supervision ensure that only qualified persons will service the installation, Type MC cable, listed for use in Class I, Division 1 locations, with a gas/vaportight continuous corrugated aluminum sheath, an overall jacket of suitable polymeric material, separate grounding conductors in accordance with Section 250-122, and provided with termination fittings listed for the application shall be permitted.

FPN: See Sections 334-3 and 334-4 for restrictions on use of Type MC cable.

Presently the user of this code is referenced to Article 250 to determine the use of the jacket of all types of type MC cable as outlined in section 334-23 Grounding as follows:
Type MC cable shall provide an adequate path for equipment grounding as required by Article 250.

The present text of 250-118(11) is misleading as it states as follows The metallic sheath or the combined metallic sheath and grounding conductors of Type MC cable. This present language clearly misleads the user of this code to believe that the metallic sheath of all types of type MC cable can stand alone as an equipment-grounding conductor.

This code makes several references to the smooth or corrugated sheath of type MC cable. Section 300-22 allows "Type MC cable employing a smooth or corrugated impervious metal sheath without an overall nonmetallic covering" to be used in "Ducts or Plenums Used for Environmental Air." If we were to apply the logic of the negative comments then we should remove this text from 300-22(b) and let the user reference product standards. The NEC specifies different types of MC cable where it permits that

product to be installed in a particular application. The NEC must move to be more user friendly and clearly point out to the user that under no circumstances is the jacket of the interlocking type MC cable permitted to serve as an equipment grounding conductor.

The interlocking type MC cable is used in almost all-commercial installations. This cable assembly must be clearly addressed in section 250-118, as is type MI cable. Section 250-118(10) recognizes "The copper sheath of mineral-insulated, metal-sheathed cable" as an equipment-grounding conductor. This is good code. Included with this comment, is the product standard listing for type MI cable in the "UL White Book General Information for Electrical Equipment 2000" page 65 under the heading "MINERAL INSULATED METAL SHEATHED CABLE (PPKV). The present text of 250-118(10) is clearly in line with the product standards as the text specifically recognizes only the copper jacket of type MI cable as an equipment-grounding conductor.

Also included with this comment are labels removed from coils of the interlocking type MC cable. Notice that each label specifically includes "with green ground" or "with green insulated ground. The interlocking type MC cable is REQUIRED to have an equipment-grounding conductor installed. Notice also the lack of the mention of a combination of the REQUIRED equipment grounding conductor and the interlocking jacket. The installer reading these labels and the present text of 250-118(11) would be led to believe that the interlocking type MC cable may be used for example to supply receptacles in a patient care area. This would be a violation of the NEC. In order to enforce such a violation the inspector must cite a violation of section 110-3(b), and provide product listing information to prove that the interlocking jacket of type MC cable is not in any manner permitted to serve as an equipment grounding conductor. Only then is it clear that the use of the interlocking jacket type MC cable does not meet the requirements of section 517-13 exception No. 1. However the present text of section 250-118(11) and the product labeling clearly mislead the user of this code to believe that the installation is in compliance with the NEC.

This proposed text makes for a more user-friendly code, it is easy to read, enforceable and practical.

Note: Supporting material available for review upon request at NFPA headquarters.

PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel Comment 5-142a (Log #CC502).
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16

(Log #2100)

5- 145 - (250-118(11)): Accept in Principle
SUBMITTER: George W. Flach, Nat'l Armored Cable Mfrs' Assn. (NACMA)
COMMENT ON PROPOSAL NO: 5-254
RECOMMENDATION: Reject the proposal.
SUBSTANTIATION: The submitter's own substantiation cites that the UL white book provides the necessary information to properly install MC Cable. The White Book information in conjunction with the Product Standard requirements concerning product marking and instruction are integral to the proper installation of all products covered by the NEC. The present language permits cable manufacturers to submit product to listing laboratories for approval of the interlocked construction as an equipment ground. The proposed change will prohibit manufacturers from such product development.

The substantiation cites misuse of the cable and a lack of knowledge and experience in working with MC cable as a reason to remove the current Code language. Revising this section as proposed will not resolve the poor installations described. Continuous sheath MC that is approved as an equipment ground with the combination sheath and grounding conductor will be installed incorrectly as well according to the substantiation if the equipment ground is not properly terminated.

If there were wide spread misuse, it would be more evident than from the information provide in the substantiation. If any action were deemed needed, the product Standard through some form of product marking would more effectively address it.

PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel Comment 5-142a (Log #CC502).
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16

(Log #2101)

5- 146 - (250-118(11)): Accept in Principle
SUBMITTER: George W. Flach, Nat'l Armored Cable Mfrs' Assn. (NACMA)
COMMENT ON PROPOSAL NO: 7-5a
RECOMMENDATION: Continue to reject the proposal.
SUBSTANTIATION: The submitter's own substantiation cites that the UL white book provides the necessary information to properly install MC Cable. The White Book information in conjunction with the Product Standard requirements concerning product marking and instruction are integral to the proper installation of all products covered by the NEC. The present language permits cable manufacturers to submit product to listing laboratories for approval of the interlocked construction as an equipment ground. The proposed change will prohibit manufacturers from such product development.

The substantiation cites misuse of the cable and a lack of knowledge and experience in working with MC cable as a reason to remove the current Code language. Revising this section as proposed will not resolve the poor installations described. Continuous sheath MC that is approved as an equipment ground with the combination sheath and grounding conductor will be installed incorrectly as well according to the substantiation if the equipment ground is not properly terminated.

If there were wide spread misuse, it would be more evident than from the information provide in the substantiation. If any action were deemed needed, the product Standard through some form of product marking would more effectively address it.

PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel Comment 5-142a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16

(Log #998)

5- 147 - (250-118(2) and (3)): Reject
SUBMITTER: David A. Kerr, Jr., Friendsville, PA
COMMENT ON PROPOSAL NO: 8-7
RECOMMENDATION: Accept in Principle. Change to read:
"Where a lubricating electrical termination compound has been applied to all threads."
SUBSTANTIATION: Threaded pipe has to be lubricated in order to be turned wrench tight in a meaningful manner. Any plumber knows this. There are numerous electrical compounds. The only threads I have ever seen are bare. Threaded ends are invariably the first place to rust and break. Lousy joints are the reason why some conduit/tubing systems fail to conduct fault current properly.
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter has not provided any additional substantiation. CMP-5 agrees with the CMP-8 statement on Proposal 8-7.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16

(Log #1192)

8- 3 - (250-118(2) and (3)): Reject
SUBMITTER: Joel A. Rencsok, Scottsdale, AZ
COMMENT ON PROPOSAL NO: 8-7
RECOMMENDATION: This proposal should have been accepted.
SUBSTANTIATION: I disagree with the panel's statement for rejection. All products do not have to be listed for use. See NEC Section 90-4 and 90-7.

The panel statement is in error because all factory cut threads are not protected against corrosion. Field thread are not protected when cut and threaded by the installing person.

PANEL ACTION: Reject.
PANEL STATEMENT: The word evaluated, not listed, was used in the panel statement for Proposal 8-7. However, Sections 345-1 and 346-1 require the use of listed IMC and RMC respectively, which require protection against corrosion for factory cut threads. For general applications Section 300-6(a) does not require corrosion protection for threads at joints. For other applications, such as installations in corrosive areas, Sections 345-3(b) and 346-3(b) require protection judged suitable for the condition. The exception in Sections 300-6(a) permits threads at joints "to be coated with an identified electrically conductive compound." This exception gives the installer the permission to apply an identified

electrically conductive compound to the threads. This is the permission sought in the proposal.
Leaving joints or terminations loose is a workmanship issue.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #974)

5- 148 - (250-118(4)): Accept
SUBMITTER: Larry F. Miller, National Electrical Manufacturers Association (NEMA)
COMMENT ON PROPOSAL NO: 5-255
RECOMMENDATION: The Panel should continue to Reject this proposal.
SUBSTANTIATION: The submitter states that EMT does not provide adequate grounding due to separation, corrosion, loose fittings, thermal expansion, etc., and maintains that there are inadequate code requirements to cover these situations. On the contrary, 348-4 covers corrosion protection; 348-5 states EMT shall not be used where subject to severe physical damage; 348-10 requires couplings and connectors to be made up tight; 300-7(b) covers requirements for expansion fittings; 110-3(b) requires a product be installed in a neat and workmanlike manner. When the current code requirements are followed, EMT has been proven to be an effective equipment-grounding conductor.

Steel conduit manufacturers are in the process of finishing an Installation Guide that will provide information on the proper installation of steel conduit. This will likely be published before the new Code is. The NEMA Fittings Section (5-FB) has already completed an installation guide on fittings, which is available from NEMA. Both publications are written to encourage good workmanship and proper installation.

The submitter cites his concerns about EMT on rooftops. If the installation is one where the EMT would be subjected to severe physical damage, 348-5 says that it shall not be used. There are new pipe support systems on the market that reduce rooftop wear and tear and provide protective cushioning between mounting hardware and the roof.

The submitter states: "it has been proven everyday that the raceway system has a high impedance path". A 1994 research report on grounding by the Georgia Institute of Technology shows that EMT actually has the lowest impedance path of all metal conduits.

There is nothing in the Code that prohibits the use of a supplemental grounding conductor. This should remain a design decision.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NEGATIVE: 2
EXPLANATION OF NEGATIVE:
BRENDER: See my Explanation of Negative vote on Comment 5-138.

RAPPAPORT: This comment and the proposal to which it is related refers only to electrical metallic tubing as a metal raceway that should not be permitted to be used as an equipment grounding conductor. Even when installed correctly, there are many applications where electrical metallic tubing moves and, as a result, the couplings and connectors are loosened. The workmanship issues with installing electrical metallic tubing are different than with installing rigid or intermediate metal conduit and can be solved by accepting the original proposal.

(Log #2094)

5- 149 - (250-118(5)): Accept
SUBMITTER: George A. Straniero, AFC Cable Systems
COMMENT ON PROPOSAL NO: 5-253
RECOMMENDATION: Continue to reject this proposal.
SUBSTANTIATION: Flexible Metal Conduit is Listed and Labeled as suitable for grounding by the City of Los Angeles in accordance with the provision of Section 250-118(5). The approval by the City is based on NEC Article 250, product submittal, testing, and follow up; and is administered by the City's Electrical Testing Laboratory. The submitter incorrectly assumes that if UL does not list a product then the product should not be covered by the NEC.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16

(Log #1128)

5- 150 - (250-119(a)): Reject
SUBMITTER: Paul Dobrowsky, Holley, NY
COMMENT ON PROPOSAL NO: 5-257
RECOMMENDATION: Accept the proposal.
SUBSTANTIATION: Manufacturers could also produce green colored conductors in sizes larger than 6 AWG and eliminate termination color marking entirely. Sizes 8 AWG and 6 AWG can safely be marked in the field to identify their purpose.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Comment 5-9.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NEGATIVE: 2
EXPLANATION OF NEGATIVE:
DOBROWSKY: See my explanation of negative vote on Comment 5-9.
HAMMEL: See my explanation of negative vote on Comment 5-9.

(Log #1730)

5- 151 - (250-119(a)): Reject
SUBMITTER: Don Ganiere, Ottawa, IL
COMMENT ON PROPOSAL NO: 5-257
RECOMMENDATION: This proposal should be accepted.
SUBSTANTIATION: The code needs to reflect field installation practices. In many areas, the largest green conductor that is installed is #10. Sizes 6 and 8 are field identified at the time of installation. If field marking is safe for #4 and larger. It is also safe for sizes 6 and 8. Current practice is often cited as a reason to accept a code change. Use of re-identified conductors in sizes 6 and 8 as grounding conductors is a current practice.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Comment 5-9.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NEGATIVE: 2
EXPLANATION OF NEGATIVE:
DOBROWSKY: See my explanation of negative vote on Comment 5-9.
HAMMEL: See my explanation of negative vote on Comment 5-9.

(Log #64)

5- 152 - (250-120(b)): Accept
Note: The Technical Correlating Committee understands that the first sentence of 250-120(B) will read as follows: "Equipment grounding conductors of bare or insulated aluminum or copper-clad aluminum shall be permitted."
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 5-260
RECOMMENDATION: The Technical Correlating Committee directs that the first sentence of the Proposal be rewritten to comply with the NEC Style Manual to read as follows: "Equipment grounding conductors of bare or insulated aluminum or copper-clad aluminum shall be permitted."

The Technical Correlating Committee understands that the metric values will be the same as accepted in Proposal 5-54. This action will be considered by the Panel as a Public Comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
BRENDER: See my Explanation of Negative vote on Comment 5-101.

(Log #775)

5- 153 - (250-120(d) (New)): Accept
SUBMITTER: Richard E. Loyd, Perryville, AR
COMMENT ON PROPOSAL NO: 5-262
RECOMMENDATION: I support the panel action to reject this proposal; it is overly restrictive and unenforceable.
SUBSTANTIATION: The NEC can never regulate other crafts nor can it regulate the owner's maintenance policies. It is the building owner's responsibility to ensure a safe environment for employees and workers in their facilities. If they permit their facility to be damaged and left in that condition then we cannot write code that will prevent that. There will always be electrical equipment located on the building roof that is easily damaged i.e., disconnecting switches, receptacles, etc. It is the designer's responsibility to regulate the wiring methods used and the owner's responsibility to maintain those installations after they are installed.

Many industrial facilities and larger office buildings properly install raceways on rooftops. They build walkways and racks to hold these raceways. Many of these racks hold large and small sizes of EMT properly installed. It would be wrong and overly restrictive to outlaw these good installations that have been practiced for years.

The submitter states that permits are not required for re-roofing. Most raceway installations where the conduit or tubing is simply laid on wood blocks across the top of the roof are after the final inspection has been signed off and would not be caught by the inspector. Therefore, they would not be regulated either.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NEGATIVE: 2
EXPLANATION OF NEGATIVE:
BRENDER: See my Explanation of Negative vote on Comment 5-138.

RAPPAPORT: In addition to the substantiation that has been presented for the need to require an equipment grounding conductor in metallic raceways, a large amount of that substantiation is related to electrical metallic tubing used on roof tops. The access of personnel on flat and gently sloping roofs (the subject of this comment) and the resultant movement of the raceways due to the natural environment (wind, sun, snow, and ice) warrants assurances that the equipment ground will remain intact in spite of adverse conditions.

(Log #820)

5- 154 - (250-122): Accept in Principle
SUBMITTER: Jamie McNamara, Hastings, MN
COMMENT ON PROPOSAL NO: 5-273
RECOMMENDATION: The panel should reconsider this proposal and accept it. This proposal would clarify sizing of equipment grounding conductor.
SUBSTANTIATION: The Panel's statement indicates this is already covered in other sections of Article 250. It is not clear how to size grounding conductor on the secondary side of devices that change the voltage and current values before they terminate on an overcurrent devices. The example of ungrounded 1/0 transformer secondary conductor protected at 60 amps on the primary and terminating in a 150-amp overcurrent device on the secondary. With a #10 on the primary as well as the secondary to the 150 amp overcurrent device, is a code violation unfortunately it is not obvious and clear. Code panel member Mr. Mello's explanation on the original proposal explains the controversy and confusion in the current code text.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action on Comment 5-65.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16

(Log #821)

5- 155 - (250-122(b)): Accept
SUBMITTER: Jamie McNamara, Hastings, MN
COMMENT ON PROPOSAL NO: 5-264
RECOMMENDATION: The panel should continue to support this proposal. It helps to clarify the requirement.
SUBSTANTIATION: In the Report on Proposals the strike through text showed up as italic text and should have looked like this.

250.122(b) Increased in size ~~Adjustment for Voltage Drop.~~ Where ungrounded conductors are increased ~~adjusted~~ in size ~~to compensate for voltage drop,~~ equipment-grounding conductors, where installed, shall be increased in size ~~adjusted~~ proportionately according to circular mil area of the ungrounded conductors.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16

(Log #1403)

5- 156 - (250-132): Accept
SUBMITTER: Kari Barrett, American Chemistry Council
COMMENT ON PROPOSAL NO: 5-275
RECOMMENDATION: Reject the proposal.
SUBSTANTIATION: The revision of 250-132 creates a conflict with 250.86 Exception No. 2. Metal raceway portions or cable armor portions used to provide support or physical protection for cable assemblies can contact grounded objects but do not need a 250.134 grounding method.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16

(Log #2031)

5- 157 - (250-146(a)): Reject
SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc.
COMMENT ON PROPOSAL NO: 5-282
RECOMMENDATION: Reject the proposal.
SUBSTANTIATION: The panel action was correct three years ago, and should stand. The proposal submitter asserts that the contact surface is only the underside of the screw in an old-work application. That is untrue. The device support ear on an old-work metal box has the same approximate surface area in contact with the yoke as the comparable area on a surface-mounted handy box. The submitter then accuses the panel of being unrealistic in terms of the prevalence of inspections. If inspections are not performed all manner of violations can take place. Every receptacle that is moved forward due to new wall coverings by untrained persons, and therefore inadequately bonded, is also even more likely to be an outlet in violation of 370.20. Does the proposal submitter seriously expect my panel (Code-Making Panel 9) to prohibit flush box applications unless each flush box is installed with movable extensions ("Add-a-Depth" rings or equivalent) as part of the original installation? I have not seen such a proposal, nor do I ever expect to.

The simple fact is that the NEC should never be written to presume the absence of inspection, any more than it can be written to presume the absence of products standards. Product standards cannot be written such that they lose the presumption of both the NEC and inspections. Inspections cannot take place outside of a context that assures the existence of both product standards and the NEC. That's how the system works. Any attempt by a portion of the NEC Committee to assume otherwise amounts to shoveling sand against the tide. The untrained persons moving the receptacle cited in the substantiation likely removed the receptacle rather than fit it through the plywood; what guarantees are there that when they put it back that they even polarized it correctly?
PANEL ACTION: Reject.
PANEL STATEMENT: The panel concludes the metal-to-metal contact should be limited to surface mounted boxes only. Boxes mounted semi-flush or flush will always present the possibility of metal-to-metal contact between the box and device mounting strap being compromised. In "old-work" installations it is not uncommon for the mounting ears for devices to be broken away from the device to allow the device to seat firmly against the 6-32 tapped hole in the box, and not the retaining ears of the "cut-in" style box. This allows the faceplates to seat firmly against the wall or surface in which the box is installed. The panel reaffirms its position in accepting the proposal adds clarity in this section and that enhanced safety is achieved.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16

(Log #2219)

5- 158 - (250-146(a)): Accept
SUBMITTER: Robert H. Keis, Dover, DE
COMMENT ON PROPOSAL NO: 5-282
RECOMMENDATION: This proposal should continue to be accepted.
SUBSTANTIATION: For the reasons mentioned in the original substantiation.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16

(Log #2032)

5- 159 - (250-148): Accept
SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc.
COMMENT ON PROPOSAL NO: 5-286
RECOMMENDATION: Revise as follows:
"Where circuit conductors are spliced within a box, or terminated on equipment within or supported by a box, any separate equipment grounding conductors associated with those circuit conductors shall be spliced or joined within the box or to the box with devices suitable for the use."
SUBSTANTIATION: The proposal concept is good, but the term "junction" in the context of the word "box" is incorrect. The terminology doesn't agree with industry definitions. A junction or pull box (and they are synonymous) is defined in UL 50 in terms of size only, and not whether or not a splice occurs within it. No one reading this will know when the requirement should be applied. This comment avoids the terminology problem entirely by inverting the sentence to focus on the real safety issue. If the associated circuit conductors either join or terminate, the odds of a failure are much greater. As the submitter noted, other Code rules (and I would also note 370.4 at this point) require a grounding connection to metal boxes generally.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16

(Log #2211)

5- 160 - (250-148): Reject
SUBMITTER: Robert H. Keis, Dover, DE
COMMENT ON PROPOSAL NO: 5-286
RECOMMENDATION: This proposal should be rejected instead of accepted.
SUBSTANTIATION: The fundamental "purpose of the code is the practical safeguarding of persons and property from hazards arising from the use of electricity." These are the words in the very first article and section of this great code. Now we are going to ignore this requirement by eliminating the bonding of some boxes because we can't bond all metal fittings. Maybe we should ask Panel 14 to eliminate seal-offs because we cannot totally stop the passage of gases from one area to the other. Article 501 requires that we "minimize" the passage of gas. Why can't we take the same approach in Article 250 and require that the electrical system be made as "safe as reasonably possible."

The submitter's reference to Sections 250-80, 250-86 and Part F do not completely solve the problem. Section 250-80 and 86 require a metal enclosure to be "grounded". Part F says the same thing. None on these require a metal box that is used as a pull box to be connected to the equipment ground wire if one is pulled. The argument of the contractor is that the box is grounded by the raceway, and he don't need the ground wire. The equipment ground wire is usually installed as additional safety for the grounding system. How about the equipment ground wire pulled with a circuit that has several metal boxes between flexible metal raceways with a total length of over 6 feet. The conductors are many times pulled without joint or splice through these boxes. (Maybe the submitter thinks that conductors are always spliced in the boxes they pass through.) The submitter feels that since the conductors are not always spliced, the ground wire would not be required to be connected to these boxes. Now we would have many feet of flexible raceway used as an equipment ground in violation of several code sections. How about broken and loose fittings into boxes or along conduit runs. If the ground wire is there, and properly attached to the boxes, we probably will prevent a fire or electrocution. If the ground wire is not connected to the boxes, then we have hazards that could have been eliminated by good code.

A lot of boxes are installed as "pull-boxes" in long runs of conduit. The conductors are not cut or spliced in these boxes, thus, the rule in the revised Section 250-148 would not require that the equipment grounding conductor be bonded to these boxes. Many times in 30 years I have seen the required bonding of metal boxes provide sufficient fault current return past damaged or loose fittings. The submitter's claim that we do not require conduit fittings to be bonded is correct. We can't solve all the problems of electricity, but we can do our best to make sure the system is as safe as we can reasonably make it. Reject this proposal if for no other reason than safety.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel reaffirms its position in accepting the original proposal as submitted and concludes that the bonding requirements for metal pull boxes exists in the code when metal pull boxes are used with nonmetallic raceways. The bonding of the pull box by a wiring method that is suitable as an equipment grounding conductor specified in Section 250-118 is a suitable means of bonding required for the pull box. See Comment 5-159.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16

(Log #2368)

5- 161 - (250-148): Reject
SUBMITTER: Monte R. Ewing, State of Wisconsin
COMMENT ON PROPOSAL NO: 5-286
RECOMMENDATION: Revise text as follows:
Where more than one equipment grounding conductor enters a wireway, outlet box, device box, junction box, conduit body, cabinet, auxiliary gutter, or explosionproof apparatus used for termination, splicing, or tapping of circuit conductors, all such... (remainder unchanged).
SUBSTANTIATION: The original submitter did not name all of the enclosures which contain splices, taps, or termination of conductors. I have added enclosures which share the same hazard as those previously accepted in the 5-286 proposal which are common field installed items. It appears that it is the panel's intent to require these multiple equipment grounding conductors to be bonded to the enclosure anytime splices, taps, or terminations are made within a metal enclosure.
PANEL ACTION: Reject.
PANEL STATEMENT: A list of all enclosures that need grounding is not practical and are covered by other sections already.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16

(Log #378)

5- 162 - (250-168): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
COMMENT ON PROPOSAL NO: 5-292
RECOMMENDATION: Accept in principle revised: DIRECT-CURRENT BONDING JUMPER. For dc systems that are grounded, an unspliced bonding jumper shall be used to connect the equipment grounding conductor(s) to the grounded conductor of the system. The point of connection shall be the same as the grounding electrode conductor, as specified in 250-164.
(a) MATERIAL. The bonding jumper shall be of copper or other corrosion-resistant material and shall be a wire, bus, screw, or similar conductor.
(b) CONSTRUCTION. Where the bonding jumper is a screw only, the screw shall be identified with a green finish that shall be visible with the screw installed.
(c) ATTACHMENT. The bonding jumper shall be attached in the manner specified by the applicable provisions of 250-8.
(d) SIZE. The size of the bonding jumper shall not be smaller than the system grounding electrode conductor specified in ~~Section~~ 250-166.
SUBSTANTIATION: Specifics are lacking for the bonding jumper; for example this section doesn't have one and no location is indicated. Section 250-28 appears limited to ac systems since a main bonding jumper applies to a connection at the service, by

definition, and 250-164 prohibits a connection at the service. Section 250-28(d) also differs from this section.

The requirements for ac system bonding jumpers are equally important for dc systems.

PANEL ACTION: Reject.

PANEL STATEMENT: Sufficient substantiation has not been provided to include all of the additional requirements. Other sections of Article 250 not specifically intended for AC systems apply to DC systems.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16

VOTE ON PANEL ACTION:

AFFIRMATIVE: 16

COMMENT ON AFFIRMATIVE:

BRETT: I agree with the panel's action but believe the concept is a good one and should be further refined.

(Log #1112)

5- 163 - (250-184): Reject

SUBMITTER: Donald W. Zipse, Zipse Electrical Engineering, Inc.

COMMENT ON PROPOSAL NO: 5-295

RECOMMENDATION: Addressing panel comment #1 - remove the word ~~identified~~ from all locations in the proposal.

SUBSTANTIATION: The panel is correct in its comment that "identified" is superfluous.

PANEL ACTION: Reject.

PANEL STATEMENT: See panel action on Comment 5-180.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16

VOTE ON PANEL ACTION:

AFFIRMATIVE: 16

(Log #1114)

5- 164 - (250-184): Reject

SUBMITTER: Donald W. Zipse, Zipse Electrical Engineering, Inc.

COMMENT ON PROPOSAL NO: 5-295

RECOMMENDATION: The panel's comment #3 states: "There is no substantiation for permitting aluminum for a neutral conductor that was not previously permitted."

SUBSTANTIATION: Nowhere in either the original file or in the ROP on page 332 is "aluminum" mentioned. Perhaps in the panel's zeal to reject this safety minded proposal they were carried away. It would be greatly appreciated if the panel would explain comment #3.

PANEL ACTION: Reject.

PANEL STATEMENT: By eliminating the word "copper" in Proposal 5-295, the implication is that aluminum would be permitted. There has been no substantiation to permit aluminum. See the action on Comment 5-180.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16

VOTE ON PANEL ACTION:

AFFIRMATIVE: 16

(Log #1113)

5- 165 - (250-184(a) Exception No. 1): Reject

SUBMITTER: Donald W. Zipse, Zipse Electrical Engineering, Inc.

COMMENT ON PROPOSAL NO: 5-295

RECOMMENDATION: Revise as follows:

Exception No. 1: Bare conductors shall be permitted to be used outdoors. ~~for the service entrances where the equipment is station type equipment located outdoors. The equipment grounding conductor of direct-buried portions of feeders may be bare conductor.~~

SUBSTANTIATION: The panel is correct in its panel comment #3. There is no reason that bare neutral conductors cannot be used outside as long as they are insulated from earth by insulators of some form, except at one location where the neutral is connected to earth or if you prefer, ground in order to earth the electrical system forming a grounded neutral system.

The equipment grounding conductor proposal belongs in Section 250-184(c).

PANEL ACTION: Reject.

PANEL STATEMENT: There is no technical substantiation of why conductors, other than neutrals, may be used without insulation and why bare copper conductors should not be permitted as neutrals of service entrances and direct buried portions of feeders. See also panel action on Comment 5-180.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16

VOTE ON PANEL ACTION:

AFFIRMATIVE: 16

(Log #1334)

5- 166 - (250-184(b)): Reject

SUBMITTER: Donald W. Zipse, Zipse Electrical Engineering, Inc.

COMMENT ON PROPOSAL NO: 5-298

RECOMMENDATION: Delete this Section and accept Doanld W. Zipse's concept as submitted in the comments.

SUBSTANTIATION: Multi-grounding of an equipment grounding conductor instead of the neutral is a safe way of transmitting electricity as there are no continuous flowing stray currents (voltage) that can and have harmed persons.

PANEL ACTION: Reject.

PANEL STATEMENT: This comment does not comply with 4-4.5 of the NFPA Regulations Governing Committee Projects. The recommendation is not compatible with the text it is intended to replace. See also panel action on Comment 5-180.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16

VOTE ON PANEL ACTION:

AFFIRMATIVE: 16

(Log #2033)

5- 167 - (250-184(b)): Accept in Principle

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

COMMENT ON PROPOSAL NO: 5-298

RECOMMENDATION: Revise as follows:

(B) Multiple Grounding. Grounding connections shall be made to the neutral of a solidly grounded neutral system at the following locations, and shall be permitted to be made at additional locations.

1. At each transformer supplying a set of feeder conductors serving a building or other structure; 2. At the supply point of underground portions of feeders where the neutral is uninsulated; and 3. To overhead portions installed outdoors, in accordance with the spacing requirements in 250.184(D).

SUBSTANTIATION: As written the term "neutral" is the subject of the clause "and shall include the following", but none of the following are portions of a neutral. This comment rewrites the second clause by inverting the sentence, allowing the mandatory information to come first. This places the focus on mandatory ground-to-neutral connections, which appears to be the intent of the phrase "and shall include" in the proposal. The three list items following have been rewritten to correlate with the parent language, and with additional material reflecting current NEC organization.

First, since this article does not govern wiring on the supply side of the service point, particularly where the medium voltage feeder with the solidly grounded neutral is premises wiring or it would never be covered here, the comment removes the term "services." Any wiring supplied by such a feeder must be a feeder, and not a service.

Second, since the focus must be on mandatory connections, the section must say where those connections are to be made. The intent appears to be at the point of connection as a minimum, with additional regrounding permitted but not required. Similarly, outdoor overhead wiring needs minimum connections specified in some way; in this case a simple reference to the new subsection (D).

Finally, this comment corrects the improper use of "exposed" in the second item, which is inconsistent with Article 100.

PANEL ACTION: Accept in Principle.

Replace the 2002 NEC ROP Proposal 5-298 with the following text:

(b) Multiple Grounding. The neutral of a solidly grounded neutral system shall be permitted to be grounded at more than one point. Grounding shall be permitted at one or more of the following locations:

(1) Transformers supplying conductors to a building or other structure;

(2) Underground circuits where the neutral is exposed;

(3) Overhead circuits installed outdoors.

PANEL STATEMENT: The first sentence was split into two and editorially revised for clarity. Reference to service in (1) was deleted. The change in (2) was rejected because there may be more portions of underground feeders, other than the supply point and exposed sections of uninsulated neutrals that are intended to be grounded. The change to (3) was rejected as not adding to clarity since the reference is in the same section.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16

(Log #1110)

5- 168 - (250-184(b)(3)): Reject
SUBMITTER: Donald W. Zipse, Zipse Electrical Engineering, Inc.
COMMENT ON PROPOSAL NO: 5-295
RECOMMENDATION: Keep the text the same.

Panel's comment #6, "There is no substantiation for requiring the neutral conductor to be insulated."

The definition of: "in-su-lat-ed, in-sul-lat-ing, in-su-lates. 1. To cause to be in a detached or isolated position. 2. To prevent the passage of heat, electricity, or sound into or out of, especially by surrounding with a nonconducting material."
SUBSTANTIATION: NEC requires low voltage systems to have the phase conductor insulated with material on the conductor to prevent passage of current to other conducting surfaces. Likewise, the neutral conductor is required to have insulation on the conductor. Panel 5 has required ranges and dryers to have the neutral conductor covered with insulation.

Using the same logic, why would not the neutral conductor of high voltage be insulated with a covering, unless 250-184(a) Exception No. 1 applies, which is outdoors. Even then, the neutral is on insulators insulating the neutral conductor from contacting a conducting material. On the other hand, panel 5 should cover the omission of the neutral being on insulators when outside.

The object of this section is to prevent stray current from flowing uncontrolled over the earth, metallic pipes, etc. causing shocks to persons and even the possibility of electrocution.
PANEL ACTION: Reject.
PANEL STATEMENT: No additional technical substantiation has been provided to require neutral conductor insulation in all cases. The panel does not agree that the use of similar logic is a technical substantiation for electrical systems that have very different distribution systems. See panel action on Comment 5-180.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16

(Log #1111)

5- 169 - (250-184(c)(2)): Reject
SUBMITTER: Donald W. Zipse, Zipse Electrical Engineering, Inc.
COMMENT ON PROPOSAL NO: 5-295
RECOMMENDATION: The panel's comment #5 states that a "neutral/blocker" cannot be supplied unless a separate system exists.

This is untrue. Per one manufacturer, such a neutral/blocking device can be supplied by setting the adjustment to carry the system's available fault current.

See comment on Panel's Comment #4.
SUBSTANTIATION: Section 250-184 does not prohibit such a service from a utility that has the misfortune to install a less than total safe electrical system. I call your attention to Section 90-2. Scope. This section specifically excludes utilities. However, Section 250-184 applies to industrial and commercial systems that elect to have electrical system 1 kV and over. It is the industrial and commercial installations that my proposal applies.

If I have misinterpreted your comment, please explain.

One manufacturer has confirmed the feasibility of using a "Neutral Blocker" to generate the separate ground conductor. The neutral would be carried straight through connecting both the utility and the industrial neutral systems. However, the neutral would not be connected to earth beyond the service point, metering point, which serves as the interface between the utility and the industrial site.

At the above service point, the fifth wire would be generated and serve as the grounding conductor just as we have in our under 1kV systems (homes). Should a fault occur and this said fault encompass the ground conductor within the industrial facility, the "modified neutral blocker" would function and connect the fault carrying current (equipment) grounding conductor to the utility's multiple grounded neutral, thus allowing the utility's protective device to open and protect the conductors inside the industrial facility.

This would prevent stray current from flowing within the industrial facility and causing the potential of electrical shock and possibility of electrocution.
PANEL ACTION: Reject.
PANEL STATEMENT: The comment does not comply with 4-4.5 of the NFPA Regulations Governing Committee Projects. There is no recommendation. See panel action on Comment 5-180.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16

(Log #1115)

5- 170 - (250-184(c)(2)): Reject
SUBMITTER: Donald W. Zipse, Zipse Electrical Engineering, Inc.
COMMENT ON PROPOSAL NO: 5-295
RECOMMENDATION: The panel comment #4 states: "This requirement (neutral grounded in one location only) cannot be met for a service supplied directly from a utility high voltage system."
SUBSTANTIATION: Section 250-184 does not prohibit such a service from a utility that has the misfortune to install a less than total safe electrical system. I call your attention to Section 90-2. Scope. This section specifically excludes utilities. However, Section 250-184 applies to industrial and commercial systems that elect to have electrical system 1 kV and over. It is the industrial and commercial installations that my proposal applies.

If I have misinterpreted your comment, please explain.

One manufacturer has confirmed the feasibility of using a "Neutral Blocker" to generate the separate ground conductor. The neutral would be carried straight through connecting both the utility and the industrial neutral systems. However, the neutral would not be connected to earth beyond the service point, metering point, which serves as the interface between the utility and the industrial site.

At the above service point the fifth wire would be generated and serve as the grounding conductor just as we have in our under 1 kV systems (homes). Should a fault occur and this said fault encompass the ground conductor within the industrial facility, the "modified neutral blocker" would function and connect the fault carrying current (equipment) grounding conductor to the utility's multiple grounded neutral, thus allowing the utility's protective device to open and protect the conductors inside the industrial facility.

This electrical system would function just the same way the present low voltage service entrance systems functions. In the case of the low voltage service entrance system the utility service drop consists of insulted phase conductors and a combination neutral/ground/messenger conductor.

With three (3) phase conductors, the neutral is combined with the ground conductor and uses the messenger for the conducting path. This is a 4 wire service. Inside the service entrance panel there can be a separate terminal strip for the white colored neutral conductors and another terminal block for the bare or green color equipment grounding conductors. The two terminal blocks are connected together.

What we now have inside the house is a 5 wire system originating from a 4 wire utility system service. Three phase conductors, an insulated white color neutral and the equipment ground conductor.

Where in the house the junction of the neutral terminal block with the equipment grounding terminal block are joined together and on one side is the utility 4 service and on the house side is the 5 wire service. With the 1 kV and over systems the neutral blocker serves the same function and the connection between the terminal blocks.

This would prevent stray current from flowing within the industrial facility and causing the potential of electrical shock and possibility of electrocution.
PANEL ACTION: Reject.
PANEL STATEMENT: The comment does not comply with 4-4.5 of the NFPA Regulations Governing Committee Projects. There is no recommendation. See also panel action on Comment 5-180.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16

(Log #65)

5- 171 - (250-184(d)): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 5-302
RECOMMENDATION: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panels 4, 10, and 13 for information.
The Technical Correlating Committee directs the Panel to provide a Title.
This action will be considered by the Panel as a Public Comment relative to the title.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
PANEL STATEMENT: The panel accepts the direction from the Technical Correlating Committee to add title to Section 250.184(d). See panel action on Comment 5-173.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16

(Log #CC504)

5- 173a - (250-184(d) (New)): Accept
SUBMITTER: CMP 5
COMMENT ON PROPOSAL NO: 5-302
RECOMMENDATION: Revise the section to read as follows:
(d) Multi-grounded Neutral Conductor. Where a multi-grounded neutral system is used, the following shall apply:
(1) The multi-grounded neutral conductor shall be of sufficient ampacity for the load imposed on the conductor but not less than 33-1/3 percent of the ampacity of the phase conductors. Exception: In industrial and commercial premises under engineering supervision it shall be permissible to size the ampacity of the neutral conductor to not less than 20 percent of the ampacity of the phase conductor.
(2) The multi-grounded neutral conductor shall be grounded at each transformer and at other additional locations by connection to a made or existing electrode.
(3) At least one grounding electrode shall be installed and connected to the multi-grounded neutral circuit conductor every 400 m.
(4) The maximum distance between any two adjacent electrodes shall not be more than 400 meters.
(5) In a multi-grounded shielded cable system, the shielding shall be grounded at each cable joint, which is exposed to personnel contact.
SUBSTANTIATION: A new first sentence was added for clarity and the last sentence was removed from the recommendation field of Comment 5-173 as it is not recommended text.
In addition, the panel concluded the neutral sizing need to be revised according to the explanation of negative vote by David Brender on Proposal 5-302.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16

(Log #1335)

5- 172 - (250-184(d)): Reject
SUBMITTER: Donald W. Zipse, Zipse Electrical Engineering, Inc.
COMMENT ON PROPOSAL NO: 5-302
RECOMMENDATION: Delete this section and accept Donald W. Zipe's concept as submitted in the comments.
SUBSTANTIATION: Multi-grounding of an equipment grounding conductor instead of the neutral is a safe way of transmitting electricity as there are no continuous flowing stray currents (voltage) that can and have harmed persons.
PANEL ACTION: Reject.
PANEL STATEMENT: This comment does not comply with 4-4.5 of the NFPA Regulations Governing Committee Projects. The recommendation is not compatible with the text it is intended to replace. See also panel action on Comment 5-180.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16

(Log #1336)

5- 173 - (250-184(d) (New)): Accept in Principle
SUBMITTER: Donald W. Zipse, Zipse Electrical Engineering, Inc.
COMMENT ON PROPOSAL NO: 5-302
RECOMMENDATION: The paragraph is too long and covers several different subjects and should be broken down as follows:
(d) Multi-grounded Neutral Conductor:
(1) The multi-grounded neutral conductor shall be of sufficient ampacity for the load imposed on the conductor but not less than 20 percent of the ampacity of the phase conductors.
(2) The multi-grounded neutral conductor shall be grounded at each transformer and at other additional locations by connection to a made or existing electrode.
(3) At least one grounding electrode shall be installed and connected to the multi-grounded neutral ~~circuit~~ conductor every 400 m.
(4) The maximum distance between any two adjacent electrodes shall not be more than 400 meters.
(5) In a multi-grounded shielded cable system, the shielding shall be grounded at each cable joint, which is exposed to personnel contact.
SUBSTANTIATION: The paragraph is too long and covers several different subjects that should be broken out separately.
It is a multi-grounded neutral so, so state. Let's not hide the fact. After all, Panel 5 may in the future have rules on Single Grounded Neutral.
Note the words "multi-grounded" were included in the section on shields.
One cannot clearly refer to the rules on transformers easily since "transformer's rules" are contained within the paragraph. by having a separate number for "transformers" a person can clearly cite that section without any ambiguity.
Consideration should be given to including lightning arrestors in Section 250-184.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel Comment 5-173a (Log #CC504) that incorporates the action on this comment.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16

(Log #1108)

5- 174 - (250-184(e)(2)): Reject
SUBMITTER: Donald W. Zipse, Zipse Electrical Engineering, Inc.
COMMENT ON PROPOSAL NO: 5-295
RECOMMENDATION: 250-184(e)(1) as submitted. The numbering should be "1" not "2" and renumber the following paragraphs.
250-184(e)(2) as found on page 332 of the ROP.
(1) 250-184(e) ~~(2)~~(1) The equipment grounding conductor may be bare and shall have sufficient ampacity for the ~~load~~ fault current imposed on the conductor, but not less than 20 percent of the ampacity of the phase conductors.
SUBSTANTIATION: The panel was correct in finding the wrong work was used. The panel could elect to use Table 250-122 for the equipment grounding conductor size in place of the 20 percent.
PANEL ACTION: Reject.
PANEL STATEMENT: There is no technical substantiation for permitting the equipment grounding conductor to have an ampacity of only 20% of the phase conductors. Table 250-122 provides for equipment grounding ampacities that are sometimes above and sometimes below 20% of the phase overcurrent device rating. Taken by itself, this comment does not fit into the existing 1999 NEC text because the use of equipment grounding conductors is not specified nor required.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16

(Log #1109)

5- 175 - (250-184(e)(2)): Reject
SUBMITTER: Donald W. Zipse, Zipse Electrical Engineering, Inc.
COMMENT ON PROPOSAL NO: 5-295
RECOMMENDATION: 250-184(e)(1) as submitted. The numbering should be "1" not "2" and renumber the following paragraphs.
250-184(e)(2) as found on page 332 of the ROP.
(1) 250-184(e)~~(2)~~(1) The equipment grounding conductor may be bare and shall have sufficient ampacity for the ~~load~~ fault current

imposed on the conductor, but not less than 20 percent of the ampacity of the phase conductors.
SUBSTANTIATION: The panel was correct in finding the wrong work was used.
The panel accepted 5-302, 250-184(d) new, which contains the same 20%. Using logic which is sometimes missing, since the multiple grounded neutral carries the fault current and is limited to minimum of 20% of the phase conductor size, it would seem appropriate to limit the minimum size of the equipment ground conductor to the same 20%, based on accepting the NESC logic, whatever that may have been.
Remember the equipment grounding conductor will be grounded every 400 m, thus allowing only the fault current to flow over the earth for the time that it takes the protective device to operate.
Equipment ground conductors should not carry continuously flowing phase return current.
The panel could elect to use Table 250-122 for the equipment grounding conductor size.
PANEL ACTION: Reject.
PANEL STATEMENT: There is no technical substantiation for permitting the equipment grounding conductor to have an ampacity of only 20% of the phase conductors. Table 250-122 provides for equipment grounding ampacities are sometimes above and sometimes below 20% of the phase overcurrent device rating. Taken by itself, this comment does not fit into the existing 1999 NEC text because the use of equipment grounding conductors is not specified nor required.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16

(Log #1107)

5- 176 - (250-184(e)(3)): Reject
SUBMITTER: Donald W. Zipse, Zipse Electrical Engineering, Inc.
COMMENT ON PROPOSAL NO: 5-295
RECOMMENDATION: 250-184(e)(2) as submitted. The numbering should be "2" not "3" and renumber the following paragraphs.
250-184(e)(3) as found on page 332 of the ROP.
As submitted:
250-184(e)
(2) The equipment grounding conductor shall be connected to each transformer and to the transformer's grounding electrode and at other additional locations by connection to existing grounding electrodes.
As accepted by the panel-
See 5-302, page 334: The Panel accepted, "The neutral conductor shall be grounded at each transformer and at other additional locations by connection to a made or existing electrode."
As suggested:
"The ~~neutral~~ equipment ground conductor shall be grounded at each transformer and connected to each transformer and lightning arrestor and at other additional locations by connection to a made or existing electrode."
SUBSTANTIATION: Substantiation is based on the same as the panel accepted. It is necessary to make sure each transformer is connected to the equipment grounding conductor. In addition, the lightning arrestor was missing from the previous entry. The NESC includes the lightning arrestor and that the lightning arrestor has a separate earthing, grounding electrode.
PANEL ACTION: Reject.
PANEL STATEMENT: There is, presently, no defined requirement for an equipment grounding conductor. The text, accepted by the panel, was for a new requirement that the neutral, not an equipment grounding conductor, be grounded at each transformer.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16

(Log #1106)

5- 177 - (250-184(e)(4)): Reject
SUBMITTER: Donald W. Zipse, Zipse Electrical Engineering, Inc.
COMMENT ON PROPOSAL NO: 5-295
RECOMMENDATION: Keep the text the same.
SUBSTANTIATION: Panel Comment #10
Would the panel be so kind as to tell me why the panel accepted the identical "400 m" when they accepted 5-302 and made the comment rejecting my "400 m"?
PANEL ACTION: Reject.
PANEL STATEMENT: The text accepted by the panel was for a new requirement for a neutral, not an equipment grounding conductor. This accepted requirement is consistent with existing utility practices that have been in place for many years. There is no technical substantiation that the requirements for an equipment grounding conductor should be the same as for a multiple grounded neutral.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16

(Log #1104)

5- 178 - (250-184(e)(6)): Reject
SUBMITTER: Donald W. Zipse, Zipse Electrical Engineering, Inc.
COMMENT ON PROPOSAL NO: 5-295
RECOMMENDATION: 250-184(e)(6) as submitted. The numbering should be "5" not "6" and renumber the following paragraphs.
250-184(e)(6) as found on page 332.
As submitted:
250-184(e)
~~(6)~~ (5) In a multiple grounded shielded cable system there shall be, if required, a separate insulated neutral conductor. The equipment grounding shield shall be grounded at each cable joint which is exposed to personnel contact.
As accepted by the panel-
See 5-302, page 334: The panel accepted,
"250-184(d) The equipment grounding shield shall be grounded at each cable joint which is exposed to personnel contact."
SUBSTANTIATION: It appears to me that the panel accepted exactly the same wording when the processed 5-302 on page 334. Is there something, other than the panel wants to allow continuous current to flow over the earth causing harm to persons in swimming pools, showers, and other areas, and for that reason the proposal has been rejected?
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action on Comment 5-180.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16

(Log #1105)

5- 179 - (250-184(e)(6)): Reject
SUBMITTER: Donald W. Zipse, Zipse Electrical Engineering, Inc.
COMMENT ON PROPOSAL NO: 5-295
RECOMMENDATION: Panel comment #11
250-184(e)
~~(6)~~(5) In a multiple grounded shielded cable system there shall be, ~~if required~~ when the electrical load device has a neutral load, a separate insulated neutral conductor. The equipment grounding shield shall be grounded at each cable joint which is exposed to personnel contact.
SUBSTANTIATION: The panel comment asked to define "when required". Naturally, a neutral conductor would be required whenever a neutral load exists.
The panel should not be specifying when a shielded cable would be required as this is a design criteria and the NEC is not supposed to be a design manual. If one wants a safe electrical system with reduced circulating neutral currents over the earth, metallic piping, etc., then one would not use a bare neutral conductor in a cable. The object is to reduce and eliminate stray electrical currents that have the potential for shocking persons and possible electrocuting of persons in showers and swimming pools and other places.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action on Comment 5-180.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16

(Log #1171)

5- 180 - (250-184(e)(6)): Reject
SUBMITTER: Donald W. Zipse, Zipse Electrical Engineering, Inc.
COMMENT ON PROPOSAL NO: 5-295
RECOMMENDATION: Revise 250-184 to read as follows:
250-184. Solidly Grounded Neutral Systems
(a) Neutral Conductor Insulation Rating. The minimum insulation level for neutral conductors of solidly grounded systems shall be 600 volts.

Exception No. 1: Bare conductors shall be permitted to be used outdoors ~~for the service entrances where the equipment is station type equipment located outdoors. The equipment grounding conductor of direct buried portions of feeders may be bare conductor.~~

FPN: See Section 225-4 for conductor covering where within 10 ft (3.05 m) of any building or other structure.

(b) Grounding. The neutral conductor of a solidly grounded neutral system above 1 kV and over (high voltage) shall be grounded at one location only, preferably at the source transformer or generator.

(1) The neutral conductor shall be insulated and isolated from earth except at one location.

(2) A separate bare equipment grounding conductor shall be installed and run with the phase conductors and the insulated neutral conductor and shall be extended into the customer's property along with the insulated phase and insulated neutral conductor(s).

(c) Utility Source. The interface between the utility source and the customer's property shall have:

(1) A neutral isolator/blocker device installed between the utility's multiple neutral grounded conductor and the customer's isolated and insulated neutral conductor. Such neutral blocking device shall be listed by Underwriters Laboratories as per 250-2(d).

(2) A separate bare equipment grounding conductor shall be installed and run with the phase conductors and extending into the customer's property.

(d) Neutral Conductor. The neutral conductor shall be an insulated conductor. The neutral conductor shall have sufficient ampacity for the load imposed on the conductor, but not less than unbalanced ampacity of the phase conductors. The neutral conductor shall be designed to carry unbalanced phase current continuously.

(e) Equipment Grounding Conductor.

(1) The equipment grounding conductor may be bare and shall have sufficient amapcity for the ~~load~~ fault current imposed on the conductor, but not less than 20 percent of the ampacity of the phase conductors.

(2) The equipment grounding conductor shall be ~~connected~~ grounded ~~to~~ at each transformer and connected to each transformer and lightning arrestor and to the transformers' grounding electrode and at other additional locations by connection to existing ground electrodes.

(3) The equipment grounding conductor shall have a least one grounding electrode installed and connected to the equipment grounding conductor every 400 m and the maximum distance between any two adjacent electrodes shall not be more than 400 meters.

(4) The equipment grounding conductor shall be available for fault current duty only and the equipment grounding conductor shall not carry or conduct continuous current.

(5) In a multiple grounded shielded cable system there shall be~~,~~ ~~if required~~ when the electrical load device has a neutral load, a separate insulated neutral conductor. The equipment grounding shield shall be grounded at each cable joint which is exposed to personnel contact.

SUBSTANTIATION: The revised Section now has been revised and meets all of the comments made by the Panel.

A few important points to digest are:

1. Low voltage wiring practices uses the separate equipment grounding conductor principle. The proposed high voltage rules eliminate the equipment grounding conductor concept.

2. It cannot be denied the combined multiple grounded neutral, which takes the place of the equipment ground conductor concept, results in continuous stray current (voltage) flow over the earth resulting in shocking and possibility of electrocuting persons.

3. The costs savings of present high voltage wiring practice of eliminating the equipment grounding conductor and combining it with the neutral and then multiple grounding the neutral to compensate for the lack of equipment grounding conductor is a dangerous practice for the NEC Panel 5 to adopt.

The choice for the Panel is between the concepts started in the late 1940s, early 1950s when the equipment ground wire was introduced and reverting back to the old days of two wire receptacles concept. Adoption of this version of 250-184 maintains the concept of the equipment ground conductor concept.

If you reject this proposal and comment, the Panel will no longer uphold the equipment ground concept. The Panel will be reverting back to the two wire concept using only the phase conductor(s) and the neutral conductor for wiring equipment.

The equipment ground conductor brought SAFETY to the electrical wiring practices. Panel 5 will be abandoning the SAFETY CONCEPT of the equipment grounding conductor if it adopts the NESC 250-184 proposal.

The next code cycle, following your principle of no equipment grounding conductor necessary for high voltage, will bring forth cost saving ideas of using the neutral as both the equipment grounding conductor and the neutral for low voltage systems, which is the same as is used by the NESC, which is less than safe.

Persons receiving shocks in showers and swimming pools are an indication the improved electrical wiring practices are dearly needed to prevent such electrical shocks. Persons may have been electrocuted from the stray currents that will be and presently are generated by the wiring practices that Panel 5 has approved so far.

PANEL ACTION: Reject.

PANEL STATEMENT: The single grounded neutral system may have advantages in certain applications and should be an optional choice rather than a mandated requirement. The panel does not agree that there is a listing requirement in Section 250.2(D) or with the requirement for a single testing laboratory.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16

VOTE ON PANEL ACTION:

AFFIRMATIVE: 15

NEGATIVE: 1

EXPLANATION OF NEGATIVE:

RAPPAPORT: The comment and the original proposal provide rules for a premises wiring system of 1 KV and over that meets the safety requirements of premises wiring systems that are less than 1 KV. The proposal is an attempt to keep all electrical current contained in conductors rather than permitting some of the current to travel through the earth. That this procedure is permitted for utilities as contained in the National Electrical Safety Code should not be a factor in the National Electrical Code. Where a utility provides a high voltage service to a facility and is complying with the National Electrical Safety Code, the facility should have the ability to provide a premises wiring system that prevents neutral current from flowing on their premises piping systems and in the grounds of their facility.

The original proposal is flawed in that it required a single point grounded neutral system rather than permitting it. The choice of whether to use a single or a multiple grounded neutral system should be an engineering decision and should not be dictated by the code. The panel action should be to accept in principle and change the requirement of single point neutral grounding from a requirement to a permission.

(Log #379)

5- 181 - (250-186): Reject

SUBMITTER: Dan Leaf, Palmdale, CA

COMMENT ON PROPOSAL NO: 5-309

RECOMMENDATION: Accept in principle revised: Delete ~~(3) Line to neutral loads are not served.~~

(b) IDENTIFIED AND INSULATED. Where the neutral conductor of an impedance grounded system is used it shall be identified in accordance with 200-6, ~~as well as~~ and fully insulated as the phase conductors.

SUBSTANTIATION: While this proposal incorporates some requirements of 250-36, the part proposed to be deleted is not in the text of 250-186, and (b) indicates a neutral may be used. For what purpose if no load is permitted? It should be noted that both 250-36 and Part K cover a 1 kV system.

"Identified" per se; is not specific; other conductors required to be identified have the specific means indicated, such as green or orange color. Section 200-6 does not appear limited to 600 volt or less systems.

PANEL ACTION: Reject.

PANEL STATEMENT: Deletion of Section 250-186(3) is not practical when the impedance grounded neutral system is used. Line to neutral loads can not be served by such a system.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16

VOTE ON PANEL ACTION:

AFFIRMATIVE: 15

NEGATIVE: 1

EXPLANATION OF NEGATIVE:

SKUGGEVIG: I agree with the comment. This comment should be accepted. Line-to-neutral loads should be continued to be acceptable as long as the neutral conductor is fully insulated as required by (b) and as long as it is clear that the ground detectors required by (2) are required to include a response to ground faults on the neutral conductor as well as the phase conductors. In addition, it appears that a conflict exists in the new text between the new item (3) which prohibits line-to-neutral loads and (b) which requires identification and insulation where the neutral "is used".

(Log #CC501)

5- 181a - (250-186(B)): Accept
SUBMITTER: CMP 5
COMMENT ON PROPOSAL NO: 309
RECOMMENDATION: Revise 250.186(B) text to read as follows: The neutral conductor of an impedance grounded neutral system shall be identified, as well as fully insulated with the same insulation as the phase conductors.
SUBSTANTIATION: In an impedance grounded system the neutral can not be utilized to supply line to neutral loads.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16
COMMENT ON AFFIRMATIVE:
SKUGGEVIG: I agree with the Panel Action to accept this proposal, but I do not agree with the submitter's substantiation. The substantiation seems inconsistent with the recommendation because there would be no need for a fully insulated and identified neutral conductor if it were not usable and permitted to serve a line-to-neutral load. Provided that the neutral conductor is fully insulated (required) and the ground detectors (also required) will respond to ground faults on the neutral conductor as well as the phase conductors, line-to-neutral loads should be permitted.

ARTICLE 285 — TRANSIENT VOLTAGE SURGE SUPPRESSORS: TVSS

(Log #1121)

5- 182 - (285): Accept in Principle in Part
SUBMITTER: George Mayle, Advanced Protection Technologies
COMMENT ON PROPOSAL NO: 5-316
RECOMMENDATION: Support the panel action to accept new Article 285, but recommend the panel reconsider accepting the wording provided by the original submitter.
SUBSTANTIATION: The panel has made two significant changes to the submitter's proposal and both are highlighted in panel member statements. The panel should support Mr. Dobrowsky's affirmative comment requesting the inclusion of the proposed 285-3(3). The new article 285 parallels the requirements in 280 and the 285-3(3) requirement the panel struck is found in Section 280-4(a).

The panel action to revise the short circuit current rating requirements for a TVSS is not clear. The short circuit current rating must be required to be marked on TVSS products. This will ensure a safe installation, specifically when the TVSS is installed in or near a panelboard or switchboard where the available fault current can cause damage when the TVSS reaches end-of-life. Mr. Diaz does not understand that when a TVSS reaches end-of-life generally fails shorted and the available fault current is introduced along that shorted path. The internal components and any external overcurrent device are then required to open this short circuit condition. Product evaluation is necessary to ensure proper overcurrent protection of the TVSS exists either internally and or externally and the short circuit current marking is required to make sure the TVSS is applied in a safe location in the electrical system.

The UL standard does not currently address this testing and marking issue as indicated in Mr. Diaz's comment, however, TVSS manufacturers such as our company (APT) and users are recognizing a need for such an evaluation to ensure proper electrical safety. The short circuit current marking concern is currently being reviewed by UL. A bulletin was issued by UL in June 2000 requesting comments on a new requirement to add short circuit current ratings which would indicate UL is also beginning to recognize this safety concern.
PANEL ACTION: Accept in Principle in Part.
Revise the introductory phrase of Section 285.21 to read as follows: 285.21 Connection. Where a TVSS is installed, it shall be connected as follows:
PANEL STATEMENT: The panel accepts the previous language from the proposal for the introductory phrase of Section 285.21 only because it adds clarity. The panel does not accept any other changes from this comment because there was no substantiation to make such a wide sweeping change. The panel prefers this language because it is clear. See panel action on Comment 5-183.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16

(Log #1786)

5- 183 - (285): Accept
Note: The Technical Correlating Committee advises that article scope statements are the responsibility of the Technical Correlating Committee and the Technical Correlating Committee Accepts the Panel Action with respect to 285-1.
SUBMITTER: Alan Manche, Square D Co.
COMMENT ON PROPOSAL NO: 5-316
RECOMMENDATION: The panel should continue to accept new Article 285 with the following revisions to the panel action:

1) 285.1 Scope. This article covers general requirements, installation requirements, and connection requirements for transient voltage surge suppressors (TVSS) permanently installed on premises wiring systems.

2) 285.3 (3) Where the rating of the TVSS is less than the maximum continuous phase-to-ground power frequency voltage available at the point of application.

3) 285.6 Short Circuit Current Rating. The TVSS ~~transient voltage surge suppressors~~ shall be marked with a short circuit current rating and shall not be installed at a point on the system where the available fault current is in excess of ~~the marked~~ that rating. This marking requirement shall not apply to receptacles.

4) 285.25 Grounding. ~~Except as indicated in this Article, TVSS transient voltage surge suppressor grounding connections shall be made as specified in Article 250, unless otherwise noted in this article.~~ Grounding conductors shall not be run in metal enclosures unless bonded to both ends of such enclosure.
SUBSTANTIATION: The present wording of the scope would include cord-and-plug connected TVSS units or TVSS units integral to appliances. It was never the intent of this article to apply to cord connected equipment such as power taps, therefore adding the word "permanently" will clarify the scope.

The panel should include the proposed text in 285-3(c) for consistency since it is nearly identical to the wording found in 280-4(a).

The wording in the panel action is not as clear as the proposed wording, therefore the text should return to the original proposed wording. An additional sentence exempting receptacles from having a marked short circuit rating should also be added since receptacles are evaluated to UL 498 which does not require short circuit current rating markings on receptacles. The discussion of this article has indicated that short circuit current markings are not necessary for receptacle type TVSS units due to their location in the electrical system, however, those TVSS units installed either internally or externally near a panel, switch, switchboard, ...are susceptible to the high fault currents that can create a hazardous condition if the tvss has not been appropriately evaluated and marked.

The comment by Mr. Diaz only addresses short circuit current conditions during normal operation of single and two-port TVSS products. His comment does not address the shorted condition of a TVSS when the current travels along the shorted path of an MOV when it fails as explained in the original proposal. The TVSS must be tested to demonstrate it has internal protection or that a breaker will protect it. You cannot assume the TVSS assembly is protected by the breaker or fuses that protect wire leads to the TVSS. The energy that passes through the branch breaker or fuses during this shorted condition can cause the TVSS to fail in an unsafe manner if it has not been appropriately designed or internally protected. Only a short circuit current evaluation and marking can assist with a safe electrical installation.

The cross-reference in paragraph 285-25 to Article 250 is not specific and not relevant and should be deleted in order to conform with Paragraph 3.6.2 of the NEC Style Manual. The proposed paragraph was copied directly from Article 280 but it is in violation of the NEC style manual.
PANEL ACTION: Accept.
Editorially in Section 285.2 Definitions, move the FPN to follow the item (3).
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16

(Log #2135)

5- 184 - (285): Accept in Principle
SUBMITTER: Patrick Howard, Lucent Technologies
COMMENT ON PROPOSAL NO: 5-316
RECOMMENDATION: The new Article 285 should continue to be accepted with specific support for the requirement to mark TVSS products with a short circuit current rating.
SUBSTANTIATION: Our company has experienced some unacceptable product failure modes with TVSS product. To minimize this damage, we evaluated both the construction and failure modes of TVSSs to both IEEE and UL test standards.

In testing hundreds of samples from different manufacturers, we find a strong correlation between undesirable failure modes and inadequate fault current ratings. Most TVSS devices we tested (either one- or two-port) rated for branch circuit use (5000 Amp fault) had undesirable failure modes when tested to 200 Amp service panel limits. Of those designs with only a 5000 Amp rating, most failed badly at their surge rating. Of those with a 10,000 Amp rating, almost none failed badly at their surge rating.

We find that use of the UL fault current ratings is a vital step in correctly applying surge protectors. Without mandatory ratings and markings, an inferior TVSS will most often be used where it has insufficient surge and follow current capability.

Harm to persons and damage to buildings can result from using TVSSs rated less than the UL requirement. A user will not know the fault current rating unless it is required to be marked.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Comment 5-183.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16

(Log #278)

5- 185 - (285-21): Reject
SUBMITTER: Roy T. Higa, Aiea, HI
COMMENT ON PROPOSAL NO: 5-316
RECOMMENDATION: Recommend that proposed sections 285-21(A)(1), 285-21(A)(2) and 285-21(A)(3) be reworded as follows:

285-21(A)(1): Service Supplied Building or Structure. A TVSS can be connected anywhere in the premises wiring system except the line side of the service disconnect overcurrent device required in section 230-91. Overcurrent protection for the TVSS shall be provided in accordance with the manufacturers' instructions.

285-21(A)(2): Feeder Supplied Building or Structure. A TVSS can be connected anywhere in the building wiring system except the line side of first overcurrent device at the building or structure. Overcurrent protection for the TVSS shall be provided in accordance with the manufacturers' instructions.

285-21(A)(3): Separately Derived System. A TVSS can be connected anywhere in the separately derived system except the line side of first overcurrent device in the separately derived system. Overcurrent protection for the TVSS shall be provided in accordance with the manufacturers' instructions.
SUBSTANTIATION: The original proposed section 285-21(A)(1) states that "The TVSS shall be connected on the load side of a service disconnect overcurrent device...". In my opinion, this can be interpreted to mean either (1) a TVSS must be connected to the load side terminals of the service overcurrent device or (2) a TVSS can be connected anywhere in the premises wiring system as long as it is on the load side of the service disconnect overcurrent device. First of all, the code needs to be written so that the intent is clear. Secondly, it is my opinion that the second, broader interpretaton is more appropriate since UL 1449 not only applies to permanently connected TVSS [which would be used with a service equipment or feeder overcurrent device] but also to cord connected TVSS and receptacle type TVSS which are normally connected to a branch circuit rather than at the service equipment or feeder overcurrent device. A similar argument holds for sections 285-21(A)(2) and 285-21(A)(3).
PANEL ACTION: Reject.
PANEL STATEMENT: The panel prefers the present wording. The submitter has not supplied sufficient substantiation for the proposed changes.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16

Note: The sequence nos. 3-3, 3-4, 3-5, and 3-6 were not used.

ARTICLE 300 — WIRING METHODS

(Log #1102)

TCC- 1 - (300): Reject
Note: The Technical Correlating Committee reaffirms its previous action that Chapter 3 should be reorganized. This action results in a change that, once implemented, will provide advantages for the user of the Code. These advantages include:
1) Opens space for additional articles to minimize renumbering in the future.
2) Articles are grouped by common wiring methods. 300-310 is general 312-314 is boxes and enclosures, 320-340 covers cables, 342-356 covers conduits, 358-362 covers tubing, 366-390 covers other methods and 392-398 covers open wiring. Within those common groups, the articles are basically alphabetized by name of the article. This allows the user to more easily find the wiring method they are using at the time.
3) In addition, a need to split a number of articles to accommodate the parallel numbering implemented by Code-Making Panel 7 and Code-Making Panel 8 resulted in the need for a number of new article numbers. The renumbering accommodates grouping of these articles.
For these reasons, the Technical Correlating Committee moves that the actions on Comments TCC-1, TCC-2, and TCC-3, be reported as "Reject".
SUBMITTER: Francis C. Pologruto, MacDonald Electric Co./Rep. IBEW
COMMENT ON PROPOSAL NO: Note to Chapter 3 Renumbering
RECOMMENDATION: Reject renumbering/relocations of Chapter 3 articles.
SUBSTANTIATION: The present article numbers, have been in the code for many years. This proposed change will add confusion to the 2002 NEC. A new future article could be assigned an unused number. It is not practicable to renumber the existing articles to even numbers, then assign new articles with odd numbers if this change causes confusion.
PANEL ACTION: Reject.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1488)

TCC- 2 - (Chapter 3): Reject
Note: See Technical Correlating Committee Note on TCC-1.
SUBMITTER: Larry F. Miller, National Electrical Manufacturers Association (NEMA)
COMMENT ON PROPOSAL NO: Note to Chapter 3 Renumbering
RECOMMENDATION: NEMA suggests that the proposed renumbering of Chapter 3 be revised as shown on the following page:
SUBSTANTIATION: NEMA proposes that the Cable Articles be arranged by the outer coverings and uses; as opposed to the alphabetic order. Concealed Knob and Tubing and Open Wiring on Insulators were moved to the end of the different cables articles. This seems more appropriate than listing them after all the raceways.

NEMA arranged the raceways by uses permitted and physical characteristics. Liquidtight conduits were organized together and located before the flexible raceways since these products have common uses. Surface Raceways are listed before the Wireways to keep these common raceways together and Strut-Type Channel Raceways are located after the Wireways for the same reason.

NEMA supports moving Switches, Receptacles and Switchboards to Chapter 4. In addition, NEMA supports relocating Temporary Wiring to Chapter 5.
PANEL ACTION: Reject.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1625)

TCC- 3 - (300): Reject
Note: See Technical Correlating Committee Note on TCC-1.
SUBMITTER: Gilbert L. Thompson, MEIA Codes and Standards
COMMENT ON PROPOSAL NO: Note to Chapter 3 Renumbering
RECOMMENDATION: We would like to go on record as opposing the complete renumbering of all except 3 articles in Chapter 3.
SUBSTANTIATION: Most electricians and inspectors know the various wiring methods by the present article numbers. Most of the notice e for corrections have been printed or programmed by these

1999 Article Number	Article Title	NEMA Proposed	NEC Usability Proposed
300	Wiring Methods	300	300
310	Conductors for General Wiring	310	310
373	Cabinets, Cutout boxes and Meter Sockets	312	312
370	Outlet, Device, Pull and Junction Boxes, Conduit Bodies & Fittings	314	314
330	Mineral-Insulated, Metal Sheathed Cable	316	332
334	Metal-Clad Cable	318	330
333	Armored Cable	320	320
340	Power and Control Tray Cable	322	336
325	Integrated Gas Spacer Cable	324	326
326	Medium Voltage Cable	326	328
336	Nonmetallic Sheathed Cable	328	334
338	Service-Enterance Cable	330	338
339	Underground Feeder and Branch-Circuit Cable	332	340
328	Flat Conductor Cable	334	324
363	Flat Cable Assemblies	336	322
321	Messenger Supported Wiring	338	396
324	Concealed Knob-and-Tube Wiring	340	394
320	Open Wiring on Insulators	342	398
345	Intermediate Metal Conduit	344	342
346	Rigid Metal Conduit	346	344
348	Electrical Metallic Tubing	348	358
347	Rigid Nonmetallic Conduit	350	352
331	Electrical Nonmetallic Tubing	352	362
343	Nonmetallic Underground Conduit with Conductors	354	354
351A	Liquidtight Flexible Metal Conduit	360	350
351B	Liquidtight Flexible Nonmetallic Conduit	362	356
350	Flexible Metal Conduit	364	348
349	Flexible Metallic Tubing	366	360
352A	Surface Metal Raceways	370	386
352B	Surface Nonmetallic Raceways	372	388
362A	Metal Wireways	374	376
362B	Nonmetallic Wireways	376	378
352C	Strut-Type Channel Raceway	378	384
354	Underfloor Raceways	380	390
356	Cellular Metal Floor Raceways	382	374
358	Cellular Concrete Floor Raceways	384	372
353	Multioutlet Assembly	386	380
342	Nonmetallic Extensions	388	382
318	Cable Trays	390	392
364	Busways	392	368
365	Cablebus	394	370
374	Auxiliary Gutters	396	366
380	Switches	404	404
N/A	Receptacles, Cord Connectors, and Attachment Plugs (Caps)	406	406
384	Switchboards and Panelboards	408	408
305	Temporary Wiring	527	527

present numbers. Most printed or educational materials, slides or projections have been made and used with these old numbers. The usability task force may have thought it would help to have a new numbering system, but we feel it would cause havoc in our existing industry. Field reports, notice of correction letters, educational programs and other materials will have to be reprinted, reprogrammed and generally reorganized at the expense of local educational and inspection authorities. It does not seem fair to make such a drastic change to the most used general wiring methods. Why should odd numbers be reserved for future code cycles?
PANEL ACTION: Reject.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #2070)

TCC- 4 - (Chapter 3): Reject

Note: The Technical Correlating Committee moves that the action on Comment TCC-4 be reported as "Reject". See Technical Correlating Committee Note on Comments TCC-1, TCC-2, and TCC-3. In addition, Articles 380 and 384 are equipment Articles and belong in Chapter 4, Equipment For General Use. The Technical Correlating Committee recommendation to locate existing Article 305 as new Article 527 is still valid as it is more frequently associated with installations such as carnivals, theatres, etc., where wiring is used on a temporary basis. It is more appropriately associated with Chapter 5 which covers special occupancies rather than in Chapter 7 which covers special conditions.

SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc.
COMMENT ON PROPOSAL NO: Note to Chapter 3 Renumbering
RECOMMENDATION: Revise as shown on the following page:
SUBSTANTIATION: The pending Chapter 3 reorganization unquestionably has benefits in terms of allowing the common internal numbering of articles by splitting off articles now subdivided into parallel parts, such as Article 351. However, it does so in a radical way, which disorients the present user base for the Code at the very time when NFPA's stewardship of the code is under concerted attack. It also contains a number of technical problems in the way it was executed, as follows:
- Under no circumstances should Articles 380 and 384 move out of Chapter 3. Very little of Article 380, for example, covers a pure device (snap switches). These articles cover enclosures that complete a wiring system, just as surely as enclosures covered in Articles 373 and 370. These four articles must stay together. They were together in 1935 when the current arrangement took effect, and nothing has changed since to force us to revisit the present plan. Code-Making Panel 9 voted at the ROP meetings to oppose this relocation. The Technical Correlating Committee should listen to the Technical Committee with jurisdiction of these articles.
- The article groupings, based in part on the alphabet for the benefit of the poorly trained, make far less sense than the present Code. This initiative groups Type AC cable with Type FCC cable (the flat cable used to run branch circuits under carpet squares), and separates it from its sister method, Type MC cable. Type FCC now lands next to Type FC cable. The only similarity here is in the letters of the alphabet; Type FC cables runs inside of strut. That's the reason, a very good reason the present Code puts this wiring method nearer strut-type raceways. The proposal ungroups some of the flexible wiring methods, and makes the major technical mistake of placing auxiliary gutters with raceways, which they are not. In 1985, the Technical Correlating Committee rejected a similar relocation for that very reason.

1999 NEC	2002 NEC	Title
300	300	Wiring Methods
305	715	Temporary Wiring (to be Temporary Wiring Installations)
310	310	Conductors for General Wiring
326	315	Medium Voltage Cable: Type MV
318	318	Cable Trays
320	320	Open Wiring on Insulators
321	321	Messenger-Supported Wiring
324	324	Concealed Knob-and-Tube Wiring
325	325	Integrated Gas Space Cable: Type IGS
342	327	Nonmetallic Extensions
328	328	Flat Conductor Cable: Type FCC
330	330	Mineral-Insulated, Metal-Sheathed Cable: Type MI
333	333	Armored Cable: Type AC
334	334	Metal-Clad Cable: Type MC
336	336	Nonmetallic Sheathed Cable: Type NM, NMC, and NMS
338	338	Service-Entrance Cable: Type SE and USE
339	339	Underground Feeder and Branch-Circuit Cable: Type UF
340	340	Power and Control Tray Cable: Type TC
343	343	Nonmetallic Underground Conduit with Conductors: Type NUCC
331	344	Electrical Nonmetallic Tubing: Type ENT
345	345	Intermediate Metal Conduit: Type IMC
346	346	Rigid Metal Conduit: Type RMC
347	347	Rigid Nonmetallic Conduit: Type RNC
348	348	Electrical Metallic Tubing: Type EMT
349	349	Flexible Metallic Tubing: Type FMT
350	350	Flexible Metal Conduit: Type FMC
351A	351	Liquidtight Flexible Metal Conduit: Type LFMC
351B	352	Liquidtight Flexible Nonmetallic Conduit: Type LFNC
353	359	Multioutlet Assemblies
352A	360	Surface Metal Raceway
352B	361	Surface Nonmetallic Raceways
352C	362	Strut-Type Channel Raceway
363	363	Flat Cable Assemblies: Type FC
354	364	Underfloor Raceways
356	366	Cellular Metal Floor Raceways
358	368	Cellular Concrete Floor Raceways
362A	372	Metal Wireways
362B	373	Nonmetallic Wireways
364	374	Busways
365	375	Cablebus
370	380	Outlet, Device, Pull and Junction Boxes, Conduit Bodies, Fittings, and Manholes
373	383	Cabinets, Cutout Boxes, and Meter Socket Enclosures
374	384	Auxiliary Gutters
380	390	Switches
384	394	Switchboards and Panelboards
410L	415	Receptacles, Cord Connectors, and Attachment Plugs (Caps)

- The Technical Correlating Committee action sends Article 305 out of Chapter 3. That's a good idea, but Article 527 is in the wrong chapter. Chapter 5 covers special occupancies, and you can have temporary wiring in any occupancy. Temporary wiring is a special condition, and it should be found in Chapter 7.

- The Technical Correlating Committee action misses the opportunity to move the Type MV cable article, which is less a wiring method than a home for conductors that will run within wiring methods covered in other articles, next to the ampacity tables that apply to it.

This counterproposal is intended as a constructive alternative to the Technical Correlating Committee initiative, one which meets all of its major objectives. It also uses the higher end of Chapter 3 more effectively, but yet conservatively, still retaining the relative arrangement and the units digits of Articles 370-384. It does not, however, pay heed to bureaucratic objectives of only using even Chapter numbers, or remaining in alphabetical order, nor should it. The total number of wiring method articles has remained static over the last twenty years (adding 331, 352C, and 362B; dropping 337, 344, 366), proving no great need for forty or fifty vacant article numbers.

Although this is a comment on material that has no formal proposal number, the NFPA Standards Administration staff has assured the submitter that a comment addressed in this way is in order, that it will be processed by the NEC Committee accordingly, and that it is actionable in this form should a motion be made on it as a part of floor action at the NFPA Annual Meeting.

PANEL ACTION: Reject.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1261)

3- 7 - (300-1(c), FPN): Reject
SUBMITTER: David A. Kerr, Jr., Friendsville, PA
COMMENT ON PROPOSAL NO: 3-6
RECOMMENDATION: Revise the FPN to read:

FPN: Metric designators are approximate inside diameter of schedule 40 pipe. Trade sizes are for identification purposes only and are not actual dimensions. Actual dimensions vary with different products.

SUBSTANTIATION: The table, as printed, will only confuse and anger users, the FPN should provide useful information, not more gibberish. Neither Americans nor foreigners will be able to make sense of the table without a didactic FPN.
PANEL ACTION: Reject.
PANEL STATEMENT: The FPN is not confusing. The metric designators are dimensionless. There is no substantiation provided as to why the Table will "confuse and anger" users.

The metric designators are not specific to just Schedule 40 conduit, as would seem to be the case in this comment. These designators are the same in most raceway articles in the 1999 NEC and have simply been relocated to Section 300-1(c) for simplification purposes, rather than having an FPN in each raceway article. Stating that actual dimensions may vary depending upon

the product is redundant since the accepted text already states that fact.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #20)

3- 8 - (300-3): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 3-8
RECOMMENDATION: The Technical Correlating Committee directs that the panel review this Proposal relative to the action on Proposal 3-11. This action will be considered by the Panel as a Public Comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
PANEL STATEMENT: Panel accepts the Technical Correlating Committee directive to review the PA on Proposal 3-8 and refers the Technical Correlating Committee to Comment 3-9.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #21)

3- 9 - (300-3(b)): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 3-11
RECOMMENDATION: The Technical Correlating Committee directs that the panel review this Proposal relative to the action on Proposal 3-8. This action will be considered by the Panel as a Public Comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
The Panel Action in Proposal 3-11 should have contained the text as amended by Proposals 3-8 and 3-11 and should be as follows:

300-3(B) Conductors of the Same Circuit. All conductors of the same circuit and, where used, the grounded conductor, all equipment grounding conductors, and bonding conductors shall be contained within the same raceway, auxiliary gutter, cable tray, trench, cable, or cord, unless otherwise permitted in accordance with (1) through (4).

~~Where permitted in (1) through (4), conductors in wiring methods with a nonmetallic sheath or other nonmagnetic sheath shall comply with the provisions of 300.20(B).~~

(1) Unchanged.

(2) Grounding and Bonding Conductors. Equipment grounding conductors shall be permitted to be installed outside a raceway or cable assembly where in accordance with the provisions of 250.130(C) for certain existing installations, or in accordance with 250.134(B), Exception No. 2, for dc circuits. Equipment bonding conductors shall be permitted to be installed on the outside of raceways in accordance with 250.102(E).

PANEL STATEMENT: The phrase ",and bonding conductors" was added to the first paragraph in (b) in accordance with Proposal 3-8. The second paragraph added in Proposal 3-11 was an error based upon a strike-out that occurred during the transfer of text at the panel meeting as recognized by Comment 3-11. This paragraph is deleted.

The title to (2) was revised to include "and Bonding Conductors" in accordance to Proposal 3-11.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #411)

3- 10 - (300-3(b)): Accept

Note: The Technical Correlating Committee understands that the action on Comment 3-10 is in addition to the action on Comment 3-9.

SUBMITTER: Dan Leaf, Palmdale, CA
COMMENT ON PROPOSAL NO: 3-11
RECOMMENDATION: Accept in Principle revise Panel Action:
"(b) CONDUCTORS OF the SAME CIRCUIT. All conductors of the same circuit, and where used, the grounded conductor and all equipment grounding conductors shall be contained within the same raceway, auxiliary gutter, cable tray, cablebus assembly, trench, cable, or cord, unless permitted in accordance with (1)" (remainder unchanged)
SUBSTANTIATION: It is reasonable to include cablebus assemblies, unless the intent is to exclude them from the requirement.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #2016)

3- 11 - (300-3(b)): Accept
SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc.
COMMENT ON PROPOSAL NO: 3-11
RECOMMENDATION: Delete the second paragraph of (b).
SUBSTANTIATION: This paragraph makes an unnecessary change in this section that is inconsistent with the panel statement. The panel member generating the word processing text at the meeting confirms to this submitter that this paragraph was supposed to have been lined out, and the line-out didn't get picked up in the ROP. The proposal submitters accused the panel of making unsubstantiated changes during the comment period for the 1999 NEC based on this submitter's comments at that time. However, the panel was correct. The 1999 action made no technical changes in the requirements. The proposal submitters seem to have overlooked 1996 NEC Section 300-3(b) Exception No. 3, which specifically recognized installations made that conformed to Section 300.20(b). The wording in 300.3 (b)(3) clearly incorporates the required reference to 300.20(b). Finally, the notion in the proposal substantiation of equipment grounding conductors running in a different cable assembly doesn't bear close examination. Nothing in Article 300 supersedes the requirements in 250.134.
PANEL ACTION: Accept.
Refer to action on Comment 3-9.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #2333)

3- 12 - (300-3(b)): Reject
SUBMITTER: Wayne A. Lilly, Bridgewater, VA
COMMENT ON PROPOSAL NO: 3-11
RECOMMENDATION: This proposal should be accepted.
SUBSTANTIATION: The Panel Statement did not address the issue raised in the proposal substantiation regarding (b)(3). This section was revised at the comment stage during the 1999 Code cycle. The revision included a new concept that should not have been accepted because it did not have the benefit of public review. The new concept is given in item three. It is now possible to obtain conductors from separate nonmetallic or nonmagnetic sheathed cables or raceways to form a circuit. Please review the comments given in the proposal substantiation again. The proposed language for 300-3(b) is simplified, direct, and easily understandable. It also does not introduce any new material.

Thank you for your consideration.
PANEL ACTION: Reject.
PANEL STATEMENT: While there may be some validity to the submitter's substantiation, there is no technical reason why wiring methods employing a nonferrous outer jacket or sheath should not be permitted to be installed as separate cables where the cables are run in close proximity to each other.

Since the nonferrous outer jacket or sheath is nonmagnetic, these cables would permit cancellation of magnetic lines of flux from one cable to another. Care must be used where installing these cables to insure the cables are not separated by any ferrous metal

products and obviously where entering a ferrous metal enclosure, they must comply with Section 300-20. Aluminum MC cable and nonmetallic sheathed cable are two cables types that could utilize this method of installation.

This action correlates with the action by CMP-7 on Proposals 7-126 and 7-126a allowing single conductor such as nonferrous MC cable with the same requirements as existed for MI cables where single conductor MC cable is used.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #22)

3- 13 - (300-3(b)(3)): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 3-13
RECOMMENDATION: It was the action of the Technical Correlating Committee that this Proposal be reconsidered and correlated with the actions on Proposals 7-126 and 7-126a. It was also the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 7 for information. This action will be considered by the Panel as a Public Comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
Revise 300-3 (b) (3) to read:

(3) Nonferrous Wiring Methods. Conductors in wiring methods with a nonmetallic or other nonmagnetic sheath , where run in different raceways, auxiliary gutters, cable trays, trenches, cables, or cords, shall comply with the provisions of Section 300.20(B). Conductors in single-conductor Type MI cable with a nonmagnetic sheath shall comply with the provisions of Section 330.16. Conductors of single-conductor Type MC cable with a nonmagnetic sheath shall comply with the provisions of Sections 334-14, 334-22, and 300-20(b).

PANEL STATEMENT: The Panel accepts the Technical Correlating Committee directive to review the panel action on Proposals 7-126 and 7-126a and refers action on Comment 3-12 and this comment to clarify correlation with the action taken by CMP-7.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #329)

3- 14 - (300-3(c)(1)): Reject
SUBMITTER: Daniel P. Kurelowech, San Diego, CA
COMMENT ON PROPOSAL NO: 3-14
RECOMMENDATION: Revise text to read as follows:

Conductors of circuits rated 600 volts, nominal, or less, as circuits and DC circuits shall not be permitted to occupy the same equipment wiring enclosure, cable, or raceway. ~~All conductors shall~~ (All the rest of text deleted).

Exception: All conductors relate to the function of the piece of equipment. All conductors shall have an insulation rating equal to the maximum circuit volt.

SUBSTANTIATION: The problem comes from "end user" trying to work with what was installed by others. Junction boxes not labeled, or painted over. Neutrals not identified. Neutrals crossed between systems. Multiple systems in a receptacle junction box with only receptacle circuit identified. Contractors do not provide accurate "as-builts".
PANEL ACTION: Reject.
PANEL STATEMENT: There is no technical substantiation in the comment to warrant the recommendation that only conductors related to the function of a particular piece of electrical equipment be permitted to occupy the same enclosure, cable, or raceway. The comment substantiation appears to relate to improper wiring with apparent Code violations. The suggested changes would not alleviate that condition in an existing installation.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1737)

3- 15 - (300-4(a), Exception (New)): Reject
SUBMITTER: Francis W. Peri, Communications Design Corporation
COMMENT ON PROPOSAL NO: 3-19
RECOMMENDATION: Add:

Exception: A plate of 1/32 in. (0.8 mm) thickness with a minimum hardness of 45 on the N scale in the Standard Hardness Conversion Tables for Metals (ASTM E140-97) shall be permitted. The plate shall be marked "1/32-45N".

SUBSTANTIATION: Association of Cabling Professionals (ACP) would like to eliminate the common complaint of the drywall bulging in places where the telecommunications cable had been run in wall studs and covered by protective nail plate.

The 1/32 in. nail plate proposed is made from a harder material than the 1/16 in. plate identified in the code today. It provides equivalent protection, and will not show the bulge in the drywall. We support a marking of nail plates to allow an inspector to readily identify that an appropriate nail plate is being used. ACP also recommends removal of the reference to bushings, as the proposal only has to do with nail plates.
PANEL ACTION: Reject.
PANEL STATEMENT: Inadequate technical substantiation was provided in the comment on the equivalency of the protection. The Panel reaffirms its position that twisted and imperfect studs, electrical boxes with raised nail brackets designed to be installed on the edge of a stud, plumbing pipes, and many other construction related items can cause bulges in drywall but a properly installed steel nail plate that is 1/16th inch in thickness would not create an unnecessary bulge in the drywall.

If the intent of the comment is to deal with nail plates for communications cables, Section 300- 4 would not apply to Chapter 8 installations, unless specifically referenced in Chapter 8. There are no requirements for nail plates for communications cables in Article 800, for example, so any nail plate can be used by the communications industry. See Section 90-3.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1859)

3- 16 - (300-4(a)(1)): Reject
SUBMITTER: Robert W. Jensen, dbi-Telecommunications Infrastructure Design
COMMENT ON PROPOSAL NO: 3-21
RECOMMENDATION: Add:

Exception: A plate of 1/32 in (0.8 mm) thickness with a minimum hardness of 45 on the N scale in the Standard Hardness Conversion Tables for Metals (ASTM E140-97) shall be permitted. The plate shall be marked "1/32-45N".

SUBSTANTIATION: BICSI is an association made up of approximately 17,000 members including telecommunications installers and designers. One of the primary issues raised by their customers has been the complaint of drywall bulging in places that the telecommunications cable had been run in wall studs and protection of a nail plate was installed.

The proposed 1/32-inch nail plate is made from a harder material than the 1/16-inch plate identified in the code today, it provides equivalent protection, and will not show the bulge in the drywall. We ask to remove the reference to bushings, as the proposal only has to do with nail plates. In addition, we support a marking of nail plates to allow an inspector to readily identify that an appropriate nail plate is being used.
PANEL ACTION: Reject.
PANEL STATEMENT: Refer to panel statement on Comment 3-15.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1860)

3- 17 - (300-4(a)(2)): Reject
SUBMITTER: Robert W. Jensen, dbi-Telecommunications Infrastructure Design
COMMENT ON PROPOSAL NO: 3-23
RECOMMENDATION: Add:

Exception: A plate of 1/32 in (0.8 mm) thickness with a minimum hardness of 45 on the N scale in the Standard Hardness Conversion Tables for Metals (ASTM E140-97) shall be permitted. The plate shall be marked "1/32-45N".

SUBSTANTIATION: BICSI is an association made up of approximately 17,000 members including telecommunications installers and designers. One of the primary issues raised by their customers has been the complaint of drywall bulging in places that the telecommunications cable had been run in wall studs and protection of a nail plate was installed.

The proposed 1/32-inch nail plate is made from a harder material than the 1/16-inch plate identified in the code today, it provides equivalent protection, and will not show the bulge in the drywall. We ask to remove the reference to bushings, as the proposal only has to do with nail plates. In addition, we support a marking of nail plates to allow an inspector to readily identify that an appropriate nail plate is being used.

PANEL ACTION: Reject.
PANEL STATEMENT: Refer to panel statement on Comment 3-15.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1738)

3- 18 - (300-4(a)(2), Exception (New)): Reject
SUBMITTER: Francis W. Peri, Communications Design Corporation
COMMENT ON PROPOSAL NO: 3-23
RECOMMENDATION: Add:

Exception: A plate of 1/32 in. (0.8 mm) thickness with a minimum hardness of 45 on the N scale in the Standard Hardness Conversion Tables for Metals (ASTM E140-97) shall be permitted. The plate shall be marked "1/32-45N".

SUBSTANTIATION: Association of Cabling Professionals (ACP) would like to eliminate the common complaint of the drywall bulging in places where the telecommunications cable had been run in wall studs and covered by protective nail plate.

The 1/32 in. nail plate proposed is made from a harder material than the 1/16 in. plate identified in the code today. It provides equivalent protection, and will not show the bulge in the drywall. We support a marking of nail plates to allow an inspector to readily identify that an appropriate nail plate is being used. ACP also recommends removal of the reference to bushings, as the proposal only has to do with nail plates.

PANEL ACTION: Reject.
PANEL STATEMENT: Refer to panel statement on Comment 3-15.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1861)

3- 19 - (300-4(b)(2)): Reject
SUBMITTER: Robert W. Jensen, dbi-Telecommunications Infrastructure Design
COMMENT ON PROPOSAL NO: 3-26
RECOMMENDATION: Add:

Exception: A plate of 1/32 in (0.8 mm) thickness with a minimum hardness of 45 on the N scale in the Standard Hardness Conversion Tables for Metals (ASTM E140-97) shall be permitted. The plate shall be marked "1/32-45N".

SUBSTANTIATION: BICSI is an association made up of approximately 17,000 members including telecommunications installers and designers. One of the primary issues raised by their customers has been the complaint of drywall bulging in places that the telecommunications cable had been run in wall studs and protection of a nail plate was installed.

The proposed 1/32-inch nail plate is made from a harder material than the 1/16-inch plate identified in the code today, it provides equivalent protection, and will not show the bulge in the drywall. We ask to remove the reference to bushings, as the proposal only has to do with nail plates. In addition, we support a marking of nail plates to allow an inspector to readily identify that an appropriate nail plate is being used.

PANEL ACTION: Reject.
PANEL STATEMENT: Refer to panel statement on Comment 3-15.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1739)

3- 20 - (300-4(b)(2), Exception (New)): Reject
SUBMITTER: Francis W. Peri, Communications Design Corporation
COMMENT ON PROPOSAL NO: 3-26
RECOMMENDATION: Add:

Exception: A plate of 1/32 in. (0.8 mm) thickness with a minimum hardness of 45 on the N scale in the Standard Hardness Conversion Tables for Metals (ASTM E140-97) shall be permitted. The plate shall be marked "1/32-45N".

SUBSTANTIATION: Association of Cabling Professionals (ACP) would like to eliminate the common complaint of the drywall bulging in places where the telecommunications cable had been run in wall studs and covered by protective nail plate.

The 1/32 in. nail plate proposed is made from a harder material than the 1/16 in. plate identified in the code today. It provides equivalent protection, and will not show the bulge in the drywall. We support a marking of nail plates to allow an inspector to readily identify that an appropriate nail plate is being used. ACP also recommends removal of the reference to bushings, as the proposal only has to do with nail plates.

PANEL ACTION: Reject.
PANEL STATEMENT: Refer to panel statement on comment 3-15.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #2090)

3- 21 - (300-4(d)): Reject
SUBMITTER: David Costa, DC Electric
COMMENT ON PROPOSAL NO: 3-29
RECOMMENDATION: Accept the proposal.
SUBSTANTIATION: The panel rejected this proposal with the statement that the submitter had not provided technical substantiation for his proposal. Mr. Casparro in his explanation of negative on this proposal has identified the technical substantiation; The Fact-Finding Report provided with Proposal 3-31. The Fact-Finding Report provides information to indicate that rigid nonmetallic conduit is susceptible to damage from nails and screws. Mr. Casparro cites from the report that the conduit was penetrated 60 and 72 percent of the times that it was tested. These percentages are mush too high and it is evident that additional protection from nails and screws is needed.

PANEL ACTION: Reject.
PANEL STATEMENT: The fact finding report referenced is to show equivalent physical characteristics between armored cable and the wiring methods currently allowed per Section 300-4(d). Rigid Nonmetallic Conduit (RNMC) has been acceptable for this application since the publication of the 1984 NEC without a reported incident. This comment requires RNMC to be protected while exempting rigid steel, IMC, and EMT without data to support this segregation.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #2093)

3- 22 - (300-4(d)): Reject
SUBMITTER: George A. Straniero, AFC Cable Systems
COMMENT ON PROPOSAL NO: 3-31
RECOMMENDATION: Accept the proposal.
SUBSTANTIATION: The Fact-Finding Report submitted with the proposal shows that steel armored cables resist penetration by nails and screws equal to or better than wiring methods currently excepted from the requirements of 300-4(d). The panel acted to reject Proposal 3-29 that would have added the steel plate requirement for rigid nonmetallic conduit. The Fact-Finding Report submitted with the proposal shows that rigid nonmetallic conduit is susceptible to damage from nails and screws. It is apparent then that the panel believes that some degree of damage is acceptable. Accordingly, since steel armored cables resist penetration by nails and screws equal to or better than rigid nonmetallic conduit, Exception No. 1 to 300-4(d) should apply to steel armored cables.

The panel statement that it may be difficult for the Authority Having Jurisdiction to determine whether the cable sheath is steel or aluminum should not be cause for rejection of the proposal. The Authority Having Jurisdiction will determine if the sheath is steel or aluminum the same way that they will determine if the steel

plate required by 300-4(d) is actually steel or aluminum. A simple means would be a commonly available pocket sized pen magnet.
PANEL ACTION: Reject.
PANEL STATEMENT: No additional technical substantiation has been submitted to support the proposed action.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1740)

3- 23 - (300-4(d), Exception (New)): Reject
SUBMITTER: Francis W. Peri, Communications Design Corporation
COMMENT ON PROPOSAL NO: 3-28
RECOMMENDATION: Add:
Exception: A plate of 1/32 in. (0.8 mm) thickness with a minimum hardness of 45 on the N scale in the Standard Hardness Conversion Tables for Metals (ASTM E140-97) shall be permitted. The plate shall be marked "1/32-45N".
SUBSTANTIATION: Association of Cabling Professionals (ACP) would like to eliminate the common complaint of the drywall bulging in places where the telecommunications cable had been run in wall studs and covered by protective nail plate.
The 1/32 in. nail plate proposed is made from a harder material than the 1/16 in. plate identified in the code today. It provides equivalent protection, and will not show the bulge in the drywall. We support a marking of nail plates to allow an inspector to readily identify that an appropriate nail plate is being used. ACP also recommends removal of the reference to bushings, as the proposal only has to do with nail plates.
PANEL ACTION: Reject.
PANEL STATEMENT: Refer to panel statement on Comment 3-15.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #2134)

3- 24 - (300-4(d), Exception (New)): Reject
SUBMITTER: Robert W. Jensen, dbi-Telecommunications Infrastructure Design
COMMENT ON PROPOSAL NO: 3-28
RECOMMENDATION: Add text to read as follows:
Exception: A plate of 1/32 in. (0.8 mm) thickness with a minimum hardness of 45 on the N scale in the Standard Hardness Conversion Tables for Metals (ASTM E140-97) shall be permitted. The plate shall be marked "1/32-45N".
SUBSTANTIATION: BICSI is an association made up of approximately 17,000 members including telecommunications installers and designers. One of the primary issues raised by their customers has been the complaint of drywall bulging in places that the telecommunications cable had been run in wall studs and protection of a nail plate was installed.
The proposed 1/32-inch nail plate is made from a harder material than the 1/16 inch plate identified in the code today, it provides equivalent protection, and will not show the bulge in the drywall. We ask to remove the reference to bushings, as the proposal only has to do with nail plates. In addition, we support of marking a nail plates to allow an inspector to readily identify that an appropriate nail plate is being used.
PANEL ACTION: Reject.
PANEL STATEMENT: Refer to panel statement on Comment 3-15.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1552)

3- 25 - (300-4(d) Exception No. 4 (New)): Reject
SUBMITTER: Ravindra H. Ganatra, Alcan Cable
COMMENT ON PROPOSAL NO: 3-31
RECOMMENDATION: Should panel decide to add an Exception No. 4, it should read as follows:
"Interlocked ~~steel~~ armored MC and AC cables ~~not exceeding four conductors no larger than 10 AWG~~."
SUBSTANTIATION: We agree with the Panel Action to reject this proposal. Interlocked steel armored MC and AC cables, regardless of the armoring material, are required to meet the same applicable prescriptive and performance requirements specified in their product standards. Type MC and AC are manufactured and listed in accordance with UL 1569 and UL 4, respectively. The performance, if compared, for puncture resistance should be between an MC (or AC) cable with a given armoring material (of thickness "x") against same product with the same armoring material (of thickness "y") and a protective steel plate that is at least 1/16 in. thick. Thus, if the first product performs equal to or better than the second product with protective steel plate that is at least 1/16 in. thick, then such exception could be evaluated for possible inclusion. Since the aforementioned product standards mandate performance and they do not mandate a thickness for the armor, the products suitable for such exception should be listed and distinctly identified. Further, there is no need for size restriction when performance is compared in this manner.
We believe that a fact finding report supporting such performance comparison is submitted to the Panel, then the Panel may consider an exception that is worded as follows:
"Interlocked armored MC and AC cables listed and marked suitable for "puncture resistant"."
PANEL ACTION: Reject.
PANEL STATEMENT: No additional technical substantiation has been submitted to support the proposed action.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #2133)

3- 26 - (300-4(e)): Reject
SUBMITTER: Robert W. Jensen, dbi-Telecommunications Infrastructure Design
COMMENT ON PROPOSAL NO: 3-33
RECOMMENDATION: Accept the original proposal in principle.
Add:
Exception: A plate of 1/32 in (0.8 mm) thickness with a minimum hardness of 45 on the N scale in the Standard Hardness Conversion Tables for Metals (ASTM E140-97) shall be permitted. The plate shall be marked "1/32-45N".
SUBSTANTIATION: BICSI is an association made up of approximately 17,000 members including telecommunications installers and designers. One of the primary issues raised by their customers has been the complaint of drywall bulging in places that the telecommunications cable had been run in wall studs and protection of a nail plate was installed.
The proposed 1/32-inch nail plate is made from a harder material than the 1/16-inch plate identified in the code today, it provides equivalent protection, and will not show the bulge in the drywall. We ask to remove the reference to bushings, as the proposal only has to do with nail plates. In addition, we support a marking of nail plates to allow an inspector to readily identify that an appropriate nail plate is being used.
PANEL ACTION: Reject.
PANEL STATEMENT: Refer to panel statement on Comment 3-15.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1741)

3- 27 - (300-4(e), Exception (New)): Reject
SUBMITTER: Francis W. Peri, Communications Design Corporation
COMMENT ON PROPOSAL NO: 3-33
RECOMMENDATION: Add:
Exception: A plate of 1/32 in. (0.8 mm) thickness with a minimum hardness of 45 on the N scale in the Standard Hardness Conversion Tables for Metals (ASTM E140-97) shall be permitted. The plate shall be marked "1/32-45N".
SUBSTANTIATION: Association of Cabling Professionals (ACP) would like to eliminate the common complaint of the drywall bulging in places where the telecommunications cable had been run in wall studs and covered by protective nail plate.
The 1/32 in. nail plate proposed is made from a harder material than the 1/16 in. plate identified in the code today. It provides equivalent protection, and will not show the bulge in the drywall. We support a marking of nail plates to allow an inspector to readily identify that an appropriate nail plate is being used. ACP also recommends removal of the reference to bushings, as the proposal only has to do with nail plates.
PANEL ACTION: Reject.

PANEL STATEMENT: Refer to panel statement on Comment 3-15.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #CC302)

3- 35a - (Table 300-5): Accept
SUBMITTER: CMP 3
COMMENT ON PROPOSAL NO: 3-39
RECOMMENDATION: Move the definition for "cover" from the title of Table 300-5 to a new Note No.1 to the Table and renumber existing notes accordingly.
SUBSTANTIATION: This comment was developed by CMP-3 to move the definition out of the title of the table to comply with the Section 2.3.1 of the NEC Style Manual.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #787)

3- 28 - (300-5(a)(1) (New)): Reject
Note: The Technical Correlating Committee notes that the various raceway articles under the jurisdiction of Code-Making Panel 8 require that raceways be listed.
SUBMITTER: David H. Kendall, Carlon
COMMENT ON PROPOSAL NO: 3-41
RECOMMENDATION: Add text to read as follows:
(1) When raceways are used with Direct Burial Cables or Conductors the raceway shall be listed.
SUBSTANTIATION: This comment supports the Panel statement. The Panel stated that sleeves should be listed conduit. This proposed text clarifies to the user that any raceways used with cables or conductors listed for direct burial are required to be listed. Currently, contractors and designers are using non-listed raceways and installing direct burial cable and conductors into it.
The original proposal allowed the raceway to be a non-listed raceway when used with cables or conductors approved for direct burial applications.
PANEL ACTION: Reject.
PANEL STATEMENT: The substantiation does not support adding a requirement for listing of raceways for underground application.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 9
NEGATIVE: 2
EXPLANATION OF NEGATIVE:
FORSBERG: This comment should have been accepted. In part, the panel statement on Proposal 3-41 reads: "A sleeve used in this application should consist of a listed conduit. Non- listed products could contain internal defects that could damage the conductors and have not been tested for the suitability of the application. Also, the panel is concerned about the potential of adding future circuits to this installation." As a result of this statement Comment 3-28 proposed text that would satisfy the panel's concern, i.e, the requirement that a raceway used with direct burial cable or conductors be listed. The panel statement for the rejection of comment 3-28 now indicates the comment substantiation "does not support a requirement for listing of raceways for underground application.
Thus, the panel has created confusion over the treatment of raceways used for direct burial cables:
1. Proposal 3-41, which specifically permitted the use of non listed raceways was rejected because the panel wanted "sleeves to be listed."
2. Comment 3-28, which requires such raceways to be listed, was rejected because the substantiation did not support the listing requirement.
Comment 3-28 should be accepted. This comment did address the concerns expressed in the panel statement on Proposal 3-41.
GRUBER: The panel should have accepted this proposal.
Substantiation: There is nothing to prevent a cable not listed for direct burial being pulled in at a later date. Or having the listed cable for direct burial removed and replaced with a cable that is not listed for direct burial. If a listed raceway is used, one would not have to worry about whether the cable is listed for direct burial or not.
A non-listed raceway is not inspected for defects on the inside of the raceway such as a high weld pad. The potential for damage to the insulation exists because the raceway is not required to be a listed product.

(Log #729)

3- 29 - (300-5(b)(1)): Accept in Principle in Part
SUBMITTER: Richard E. Loyd, Perryville, AR
COMMENT ON PROPOSAL NO: 3-25a
RECOMMENDATION: Reconsider and accept this proposal.
SUBSTANTIATION: Mr. Nickson's substantiation is accurate. The reference to UL 635, which could be revised if needed to address NM cable grommets. Should this proposal be accepted, I would hope that the new listing would require a grommet with a nonremoval feature, so that when it was installed it could not be removed without destroying it. This would resolve the problem.
Accepting this comment will correct a well-documented field problem. The 1999 NEC was revised because of reoccuring problems and Canada has considered outlawing NM cable in metal studs because of the problem. The existing grommets fall out easily. This usually occurs when other crafts are installing their systems or when the sheet rockers align the studs just prior to screwing the gypsum rock to them. This leaves the NM cable exposed to the sharp edges of the metal studs. Once the gypsum is installed the electrician cannot get to the grommet to reinsert it. The requirement for a listed grommet would ensure that removal would be very difficult and help to resolve this acute safety problem.
PANEL ACTION: Accept in Principle in Part.
Revise 300.4 (b) (1) to read:
(1) Nonmetallic-Sheathed Cable. In both exposed and concealed locations where nonmetallic-sheathed cables pass through either factory or field punched, cut, or drilled slots or holes in metal members, the cable shall be protected by listed bushings or listed grommets covering all metal edges that are securely fastened in the opening prior to installation of the cable.
PANEL STATEMENT: The requirement for listed grommets and bushings is added to correlate with the addition of a requirement in Section 336-17, second paragraph for NM cable installed in metal studs to have listed fittings for protection of the cable. The removal of the word "grommet" is rejected since the dictionary also defines it as a bridle ring or a rope ring. In this case, it functions similar to a rope ring to keep the type NM cable from abrading on sharp edges.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #410)

3- 30 - (300-5(d)): Accept in Principle
SUBMITTER: Dan Leaf, Palmdale, CA
COMMENT ON PROPOSAL NO: 3-47
RECOMMENDATION: Accept in Principle, revise last sentence:
Insulated conductors used in enclosures or raceways in underground installations shall be listed for use in wet locations.
SUBSTANTIATION: The literal wording imposes the rule on bare conductors also.
PANEL ACTION: Accept in Principle.
Refer to action on Comment 3-31
PANEL STATEMENT: The revised text accomplishes the intent of the submitter.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
ANDREWS: This comment should be rejected thus reversing the panel action. Proposal 3-47, which was accepted, added the words "Conductors or cables used in enclosures or raceways in underground installations shall be listed for wet locations". The proposer's stated intention was "to protect the conductors and cables from corrosion...". The commentor has added new material by inserting the word "insulated" in front of the word "conductors". His argument was that the proposal imposed the rule on bare conductors also. He did not give any substantiation as to why the rule should not apply to bare conductors. Perhaps it was because bare conductors are not "listed". The panel "accepted this comment in principle" and incorporated it in the panel action

on Comment 3-31. The adopted wording implies that no consideration needs be given to bare conductors. However, when in a wet environment, bare conductors should be suitable for any possible corrosive action in that environment. NEC Section 230-30 gives some criteria for bare service-lateral conductors in underground installations. If the panel decides to agree with this negative vote, some action would have to be taken to modify the revised words of Section 300-5(d)(5) in the panel action on Comment 3-31. We suggest the following words: "Cables and ~~insulated~~ conductors installed in enclosures or raceways in underground installations shall be ~~listed~~ suitable for wet locations."

(Log #2017)

3- 31 - (300-5(d)): Accept in Principle

Note: The Technical Correlating Committee understands that the panel did not intend to change the clearances from those accepted in Proposal 3-5. Therefore, "8 ft (2.44 m)" should be shown as "2.5 m (8 ft)", "18 in. (457 mm)" should be shown as "450 mm (18 in.)", and "12 in. (305 mm)" should be shown as "300 mm (12 in.)".

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

COMMENT ON PROPOSAL NO: 3-48

RECOMMENDATION: Revise as follows:

(D) Protection from Damage. Direct-buried conductors and cables ~~emerging from the ground~~shall be protected from damage from exposure to soil and moisture, and from impact upon emergence from grade, in accordance with (1) through (5).

(1) Emergence from Grade. Direct-Buried conductors and cables emerging from the ground shall be enclosed in ~~by~~ enclosures or raceways extending from the minimum cover distance required by Section 300-5(a) below grade to a point at least 8 ft (2.44 m) above finished grade. In no case shall the protection be required to exceed 18 in. (457 mm) below finished grade. Conductors entering a building shall be protected to the point of entrance. Where the enclosure or raceway is subject to physical damage, the conductors shall be installed in rigid metal conduit, intermediate metal conduit, Schedule 80 rigid nonmetallic conduit, or equivalent.

(2) Service Conductors. Undergroundservice ~~lateral conductors~~ that are not encased in concrete and that are buried 18 in. (457 mm) or more below grade shall have their location identified by a warning ribbon that is placed in the trench at least 12 in. (305 mm) above the underground installation.

~~Conductors entering a building shall be protected to the point of entrance. Where the enclosure or raceway is subject to physical damage, the conductors shall be installed in rigid metal conduit, intermediate metal conduit, Schedule 80 rigid nonmetallic conduit, or equivalent.~~

(3) Listing. Conductors or cables used in enclosures or raceways in underground installations shall be listed for wet locations.

SUBSTANTIATION: This comment makes a more logical division of the material covered, which has different functions. One rule, the original on dating back many cycles, covers the protection of conductors as they emerge from grade. Subsequently the warning ribbon and the listing requirement were/are being added, and need a separate heading.

This comment also reiterates the proposed language in Proposal 3-48. Code Making Panel 3 rejected it, suggesting that Article 100 solved the problem. Article 100 does not solve the problem. There are many example of underground service entrance conductors that are not service lateral. For examples, if a service lateral (or, for that matter, aboveground service entrance conductors connected to a service drop) extends to an outdoor meter socket, and then the conductors running from the load side of the meter socket to the service disconnect are routed underground to another location, those conductors are underground service entrance conductors. They do not constitute a service lateral, but they do present the same hazard. This comment economizes on wording by simply using the phrase "underground service conductors."

PANEL ACTION: Accept in Principle.

Revise 300-5 (d) to read:

(d) Protection from Damage. Direct-buried conductors and cables shall be protected from damage in accordance with (1) through (5)

(1) Emerging from Grade. Direct-buried conductors and enclosures emerging from grade shall be protected by enclosures or raceways extending from the minimum cover distance required by Section 300-5(a) below grade to a point at least 8 ft (2.44 m) above finished grade. In no case shall the protection be required to exceed 18 in. (457 mm) below finished grade.

(2) Conductors Entering Buildings. Conductors entering a building shall be protected to the point of entrance.

(3) Service Conductors. Underground service conductors that are not encased in concrete and that are buried 18 in. (457 mm) or more below grade shall have their location identified by a warning ribbon that is placed in the trench at least 12 in. (305 mm) above the underground installation.

(4) Enclosure or Raceway Damage. Where the enclosure or raceway is subject to physical damage, the conductors shall be installed in rigid metal conduit, intermediate metal conduit, Schedule 80 rigid nonmetallic conduit, or equivalent.

(5) Listing. Cables and insulated conductors used installed in enclosures or raceways in underground installations shall be listed for use in wet locations.

PANEL STATEMENT: The first paragraph is revised to delete the phrase "from damage from exposure to soil and moisture" since this is new material introduced at the comment stage without public review.

Two additional subsections are inserted to provide clarity and a further delineation of information.

The (5) text is changed to comply with the revision initiated by Comment 3-30.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

COMMENT ON AFFIRMATIVE:

ANDREWS: Although we agree with the panel action to "Accept this comment in principle", we do not agree with the revised wording accepted for Section 300-5(d)(5), which came from Comment 3-30. See our Explanation of Negative on Comment 3-30.

(Log #2018)

3- 32 - (300-5(i)): Accept in Principle

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

COMMENT ON PROPOSAL NO: 3-49

RECOMMENDATION: Add the words "or cables" after "in parallel in raceways" and change (in Exception No. 2) "nonmetallic raceways or nonmetallic sheathed cables" to "nonmetallic raceways, or cables with nonmetallic or nonmagnetic sheaths, arranged."

SUBSTANTIATION: The first change makes the two halves of the sentence agree with each other. The second change avoids possible confusion with Romex. It uses the more technically correct language in Section 300-3(B)(3), which also recognizes such methods as copper MI cable. It also makes the close proximity rule clearly apply to both raceway and cable installations, by means of revised sentence punctuation.

PANEL ACTION: Accept in Principle.

The base section should remain as changed by Proposal 3-49. The words "or cables" should be added in the first exception. The second exception should have the text as indicated in the recommendation without the final word "arranged" to read as follows:

(i) Conductors of the Same Circuit. All conductors of the same circuit and, where used, the grounded conductor and all equipment grounding conductors shall be installed in the same raceway or cable or shall be installed in close proximity in the same trench.

Exception No. 1: Conductors in parallel in raceways or cables shall be permitted, but each raceway or cable shall contain all conductors of the same circuit including grounding conductors.

Exception No. 2: Isolated phase, polarity, grounded conductor and equipment grounding and bonding conductor installations shall be permitted in nonmetallic raceways or cables with a nonmetallic covering or nonmagnetic sheath in close proximity where conductors are paralleled as permitted in Section 310-4, and where the conditions of Section 300-20(b) are met

PANEL STATEMENT: The comment was not clear as to the location of the first change so the panel action clarified the changes in the entire subsection, including the exceptions. This change also clarifies the issue of permitting single conductor MC cables as now covered in Sections 334-14 and 334-22.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

COMMENT ON AFFIRMATIVE:

KREINER: In the Panel Action in Exception No. 2, add a comma after the word "conductor" and delete the "and" between "conductor" and "equipment". Add a comma after "grounding" in that same line. In the second to last line of the exception, add the

word "a" before the word "nonmagnetic." These are editorial corrections.

(Log #594)

3- 33 - (300-5(i) Exception No. 2): Accept in Principle
SUBMITTER: James M. Daly, BICC General
COMMENT ON PROPOSAL NO: 3-49
RECOMMENDATION: This proposal should be accepted in principle in part.
In Exception No. 2, change "or nonmetallic sheathed cables" to "or cables with an overall nonmetallic covering."
SUBSTANTIATION: The wording proposed in the panel action could be misinterpreted to require Type NM Nonmetallic-Sheathed Cable (Article 336), which is not permitted to be used in wet locations. The revised wording indicates that whichever cable type is used, it must have an overall nonmetallic covering.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: The word "overall" was removed because it could be misinterpreted. See panel action and statement on Comment 3-32.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #973)

3- 34 - (300-5(i) Exception No. 2): Accept in Principle
SUBMITTER: Larry F. Miller, National Electrical Manufacturers Association (NEMA)
COMMENT ON PROPOSAL NO: 3-49
RECOMMENDATION: The Panel should continue to Accept this proposal in Part but delete the words "nonmetallic sheathed" in Exception No. 2.
SUBSTANTIATION: The intent of the Panel appears to be to allow cables with nonmetallic jackets in this exception. However, the words "nonmetallic sheathed cable" could be misconstrued to mean NM cable, which is not allowed for use in wet locations, and should not be used in this application.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: The panel's action on Comment 3-32 addresses the submitter's concern.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #788)

3- 35 - (300-5(k)): Accept in Principle
SUBMITTER: David H. Kendall, Carlon
COMMENT ON PROPOSAL NO: 3-50
RECOMMENDATION: Add text to read as follows:
(k) Directional Boring. Cables or raceways shall be approved for the use with directional boring equipment.
SUBSTANTIATION: The original proposal indicated that the cables, conduits or raceways were required to be "listed". This comment indicates that the cable or raceway be "approved". This will make it clear to the designers, contractors and the authority having jurisdiction that consideration needs to be taken when using cables and raceways with directional boring equipment.
PANEL ACTION: Accept in Principle.
Revise text to read:
(m) Directional Boring. Cables or raceways installed using directional boring equipment shall be approved for the purpose.
PANEL STATEMENT: The text has been revised for clarity.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #728)

3- 36 - (300-6): Reject
SUBMITTER: Richard E. Loyd, Perryville, AR
COMMENT ON PROPOSAL NO: 3-52, 3-53
RECOMMENDATION: Reconsider Proposals 3-52 and 3-53, and accept Loyd's comment on 3-52.
SUBSTANTIATION: The proper selection of wiring methods for the application is one of the most violated requirements in the code. Please reconsider this change. It will be beneficial to all users of the code especially the inspector and make the code a more user-friendly document for the achievement of a safe and reliable installation.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Comment 3-37.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #730)

3- 37 - (300-6): Reject
SUBMITTER: Richard E. Loyd, Perryville, AR
COMMENT ON PROPOSAL NO: 3-52
RECOMMENDATION: Reconsider Proposal 3-52 as revised.
300-6. Protection Against Corrosion and Degradation. ~~Metal r~~ Raceways, cable trays, cablebus, auxiliary gutters, cable armor, boxes, cable sheathing, cabinets, elbows, couplings, fittings, supports, and support hardware shall be of materials suitable for the environment in which they are to be installed.
(a) General. Ferrous raceways, cable trays, cablebus, auxiliary gutters, cable armor, boxes, cable sheathing, cabinets, metal elbows, couplings, fittings, supports, and support hardware shall be suitably protected against corrosion inside and outside ~~(except threads at joints)~~ by ~~a coating of~~ an approved corrosion-resistant coating ~~material such as zinc, cadmium, or enamel. Where protected from corrosion solely by enamel, they shall not be used outdoors or in wet locations as described in (c). Where boxes or cabinets have an approved system or organic coatings and are marked "Raintight," Rainproof," or "Outdoor Type," they shall be permitted outdoors.~~
~~Exception:~~ The threads at joints shall be permitted to be coated with an identified electrically conductive compound.
(1) Protected from Corrosion Solely by Enamel. Where protected from corrosion solely by enamel they shall not be used outdoors or in wet locations as described in (c). Where boxes or cabinets have an approved system of organic coatings and are marked "Raintight," "Rainproof," or "outdoor Type," they shall be permitted outdoors.
~~(b)~~ (2) In Concrete or in Direct Contact with the Earth.
(a) Ferrous or nonferrous, other than aluminum, metal raceways, cable armor, boxes, cable sheathing, cabinets, elbows, couplings, fittings, supports, and support hardware shall be permitted to be installed in concrete or in direct contact with the earth, or in areas subject to severe corrosive influences where made of material judged suitable for the condition, or where provided with corrosion protection approved for the condition.
(b) Aluminum, raceways, cable armor, boxes, cable sheathing, cabinets, elbows, couplings, fittings, supports, and support hardware shall be protected by an approved corrosion resistant material or coating where embedded or encased in concrete or where in direct contact with soil.
(c) Nonmetallic raceways, cable trays, cablebus, auxiliary gutters, cable armor, boxes, cable sheathing cabinets, metal elbows, couplings, fittings, supports, and support hardware shall be suitable for the environment in which they are installed and shall comply with (1) and (2) below.
(1) Exposed to Sunlight. Where exposed to sunlight or other forms of ultraviolet rays they shall utilize materials or coatings approved for the installation and shall be listed sunlight resistant.
(2) Exposed to Chemical Degradation. Where subject to chemical solvent vapors, or airborne, splash or immersion exposure they shall utilize materials or coatings suitable for the installation.
(c) Indoor Wet Locations. In indoor wet locations, and in locations where walls are frequently washed or where there are surfaces of absorbent materials, such as damp paper or wood, the entire wiring system, where installed exposed, including all boxes, fittings, conduits, and cable used therewith, shall be mounted so that there is at least a 1/4-in. (6.35 mm) airspace between it and the wall or supporting surface.
Exception: Nonmetallic raceways, boxes, and fittings shall be permitted to be installed without the airspace on a concrete, masonry, tile, or similar surface.
FPN: In general, areas where salts, acids and alkali chemicals are manufactured, processed, handled and or stored ~~may~~ present such corrosive conditions, particularly when wet or damp. Severe corrosive conditions ~~may~~ also tend to be present in portions of

~~meatpacking plants, tanneries, glue houses, and some stables;~~ water and wastewater treatment plants, pulp and paper plants, petrochemical operations, primary metals production facilities, direct burial applications in corrosive soils, food processing areas subject to frequent washdowns, installations immediately adjacent to a seashore and swimming pool areas; and areas where chemical deicers are used; and storage cellars or rooms for hides, casings, fertilizer, salt, and bulk chemicals.

SUBSTANTIATION: I have over 40 years in the electrical industry with the last 18 years as a circuit rider attending and speaking at industry related meetings. As a consultant, former inspector, author and instructor regarding electrical installations, I constantly receive questions about the requirements for corrosion and degradation. The proper selection of a wiring method at the time of installation is one of the most important aspects of a design to ensure a good installation that will last the life of the electrical system. Too often the installer selects a product, which fails due to improper product selection for the environmental elements present. The panel was incorrect in their statement for rejection in stating that corrosion is covered in the individual nonmetallic articles this is not true 347-2(b) references the user to 300-6 for guidance. Articles 351, 352, and 362 Part B do not address the issue. Articles 370, 373 and 374 do not address the issue. Therefore, the information in 300-6 is needed as stated by the proposal.

Proposal 3-52 was intended as an editorial rewrite with additional references and information. There are numerous metallic and nonmetallic materials being used today to manufacture electrical products i.e., steel with various protective coatings, aluminum, brass, stainless steel, PVC, polyethylene and fiberglass just to name a few. All of the specific uses cannot be covered therefore, general information and guidance is needed and this information belongs in the "General Requirements Article 300."

It was the intent of the submitter to reorganize the existing text, separate the aluminum products from other nonferrous products and incorporate into 300-6 the proposed wording developed by the nonmetallic representative and the chemical representative on CMP 8 for the new Article 344, which was rejected in the 1999 NEC cycle for other reasons. The 1999 NEC only covers metallic wiring methods with some reference to nonmetallic wiring methods. Common corrosion and degradation issues that need to be addressed by the user and designer should first appear in the general wiring method requirements, Article 300. I believe this proposal does that.

The rewrite proposed in 3-52 did not add confusion or place any additional restrictions on the nonmetallic products. This proposal did not state that mold and fungus caused degradation. It is agreed that exposure to sunlight, is addressed in some individual nonmetallic cable tray and wiring method articles however, not all. The attempt here is to make the NEC a more complete and user-friendly document.

PANEL ACTION: Reject.

PANEL STATEMENT: "Degradation" is an undefined term in the NEC and has only been used in a Fine Print Note in Section 310-10 dealing with the temperature rating of a conductor.

Section 300-6 is written to instruct the users about how and when to protect metal raceways against corrosion. This proposal adds requirements to nonmetallic products, including raceways, cable trays, auxiliary gutters, cable armor, enclosures, outlet boxes, cable sheathing, cabinets, elbows, couplings, fittings, supports and support hardware without substantiation.

Section 300-6 (a) required metal raceways to be protected by an approved corrosion-resistant coating. The proposal only requires it to be suitable where as the nonmetallic products needs to be approved (Section 300-6(b)(1)). These listing requirements belong in the individual raceway Article where they are currently addressed. Nonmetallic raceway articles do reference Section 300-6 but also have additional requirements per the raceway article. Exposure to sunlight, corrosion and temperature are addressed in each of the individual raceway articles and product standards.

The revisions to the Fine Print Note is unnecessary. Removing and adding a new list of corrosive applications is only confusing.

The comment has continued to add confusion without the substantiation to change it.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #972)

3- 38 - (300-6(a)): Accept in Principle

SUBMITTER: Larry F. Miller, National Electrical Manufacturers Association (NEMA)

COMMENT ON PROPOSAL NO: 3-54

RECOMMENDATION: The Panel should Accept this proposal in Principal. The text should be revised as follows:

Retain the words "(except threads at joints:" in the first sentence.

Add the following text after the first sentence: "Where corrosion protection is necessary for field threads, an approved electrically conductive compound shall be used."

Retain the last two sentences and delete the exception.

SUBSTANTIATION: The Panel is correct that the factory-applied corrosion protection on the threads is sufficient and that the submitter has not provided technical substantiation to justify the requirement for an additional coating for all threads. (The comment by Mr. Beile and Dr. Gruber that the word "often" should be deleted from the Panel Statement is also correct). However, field threads need protection suitable for the environment in which the conduit is installed. The proposed text makes it clear that an electrically conductive coating must be used where corrosion protection of field threads is necessary. The word "approved" is used in lieu of "identified" because there are many products, such as zinc rich spray paint, that will provide the intended field thread protection. A requirement to be "identified" could preclude their use.

PANEL ACTION: Accept in Principle.

PANEL STATEMENT: The submitter's concern has been addressed by the panel action on Comment 3-39.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #1711)

3- 39 - (300-6(a)): Accept in Principle

SUBMITTER: Charles M. Trout, Maron Electric Co. Inc.

COMMENT ON PROPOSAL NO: 3-54

RECOMMENDATION: This proposal should be accepted with new wording as follows. Delete the exception and add a new second sentence to read: "Threads at joints shall be coated with an identified electrically conductive, corrosion-resistant compound."

SUBSTANTIATION: The concerns addressed in this proposal are that when field threads are cut the corrosion-resistant material applied at the factory is disrupted and should be replaced. Additionally, factory applied corrosion resistant material applied to the threads is disrupted by the threads in a coupling being applied. If the integrity of the corrosion-resistant material is compromised, corrosion resulting in a high resistance connection will result. A high resistance connection will result in additional impedance in the ground-fault return path. As presently written this section excepts threads at joints because some of the corrosion-resistant materials suggested in the text are not electrically conductive. To support this, the existing exception permits threads to be coated with an identified electrically conductive compound. Identified electrically conductive, corrosion-resistant compounds are readily available from manufacturers. Application of electrically conductive, corrosion resistant compounds should be mandatory.

Note: supporting material available for review at NFPA Headquarters.

PANEL ACTION: Accept in Principle.

Revise the text to read:

Where corrosion protection is necessary and the conduit is threaded in the field, the threads shall be coated with an approved electrically conductive, corrosion-resistant compound."

PANEL STATEMENT: The revised text meets the intent of the submitter and clarifies the requirement. The panel has changed "identified" to "approved" to indicate that the compound is not required to be listed.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #23)

3- 40 - (300-7(a)): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 3-61
RECOMMENDATION: It was the action of the Technical Correlating Committee that further consideration be given to the comments expressed in the voting. This action will be considered by the panel as a public comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
The panel accepts the Technical Correlation Committee direction for further consideration of negative comments expressed in the voting for Proposal 3-61 and accepts in principle the following text noted in two of the negative comments:
Where portions of a cable, raceway or sleeve are known to be subjected to different temperatures and where condensation is known to be a problem, as in cold storage areas of buildings or where passing from the interior to the exterior of a building, the raceway or sleeve shall be filled with an approved material to prevent the circulation of warm air to a colder section of the raceway or sleeve. An explosionproof seal shall not be required for this purpose.
PANEL STATEMENT: The panel has modified the text to address the concerns expressed in the negative votes as requested by the Technical Correlating Committee.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1455)

3- 41 - (300-7(b)): Reject
SUBMITTER: Richard E. Loyd, Perryville, AR
COMMENT ON PROPOSAL NO: 3-63
RECOMMENDATION: Reject this proposal.
SUBSTANTIATION: Reject this proposal as it is overly restrictive. The proponent cites the exact reason the term "joint" needs to remain. At architectural expansion joints the amount of expansion is sometimes too great for standard electrical expansion fittings and these fittings are not appropriate since the building can move apart during a drop in temperature of several inches. 6 to 12 inches would not be uncommon. EMT and Rigid expansion fittings would not accommodate this amount in one fitting. Also seismic considerations may not be covered by this section since it appears to only apply for thermal considerations.
PANEL ACTION: Reject.
PANEL STATEMENT: The term used for expansion devices, connectors, couplings and similar raceway fittings is a "fitting." This section is not referring to an architectural expansion joint but is actually referring to a raceway fitting. This fitting may be required for the raceway even where the raceway may not be installed over an architectural expansion joint, such as noted in the Fine Print Note for raceways exposed to wide variations in temperatures with the resulting expansion and contraction of the raceway.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #24)

1- 174 - (300-9):
Note: The Technical Correlating Committee directs that this Comment and Proposal 3-65 be reported as "Hold" to allow for correlation with Code-Making Panels 7 and 8 on 336.12(A) and 331.12, respectively. The definition will remain in 336.12(A)(1) for the 2002 NEC.
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 3-65
RECOMMENDATION: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 1 for possible inclusion in Article 100. This action will be considered by the Panel as a Public Comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
The panel accepts the direction of the Technical Correlating Committee and amends the definition of "Building, first floor" in Article 100 as follows:
"The lowest building floor that has 50 percent or more of the exterior wall surface area level with or above finished grade".
PANEL STATEMENT: The text suggested by Proposal 3-65 has been revised to put it in the form of a definition.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #430)

3- 42 - (300-11(a) and (b)): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
COMMENT ON PROPOSAL NO: 3-67
RECOMMENDATION: Accept in principle revised:
(a) Secured in place. Raceways, cable assemblies, auxiliary gutters, cable trays, cablebus assemblies, boxes, cabinets, and other electric equipment shall be securely fastened in place, except as otherwise permitted or required elsewhere in this Code.
(remainder unchanged)
(b) Raceways and cables used as a means of support. Raceways or cables shall only be used as a means of support for other raceways, cables, conductors, or nonelectric equipment under the following conditions:
(1) Where the raceway or means of support is identified for the purpose.
(2) Where the raceway or cable contains power supply conductors for electrically controlled equipment and is used to support Class 2 circuit conductors or cables that are solely for the purpose of connection to the equipment control circuits.
~~(3) Where the raceway is used to support boxes or conduit bodies in accordance with Section 370-23 or to support fixtures in accordance with Section 410-16(f).~~
SUBSTANTIATION: Previously missing underlining is provided. Additional items are proposed in (a) and a proviso to correlate with permission or requirements of other Code sections relating to flexibility or movement, or nonfastening such as 333-7(b). (Style Manual 3.3.5) This section does not mention cables used as support. Power cables should be as suitable for support of Class 2 conductors as flexible raceways.
The word "conductors" is added in (b) to exclude single conductors such as grounding electrode conductors, to correlate with (b)(2) use of the word.
The present (b)(3) has no relation to the rule of (b) since boxes, conduit bodies, and fixtures are not raceways, cables, or nonelectric equipment. In any case nonelectric equipment is covered by (b)(1).
The original proposal relating to a raceway mast and external bonding jumpers is deleted as those uses are covered by (b)(1).
PANEL ACTION: Reject.
PANEL STATEMENT: The change recommended for (a) was not accepted since there is no reason to start a list of items that should be securely fastened in place, especially since the items being recommended already have their own articles and support requirements.
Power cables do not necessarily provide the same support for Class 2 or 3 cables as other flexible raceways, such as liquidtight flexible metal and nonmetallic raceways. The initial acceptance of text to allow Class 2 or Class 3 cables to be supported by raceways was an attempt to provide some relief to installers of having to provide separate support for these low voltage cables. The submitter has not provided any technical support or data to allow this to be expanded for cables to support other cables.
There also was no technical data submitted on allowing raceways to support grounding electrode conductors, some of which could be sized at 3/0 or larger, depending upon the size of the service conductors and the design provided by the electrical designer. For example this change would permit a 1/2 inch raceway to support a 3/0 grounding electrode conductor. Item (3) has been retained to correlate this section with Sections 370-23 and 410-16.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
COMMENT ON AFFIRMATIVE:
KREINER: In the 11th line of the Panel Statement, delete the apple and replace with "1/2".

(Log #2137)

3- 43 - (300-11(a)(2), Exception): Reject
SUBMITTER: Joseph A. Ross, Ross Electrical Assessments
COMMENT ON PROPOSAL NO: 3-68
RECOMMENDATION: Accept Proposal 3-68 in Part as follows:
Delete the Exception to Section 300-11(a)(2).
SUBSTANTIATION: It's time for this Exception to be deleted. There is no "ceiling system manufacturer" that is willing to assign their name to any instructions for the support of branch-circuit wiring and associated equipment. This is just a little overdue house cleaning. Let's make this Code the best it can be.
PANEL ACTION: Reject.
PANEL STATEMENT: There was no technical substantiation submitted in either the proposal or this comment to support the deletion of the exception. A survey of all the ceiling system manufacturers indicating which ceiling assemblies, if any, permit the ceiling assembly to support branch circuit wiring would provide a true indication that this exception should be deleted. This has not been provided. Acceptance of this proposal and comment would preclude the submission of documentation by a ceiling manufacturer in the future.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #628)

3- 44 - (300-11(b)(2)): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
COMMENT ON PROPOSAL NO: 3-73
RECOMMENDATION: Accept in principle. Revise (b)(2) of proposal:
Where the raceway contains power supply conductors for electrically controlled equipment and is used to support Class circuit ~~conductors or~~ cables of a type listed in Table 725-61 that are soley for the purpose of connection to the equipment control circuits. ~~or~~ Delete (b)(3).
Revise panel action: (c) Cables Not Used as a Means of Support. Cable wiring methods shall not be used as a means of support for other cables, raceways, or nonelectrical equipment, except that cables covered in Chapter 3 used for power supply conductors for electrically controlled equipment shall be permitted to support Class 2 cables of a type listed in Table 725-61 that are solely for the purpose of connection to the equipment control circuits.
SUBSTANTIATION: Class 2 circuit conductors are not prohibited from being installed in accordance with wiring methods of Chapter 3. The Class 2 type cables of Table 725-61 are an alternative to wiring requirements of Chapters 1 through 4 but are not mandatory requirements per the fine print note for 725-1. Article 725 indicates Class 2 conductors in raceways, or installed as Class 1 conductors as may be required. Sections 330-3, 334-3 permit Type MI and MC cables for control and signal circuits and other articles of Chapters 1 through 4 do not prohibit applications to Class 2 circuits. Present wording appears to literally not disallow Class 2 circuits in raceways or cables as covered in Chapter 3 from being supported by another raceway. The intent seems to envision Class 2 type cables.
Section (b)(3) has no relationship to the second paragraph of (b) since boxes, conduit bodies, and fixtures are not raceways, cables or nonelectric equipment.
In the panel action use of the word "nonelectrical" may infer that electrical equipment is not prohibited from being supported and perhaps modifies other code rules which require other support.
Cable wiring methods of Chapter 3 appear to be suitable for support of Class 2 type cables. If a 3/8 or 1/2 in., flexible raceway is permitted to support Class 2 cables but a Type MC or MI cable with three No. 4 conductors is not, it seems somewhat unreasonable.
PANEL ACTION: Reject.
PANEL STATEMENT: Class 2 conductors enclosed in a raceway wiring method from Chapter 3 can support individual Class 2 conductors or Class 2 cables. The existing text in the 1999 and previous Codes provides adequate clarity for permission to support Class 2 conductors or cables from raceways and the proposed new text does not provide that same clarity. The new text may cause confusion about the intent.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #328)

3- 45 - (300-14): Reject
SUBMITTER: Daniel P. Kurelowech, San Diego, CA
COMMENT ON PROPOSAL NO: 3-78
RECOMMENDATION: Add to exceptions:
Where conductors end at a device, conductors shall measure 6 in. from front edge of junction box.
SUBSTANTIATION: As an end user, I am required to work live at times. 3 in. from front of a deep box makes it hard and unsafe. (3 in. based on the NEC 1999 handbook page 224)
PANEL ACTION: Reject.
PANEL STATEMENT: Requiring 6 inches of free conductor from the front edge of a box, in addition to the conductor length inside the box, will add a substantial amount of box fill to the installation without any technical substantiation to warrant the change. Circuits are provided with a disconnecting means in the system so that the circuit may be disconnected to allow maintenance and work to be done. Adding extra conductor length would not make live work any less dangerous. The current text of the code does not preclude longer conductor lengths where a safety concern exists.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1346)

3- 46 - (300-14): Reject
SUBMITTER: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education
COMMENT ON PROPOSAL NO: 3-78
RECOMMENDATION: In the present text, after "cable sheath" insert "to its first point of termination or splice."
SUBSTANTIATION: Mr. Slater is right that shallow boxes don't demand 6 in. of free conductor to permit 3 in. to emerge, and the code-making panel is right that shallow boxes often are extended. Even deep boxes, though may be retrofitted with extension boxes that can make it impossible to get at wiring. However, if conductors can be rendered accessible by pigtailing before, or at the time, the extension box is added, the problem has a great work-around. However, the wording I propose reflects a more restrictive interpretation of 300-14, indicating that you have to pull, or re-pull 8 in. or 10 in. or whatever length of conductor is required to peek out from extension boxes, especially multiple extension boxes. Interpretations differ, since the required 3 in. is for terminations and splices, but the NEC has no restriction against "splicing a splice", equivalent to the rule against tapping a tap. If doing so is incorrect, and the 6 in. and 3 in. free conductors must be unbroken, reject this comment.
PANEL ACTION: Reject.
PANEL STATEMENT: The existing text in the 1999 NEC provides the necessary information that the submitter of the comment requested. The existing text states that the length of the conductor must be at least 6 inches from the point in the box where it emerges from the raceway or cable sheath. This 6-inch length would be from the sheath to where it terminates at the junction, switch, or outlet point. It would not permit the conductor to be cut off 2 inches from the sheath and then spliced internally with an additional 4 inches of conductor.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #25)

3- 47 - (300-15): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 3-81
RECOMMENDATION: It was the action of the Technical Correlating Committee that this Proposal be correlated with the action on Proposal 3-84. This action will be considered by the Panel as a Public Comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
Accept the Technical Correlating Committee direction to correlate the two different actions to Section 300-15(c) and use the text in the panel action for Section 300-15(c) in Proposal 3-81 as the correct revision for that subsection.

PANEL STATEMENT: The text in the panel action for Proposal 3-81 for Section 300-15(c) was accepted in lieu of the acceptance of the recommended change in Proposal 3-84 since it more correctly identified that a box or conduit body was not required for this type of installation.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #2019)

3- 48 - (300-15(c)): Accept
SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc.
COMMENT ON PROPOSAL NO: 3-84
RECOMMENDATION: Convert the panel action to Accept in Principle, and refer to the action on Proposal 3-81.
SUBSTANTIATION: The results are inconsistent. The Technical Correlating Committee missed this one.
PANEL ACTION: Accept.
PANEL STATEMENT: See the panel action and statement on Comment 3-47 for the proper action. The Technical Correlating Committee did not miss correlating these two actions.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1215)

3- 49 - (300-15(i)): Hold
SUBMITTER: Don W. Jhonson, ESP of South Florida, Inc.
COMMENT ON PROPOSAL NO: 3-81
RECOMMENDATION: Add new text as indicated:
300-15(i) Enclosures. A box or conduit body shall not be required where a splice, switch, terminal or pull point is in a cabinet or cutout box, in an enclosure for a switch or overcurrent device as permitted in Section 373-8, in a motor controller as permitted in Section 430-10(a), or in a motor control center. A box or conduit body shall not be required where a splice, tap or pull point is in an approved underground handhole and conductors are listed for wet location where the wiring method is conduit, tubing, or direct burial cables.
SUBSTANTIATION: The problem is the widespread industry practice of using underground handholes for the distribution of underground branch wiring in conduit systems, which is presently not permitted by 300-15. The handholes are often used in conjunction with underground PVC conduit as well as other approved wiring methods for the installation of landscape lighting, light poles, and other applications where an above ground box would pose a physical hazard such as parks and recreational areas. Listed wet location boxes are not designed for immersions during prolonged flooding conditions as experience in many parts of the country and have not been the equipment of choice due to the accumulation of water and potential fault conditions caused when standard splice connections are used within the box. The handhole would require a listed direct burial splice and allows for natural drainage through the open bottom where subject to heavy rain flooding. I have substantiated the practice of using these handholes as described through personal contact with other industry members and have found many felt the intent of the code permitted a conduit to be stubbed up within the handhole, a bushing/fitting installed, conduit sealed to prevent foreign entry, continuity maintained with bonding jumpers, conductors suitable for wet locations, splice/taps made with direct burial listed methods, covers secured and handhole grounded if metallic.
PANEL ACTION: Hold.
PANEL STATEMENT: While the submitter is correct in his substantiation about the widespread use of handholes, this comment must be held in accordance with Section 4-4.6.2.2 of the NFPA Regulations Governing Committee Projects since it has not had public review in the ROP stage of the process. We recommend that the Technical Correlating Committee establish a task group between CMP 3 and CMP 9 to develop a definition for handhole and associated requirements.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #26)

3- 50 - (300-22(b)): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 3-95
RECOMMENDATION: The Technical Correlating Committee directs that the panel clarify the Panel Action on this Proposal considering the comments on voting and the Panel Action on 3-98. This acton will be considered by the Panel as a Public Comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
The panel accepts the Technical Correlating Committee direction to clarify the panel action on this proposal. The proposal is accepted in principle and the phrase "without an overall nonmetallic covering" inserted after "rigid metal conduit" with the change to read as follows:
"(b) Ducts or Plenums Used for Environmental Air. Only wiring methods consisting of Type MI cable, Type MC cable employing a smooth or corrugated impervious metal sheath without an overall nonmetallic covering, electrical metallic tubing, flexible metallic tubing, intermediate metal conduit, or rigid metal conduit without an overall nonmetallic covering shall be installed in ducts or plenums specifically fabricated to transport environmental air."
The remainder of the existing text in this subsection in the 1999 Code to remain unchanged.
PANEL STATEMENT: By inserting the phrase "without an overall nonmetallic covering" after "Type MC cable employing a smooth or corrugated impervious metal sheath" and after "rigid metal conduit" the concerns of the submitter of the proposal should be satisfied. Rigid metal conduit with an overall nonmetallic covering should not be installed in a fabricated duct or plenum, unless the nonmetallic covering is tested and listed for use in this area.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #789)

3- 51 - (300-22(b)): Reject
SUBMITTER: David H. Kendall, Carlon
COMMENT ON PROPOSAL NO: 3-95
RECOMMENDATION: This proposal should be rejected.
SUBSTANTIATION: This proposal is similar to Proposal 3-98 where the panel rejected the proposed text because the substantiation covered only coated rigid nonmetallic conduit. There was no substantiation to include other products, such as cables with nonmetallic insulation, to be limited in this application. There are products currently listed to be used in these applications with nonmetallic coatings. In addition, this sort of text limits the development of future products that may be evaluated as acceptable for the plenum.
PANEL ACTION: Reject.
PANEL STATEMENT: The text as revised in Comment 3-50 specifically applies to corrugated or smooth MC cable and rigid metal conduit and does not put undue restrictions on other wiring methods or any future wiring methods. See panel action and statement on Comment 3-50.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1817)

3- 52 - (300-22(b)): Accept in Principle
SUBMITTER: Tim Andrassy, Steel Tube Inst.
COMMENT ON PROPOSAL NO: 3-95
RECOMMENDATION: This proposal should continue to be accepted.
SUBSTANTIATION: Section 300-22(B) has never included a permission for nonmetallic wiring methods. Note that the current text states "only wiring methods consisting of Type MI cable, Type MC cable employing a smooth or corrugated impervious metal sheath without an overall nonmetallic covering" . . . "Flexible metal conduit and liquid tight flexible metal conduit shall be permitted."
The raceways currently permitted (electrical metallic tubing, flexible metallic tubing, intermediate metal conduit, rigid metal

conduit, flexible metal conduit) have not been listed before with a nonmetallic cover; therefore, the words "without an overall nonmetallic covering" were not necessary. However, recent changes have been made to UL Safety Standard 6 (Rigid Metal Conduit), UL 797 (Electrical Metallic Tubing), and UL 1292 (Intermediate Metal Conduit) which now allow the listing of those products with a PVC coating as an alternative to galvanizing. If this change is not made, this type of conduit could be used in ducts or plenums, which was not the original intent.

The 1999 UL electrical Construction Equipment Directory states that: "Conduit with nonmetallic coatings has not been evaluated for use in ducts, plenums, or other environmental air spaces in accordance with Section 300-22 of the National Electrical Code."

Concerning Mr. Forsberg's negative comment: These Articles (725, 770, 800) are covered by Panel 16. According to 90-3, Chapter 7 can amend Chapters 1-4 and Chapter 8 is independent of the other chapters. If Panel 16 wants to allow the nonmetallic wiring methods covered in those articles in ducts and plenums, they can allow permission in those articles. However, it is not Panel 16's jurisdiction to change Chapter 3 requirements.

PANEL ACTION: Accept in Principle.

PANEL STATEMENT: The submitter's intent is covered by the panel's action on Comment 3-50.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #1818)

3- 53 - (300-22(c)): Accept in Principle

SUBMITTER: Tim Andrassy, Steel Tube Inst.

COMMENT ON PROPOSAL NO: 3-98

RECOMMENDATION: This proposal should be accepted with the following change in text:

Other type cables and conductors shall be installed <u>in the following raceways, which are not permitted to have an overall nonmetallic covering:</u> electrical metallic tubing, flexible metallic tubing, intermediate metal conduit, rigid metal conduit, flexible metal conduit, or, where accessible, surface metal raceway or metal wireway with metal covers or solid bottom metal cable tray with solid metal covers.

SUBSTANTIATION: The intent of the current code text is that nonmetallic wiring methods are not permitted in these spaces, unless they are "factory-assembled multiconductor control or power cable that is specifically listed for the use". The current code uses the phrases: "Type MC cable without an overall nonmetallic covering", "listed prefabricated cable assemblies of metallic manufactured wiring systems without nonmetallic sheath", "surface metal raceway or metal wireway with metal covers or solid bottom metal cable tray with solid metal covers." The raceways currently permitted (electrical metallic tubing, flexible metallic tubing, intermediate metal conduit, rigid metal conduit, flexible metal conduit) have not been listed before with a nonmetallic cover; therefore the words "without an overall nonmetallic covering" were not necessary. However, recent changes have been made to UL Safety Standard 6 (Rigid Metal Conduit), UL 797 (Electrical Metallic Tubing), and UL 1292 (Intermediate Metal Conduit) which now allow the listing of those products with a PVC coating as an alternative to galvanizing. If this change is not made, this type of conduit could be used in "other spaces used for environmental air", which was not the original intent. The text submitted with the original proposal may have been confusing. The altered text submitted with this comment should clarify the intent. The addition of this text does not prevent the use of any of the wiring methods currently permitted in this section.

The 1999 UL Electrical Construction Equipment Directory (Green Book) states that, "Conduit with nonmetallic coatings has not been evaluated for use in ducts, plenums, or other environmental air spaces in accordance with Section 300-22 of the National Electrical Code."

PANEL ACTION: Accept in Principle.

The proposal is accepted in principle and the phrase "without an overall nonmetallic covering" inserted after "rigid metal conduit" with the change to read as follows:

(1) Wiring Methods. The wiring methods for such other space shall be limited to totally enclosed, nonventilated, insulated busway having no provisions for plug-in connections, Type MI cable, Type MC cable without an overall nonmetallic covering, Type AC cable, or other factory-assembled multiconductor control or power cable that is specifically listed for the use, or listed prefabricated cable assemblies of metallic manufactured wiring systems without nonmetallic sheath. Other types of cables and conductors shall be installed in electrical metallic tubing, flexible metallic tubing, intermediate metal conduit, rigid metal conduit without an overall nonmetallic covering, flexible metal conduit, or where accessible, surface metal raceway or metal wireway with metal covers or solid bottom metal cable tray with solid metal covers.

PANEL STATEMENT: By inserting the phrase "without an overall nonmetallic covering" after "rigid metal conduit" the concerns of the submitter of the proposal should be satisfied. Rigid metal conduit with an overall nonmetallic covering should not be installed in an other space used for environmental air, unless the nonmetallic covering is tested and listed for use in this area.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #1873)

3- 54 - (300-22(e)): Reject

SUBMITTER: C.W. Beile, Allied Tube & Conduit

COMMENT ON PROPOSAL NO: 3-100

RECOMMENDATION: Change the proposal to read:

(e) Abandoned, unusable and obsolete cables shall be removed.

SUBSTANTIATION: Never in the history of Code-Making Panel 3 has the other space used for environmental air been considered a storage area for unused equipment. The code panel's rationalizations are weak.

PANEL ACTION: Reject.

PANEL STATEMENT: The proposal submitter's own substantiation states there is no indication that the additional cables in plenums caused an added fire hazard and that the fire record of cables in plenums is excellent. Requiring abandoned cables to be removed that are not intended for future use would be almost impossible to enforce. Many cables are installed for future use and cables are often swapped at patch panels to provide a very effective method of moving a computer or a piece of telecommunications equipment without having to pull a new cable.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 8

NEGATIVE: 3

EXPLANATION OF NEGATIVE:

BEILE: Although CMP-16 has partially addressed the problem, the total subject seems to evade a direct solution. Many weak arguments rationalize why obsolete unused equipment cannot be removed. Until responsibility is fixed upon those who are adding new equipment to take out the items they are replacing, nothing will be done and unused items will continue to pile up in other space used for environmental air. New equipment is fast replacing old technology.

Many manufacturers as well as inspectors and installers are concerned that additional weight and combustibles will ultimately cause them liability if accidents occur.

There is no valid reason not to act.

GRUBER: The panel should have accepted this proposal in principal. See my Explanation of Negative on Comment 3-55.

WEBER: My negative vote on this panel action is in concurrence with the negative vote and justification on Comment 3-55. See my explanation of negative vote on Comment 3-55.

(Log #1913)

3- 55 - (300-22(e)): Reject

SUBMITTER: Michael I. Callanan, International Brotherhood of Electrical Workers

COMMENT ON PROPOSAL NO: 3-100

RECOMMENDATION: Accept this proposal in principle as follows:

<u>(e) Abandoned wiring methods, cable assemblies and cables. Wiring methods, cable assemblies and cables not intended for future use shall be removed from plenums and other air handling spaces. Wiring methods, cable assemblies and cables intended for future use shall be durably and legibly marked where accessible.</u>

SUBSTANTIATION: The submitter has identified an existing and future problem that the NEC must address. The buildup of discontinued wiring methods, cable assemblies and cables represent serious hazards for persons and property. Renovation after renovation of transient commercial occupancies demand that

the NEC clearly require that an accumulation of wiring methods, cable assemblies and cables not in use shall not be permitted.

This comment represents the official position of the International Brotherhood of Electrical Workers Codes & Standards Committee.

PANEL ACTION: Reject.

PANEL STATEMENT: See panel action and statement on Comment 3-54.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 8

NEGATIVE: 3

EXPLANATION OF NEGATIVE:

CASPARRO: This comment should be accepted. The allowance of abandoned cables, and cable assemblies to be accumulated in plenums and other air handling spaces is unbelievable. The technology of the telecommunications industry is dictating that new cables be pulled all the time for upgrading, not only for computer wiring, but also power wiring for isolated circuits. I disagree with the panel statement on Comment 3-54, that many cables are installed for future use. Most cables are obsolete after a few years.

How many cables, and how much weight are we going to allow in these plenums and air handling spaces before we have support problems?

GRUBER: The panel should have accepted this proposal.

Substantiation: because something would be difficult to enforce is not a reason to reject a proposal. This item has significant merit for several reasons.

1. There is an ever increasing burden of unused, abandoned and obsolete cables left in plenums and air handling spaces. Not only is there a concern for a potential increase in the fire hazards, but also the safety factor based upon the weight load.

2. The Society of Plastic Industries could not come to agreement on this proposal which indicates that some of the members believe there is merit to this proposal.

3. Simply because we have had no deaths to support the proposal is not a reason to dismiss the efficacy of it.

WEBER: This comment should be accepted. The panel needs to review and develop guidance on the type and amount of discontinued wiring methods, cable assemblies and cables that remain in other spaces used for environmental air purposes. As we examine the panel action on Proposal 3-99 (300-22(c)(1) Exception): which was accepted by the panel thus removing the exception that allowed liquidtight flexible conduit in single lengths not exceeding 6 feet to be installed in that space. The proposal correctly indicated that a conflict exists with the basic intent of the section. These spaces need special care and concern as to what is allowed in the space or to remain in that area that can have a serious hazard in a fire scenario. The proposed wording in essence addresses the need to remove abandoned, unusable and obsolete cables and allows those wiring methods intended for future use to remain and are then required to be durably and legibly marked where accessible.

(Log #334)

3- 56 - (300-37): Reject

SUBMITTER: Gregory P. Bierals, Electrical Design Inst.

COMMENT ON PROPOSAL NO: 3-103

RECOMMENDATION: Revise text to read as follows:

Aboveground conductors shall be installed in rigid metal conduit, intermediate metal conduit, EMT, in rigid nonmetallic conduit, in flexible metal conduit and liquidtight flexible metallic conduit at motor connections in lengths up to 6 ft.

SUBSTANTIATION: Section 430-123 and Section 430-145(b) recognize the use of the flexible raceways for motor connections at voltages over 600 volts. This proposal should be accepted.

PANEL ACTION: Reject.

PANEL STATEMENT: The panel affirms the reason for rejecting the original proposal. The permission to use this wiring method for over 600 volt applications is very limited. To insert it within Section 300-37 would seem to be an invitation to misread and misapply it. If the user is installing a motor with a voltage in excess of 600 volts, then Part K of Article 430 should be read and the requirements specifically adhered to, especially Section 430-123. The submitter also deleted other wiring methods within this section without proper substantiation for the deletion. See panel action on Comment 3-58.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #1662)

3- 57 - (300-37): Hold

Note: The Technical Correlating Committee directs that Proposal 3-102 and Comment 3-57 be reported as "Hold", and forwarded to Code-Making Panel 8 for action during the next code cycle.

SUBMITTER: Melvin K. Sanders, TECo., Inc.

COMMENT ON PROPOSAL NO: 3-102

RECOMMENDATION: This proposal should be rejected for the reasons cited by Mr. Andrews.

SUBSTANTIATION: In addition to the rejection comments of Mr. Andrews, I have reviewed similar articles in the 1999 Edition and the 2002 Draft and they specifically include minimum wall thickness where higher voltages are concerned. None is included for auxiliary gutters.

In earlier editions, information on permitted wiring methods was covered by now deleted Article 710 and the referral in 300-2(a) (1999 Edition) to other articles allowed specific review by them. Now that this is in Article 300, this cross-check has been eliminated and until the panel having jurisdiction of particular wiring methods makes an evaluation, adding it to the shopping list here without such validation makes no sense. This should have been referred to Code-Making Panel 6, and if they agree sufficient safeguards are in place they can include it at that time and present wording of 300-2(a) would be adequate.

The present wording of 300-2(a) does not prohibit wiring methods - it merely guides the reader to the appropriate article of concern. I see this as a backdoor attempt to accept wiring methods that rightfully are the responsibility of the individual panels where the expertise to make such decisions resides.

PANEL ACTION: Hold.

PANEL STATEMENT: The proposal and comment should be held for further study and sent to CMP-8 as a proposal for the 2005 Code cycle since they have jurisdiction over the specific use of auxiliary gutters. The Technical Correlating Committee could then send it to CMP-3 for insertion of the term "auxiliary gutter" into Section 300-37.

The panel statement for the proposal did not make any reference to permission for use above 600 volts since it was permitted for 600 volts or less. In fact, Article 374 does not make any reference to voltage at all. With the utility company deregulation, many systems that were utility-owned high voltage systems are now being sold to the end user or installed as owner provided high voltage substations. There is no particular reason why auxiliary gutters for over 600 volts could not be submitted for listing and UL 870 modified to provide for over 600 volt testing.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #2334)

3- 58 - (300-37): Accept

SUBMITTER: Wayne A. Lilly, Bridgewater, VA

COMMENT ON PROPOSAL NO: 3-103

RECOMMENDATION: This comment is made at the direction of the Technical Correlating Committee. That direction being that Code-Making Panel 8 "comment on application of the subject wiring methods over 600 volts."

This proposal should continue to be rejected.

SUBSTANTIATION: A Task Group that consisted of Wayne A. Lilly and Kenneth E. Jannot developed this comment.

The language of this proposal would delete from the current text several wiring methods, such as cablebus and busway, as being suitable for above ground applications of over 600 volts. The proposal offered no substantiation to support the removal of these wiring methods. These wiring methods have a positive history of use in over 600-volt applications.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #1218)

3- 59 - (300-50): Hold

SUBMITTER: Dann Strube, Lanesville, IN

COMMENT ON PROPOSAL NO: 3-109

RECOMMENDATION: The panel needs to reconsider several parts of the proposed table. Differences between this table and the 300-5 table need to be addressed.

SUBSTANTIATION: Column (7) depth on Table 300-50 is zero inches while at less than 600 volts a depth of 4 in. is required.

Depth for 15 KV should not be less than that required for 480 volt systems under the same conditions.

Section 300-50 Exception No. 2 allows reduction of depth with concrete cover. Section 300-5 has no such provision. Safe at 15 KV is safe at 480 V.

Please note that I did not recommend a specific way to revise the items. It is not important to me which way code-making panel 3 fixes this problem, only that the rules agree.

The third issue to consider is airport runway depth. The exception allowing cable to be at 18 in. while other methods did not change is documented in the TCR for the 1974 NEC (published 1975) as proposal 7 for Panel 8. The exception, seen as 300-50 Exception No. 6, 1999 NEC, appeared in 300-5 for less than 600 V as well as Article 710 for higher voltages. The table now found in 300-5 was introduced in 1990. The exception in question went away and the 18 in. rule appeared. There was no substantiation for the change in depth requirements at that time.

I am not really opposed to the 18 in. depth at the runway but I do urge the panel to consider the need for greater depth for raceways. First the FAA Memphis office told me that their Advisory Circular 150/5370-108 specifies 18 in. for all methods in these locations. I was also told that this is advisory only and they do not demand 18 in. in some cases.

I have a background in air traffic control and can say from experience that an aircraft off the runway does alot of damage. Runway lights, taxiway lights, distance marker signs and lights, etc. are damaged. Considering the amount of above ground damage that can occur, I question the need to provide extra protection for an underground conduit.

PANEL ACTION: Hold.

PANEL STATEMENT: The panel recommends that the proposal and comment be held for further study in order that all issues regarding conduits and other raceways are addressed.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #27)

3- 60 - (Table 300-50): Accept

SUBMITTER: Technical Correlating Committee National Electrical Code

COMMENT ON PROPOSAL NO: 3-109

RECOMMENDATION: The Technical Correlating Committee directs the Panel to clarify the action on this Proposal. The relationship of the Exceptions to the Table Columns is not clear. The Technical Correlating Committee also directs the Code-Making Panel to revise the title of the table to move the definition of "cover" into a Table Note. This action will be considered by the Panel as a Public Comment.

SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.

PANEL ACTION: Accept.

Move the definition for "cover" from the title of Table 300-50 to a new Note No.1 to the Table and renumber existing notes accordingly.

PANEL STATEMENT: The panel accepts the direction of the Technical Correlating Committee to move the definition of "cover" from the heading to a table note.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #2020)

3- 61 - (Table 300-50): Hold

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

COMMENT ON PROPOSAL NO: 3-109

RECOMMENDATION: Replace the accepted table with the suggested version, with four notes, as shown below:

SUBSTANTIATION: The attached table eliminates all exceptions without making unsubstantiated changes in the technical requirements. The panel action raised conduits under slabs to the surface of the slabs, eliminated cables from the runway allowance, failed to account for the 2-in. concrete-in-the-trench exception, and didn't incorporate the warning ribbon requirement. The panel action also made column headers that are far too complicated to be usable as such. This comment solves that problem with a note, only enumerates columns with substantive requirements, similar to Table 300-5, and it also incorporates the Technical Correlating Committee objection to the cover definition being in the title.

PANEL ACTION: Hold.

PANEL STATEMENT: See panel action and statement on Comment 3-59.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #1663)

3- 62 - (300-50(a) and Table 300-50): Hold

SUBMITTER: Melvin K. Sanders, TECo., Inc.

COMMENT ON PROPOSAL NO: 3-109

RECOMMENDATION: Revise Section 300.50(A) Exceptions and Table 300-50 as shown on the following page:

SUBSTANTIATION: To be consistent with Table 300-5, and acknowledge burial depths for airport locations are to be 18 inches (457.2 mm) minimum due to FAA regulations.

PANEL ACTION: Hold.

PANEL STATEMENT: See panel action and statement on Comment 3-59.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

Table 300.50 Minimum Cover[1] Requirements

	General Conditions (not otherwise specified)						Special Conditions (use if applicable)					
	(1) Direct- Buried Cables[2]		(2) Rigid Nonmetallic Conduit[2,3]		(3) Rigid Metal Conduit and Intermediate Metal Conduit		(4) Raceways under buildings or exterior concrete slabs, 100 mm (4 in.) minimum thickness[4]		(5) Cables in airport runways or adjacent areas where trespass is prohibited		(6) Areas subject to vehicular traffic, such as thoroughfares and commercial parking areas	
Circuit Voltage	**mm**	**in.**	**mm**	**in.**	**mm**	**in.**	**mm**	**in.**	**mm**	**in.**	**mm**	**in.**
Over 600 V through 22 kV	750	30	450	18	150	6	100	4	450	18	600	24
Over 22 kV through 40 kV	900	36	600	24	150	6	100	4	450	18	600	24
Over 40 kV	1000	42	750	30	150	6	100	4	450	18	600	24

[1]Cover is defined as the shortest distance in millimeters (inches) measured between a point on the top surface of any direct-buried conductor, cable, conduit, or other raceway and the top surface of finished grade, concrete, or similar cover.

[2]Depth reduction of 50 mm (2 in.) permitted for each 50 mm (2 in.) of concrete or equivalent protection placed in the trench over the underground installation.

[3]Listed by a qualified testing agency as suitable for direct burial without encasement. All other nonmetallic systems shall require 50 mm (2 in.) of concrete or equivalent above conduit in addition to the table depth.

[4]The slab shall extend a minimum of 150 mm (6 in.) beyond the underground installation, and a warning ribbon or other effective means suitable for the conditions shall be placed above the underground installation.

INSERT LANDSCAPE TABLE 300-50 (Log #1663) HERE **See Table on the following page**

Table 300-50 Minimum Cover[1] Requirements ~~(Cover is defined as the shortest distance in millimeters (inches) measured between a point on the top surface of any direct buried cable or conduit, and the top surface of finished grade, concrete, or similar cover.~~

					Rigid Metal and Intermediate Metal Conduit							
Circuit Voltage	Column 1 Direct Buried Cables		Column 2 Rigid Nonmetallic Conduit Approved for Direct Burial and not Under a Building[2]		Column 3 All Locations not Otherwise Specified		Column 4 Under a Building or Minimum 4-in. Thick Concrete Exterior Slab with No Vehicular Traffic and the Slab Extending Not Less than 150 mm (6-in.) Beyond the Underground Installation (Including Rigid Nonmetallic Conduit Approved for Direct Burial)		Column 5 Under Streets, Highways, Roads, Alleys, Driveways, and Parking Lots (Including Rigid Nonmetallic Conduit Approved for Direct Burial)		Column 6 In or Under Airport Runways, Including Adjacent Areas Where Trespassing is Prohibited (Including Direct Buried Cables and Nonmetallic Conduit With or Without Approval for Direct Burial)	
	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in
Over 600 V through 22 kV	750	30	450	18	150	6	100	4	600	24	450	18
Over 22 kV through 40 kV	900	36	600	24	150	6	100	4	600	24	450	18
Over 40kV	1000	42	750	30	150	6	100	4	600	24	450	18

1. **NOTE –** Cover is defined as the shortest distance in millimeters (inches) measured between a point on the top surface of any direct-buried cable or conduit, and the top surface of finished grade, concrete, or similar cover.

2. **NOTE –** Listed by a qualified testing agency as suitable for direct burial without encasement. All other nonmetallic systems shall require 50 mm (2 in.) of concrete or equivalent above conduit in addition to above depth.

(The definition of "Cover" was deleted from the table title and added as Note No. 1 at the direction of the Correlating Committee. The asterisk information in the 1999 Edition for this Table then became Note No. 2.)

~~Exception No. 1: Areas subject to vehicular traffic, such as thoroughfares or commercial parking areas, shall have a minimum cover of 24 in. (610 mm).~~

(The provisions of Exception No. 1 are now covered by Column 6.)

Exception No. ~~2~~ 1: The minimum cover requirements for other than rigid metal conduit and intermediate metal conduit shall be permitted to be reduced 150 mm (6 in.) ~~(152 mm)~~ for each 50 mm (2 in.) ~~(50.8 mm)~~ of concrete or equivalent protection placed in the trench over the underground installation.

(Re-number Exception No. 2 to become Exception No. 1 and metric values added with inches placed in brackets to conform to the Manual of Style.)

Exception No. ~~3~~: ~~The minimum cover requirements shall not apply to conduits or other raceways that are located under a building or exterior concrete slab not less than 4 in. (102 mm) in thickness and extending not less than 6 in. (152 mm) beyond the underground installation.A~~ *Installations meeting the conditions of Column 4 shall have a warning ribbon or other effective means suitable for the conditions ~~shall be~~ placed above the underground installation.*

(The 1st sentence of Exception No. 4 is covered by Column 4, and text was added to the 2nd sentence in order to make a complete sentence and indicate what situation governs the placement of warning ribbon. Note: this is not an exception to burial depths but instead covers the placement of warning ribbon and should be added as new 300-50 (F).)

Exception No. ~~4~~ 2: Lesser depths shall be permitted where cables and conductors rise for terminations or splices or where access is otherwise required.

(Re-number Exception No. 4 as Exception No. 2.)

~~Exception No. 5: In airport runways, including adjacent defined areas where trespass is prohibited, cable shall be permitted to be buried not less than 18 in. (457 mm) deep and without raceways, concrete enclosement, or equivalent.~~

(The provisions of Exception No. 1 are now covered by Column 6.)

Exception No. ~~6~~3: Raceways installed in solid rock shall be permitted to be buried at lesser depth where covered by 50 mm (2 in.) ~~(50.8 mm)~~ of concrete~~.~~ ~~which~~ and the concrete shall be permitted to extend to the rock surface.

(Exception No. 6 changed to Exception No. 3, with metric value with inches placed in brackets to conform to the Manual of Style. "Which" changed to "and the concrete" for grammar.)

(In addition, I combined proposed columns (6) and (7) into a single column 5 since the only difference was whether the raceway was under a building or under a concrete slab.)

(Log #28)

3- 63 - (300-50(e)): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 3-111
RECOMMENDATION: The Technical Correlating Committee directs the Panel to confirm the Technical Correlating Committee's assumption that the Panel intends that 300-50(e) remain as presently written in the 1999 NEC. This action will be considered by the Panel as a Public Comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
PANEL STATEMENT: The panel accepts the Technical Correlating Committee direction and affirms that there was no text change in Section 300-50(e).
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

ARTICLE 305 — TEMPORARY WIRING

(Log #770)

3- 64 - (305): Reject
SUBMITTER: Richard E. Loyd, Perryville, AR
COMMENT ON PROPOSAL NO: 3-141
RECOMMENDATION: Reconsider the location of this article was moved to and leave it in chapter three or retitle Chapter 5 or move to Chapter 7.
SUBSTANTIATION: Chapter 5 is titled "Special Occupancies," "Temporary Wiring" is not an occupancy. It is either a lesser "Chapter 3 General Wiring Method" or "Chapter 7 Special Conditions". To relocate Article 305 to Chapter 5 does not make the code more user friendly. A new student of the code would never look for it in Chapter 5. I would suggest reconsideration or retitle Chapter 5 to "Special Occupancies and Systems". If this is done the move would be acceptable.
PANEL ACTION: Reject.
PANEL STATEMENT: 1. This comment is outside the scope of CMP 3 since the organization and location of articles is under the pervue of the Technical Correlating Committee.
2. CMP 3 refers this comment to the Technical Correlating Committee for action.
3. CMP 3 requests that it retain pervue over the article on temporary wiring.
4. CMP 3 requests that the article on temporary wiring be located in Chapter 7 because it relates to special conditions and occupancies.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
COMMENT ON AFFIRMATIVE:
FORSBERG: I agree that this comment must be rejected, but I disagree with item No. 4 of the panel statement. The panel should recommend to the Technical Correlating Committee that Article 305 should remain in Chapter 3 because the temporary wiring rules are related to, but different than, rules for permanent installations. Chapter 7 deals with "Special Conditions" that, in my view, do not cover temporary wiring. The NEC will be a more user friendly document if Article 305 is retained in Chapter 3.
KREINER: Concerning Item No. 4 of the Panel Statement, it would seem better to leave Article 305 where it is presently located since it is more of an exception to Article 300 than it is a special occupancy as indicated in the title of Chapter 5.

(Log #879)

3- 65 - (305): Reject
SUBMITTER: George W. Flach, New Orleans, LA
COMMENT ON PROPOSAL NO: 3-141
RECOMMENDATION: Leave temporary wiring in Chapter 3 under Article 305.
SUBSTANTIATION: Although Article 305 covers more than temporary wiring, it does relax the requirements for wiring methods. Chapter 5 has the title Special Occupancies. Temporary wiring is not restricted to special occupancies, and therefore should not be placed in Chapter 5.
PANEL ACTION: Reject.
PANEL STATEMENT: 1. This comment is outside the scope of CMP 3 since the organization and location of articles is under the pervue of the Technical Correlating Committee.
2. CMP 3 refers this comment to the Technical Correlating Committee for action.
3. CMP 3 requests that it retain pervue over the article on temporary wiring.
4. CMP 3 requests that the article on temporary wiring be located in Chapter 7 because it relates to special conditions and occupancies.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
COMMENT ON AFFIRMATIVE:
FORSBERG: See my Comment on Affirmative on Comment 3-64.
KREINER: See my Comment on Affirmative on Comment 3-64.

(Log #1626)

3- 66 - (305): Reject
SUBMITTER: Gilbert L. Thompson, MEIA Codes and Standards
COMMENT ON PROPOSAL NO: 3-112
RECOMMENDATION: This proposal was rejected, but the panel action moved the article to become new Article 527 as proposed by the Technical Correlating Committee.
SUBSTANTIATION: Why move an entire article to the special occupancies chapter and give it an odd number? Temporary wiring is used in all occupancies and generally uses wiring methods found in Chapter 3.
PANEL ACTION: Reject.
PANEL STATEMENT: 1. This comment is outside the scope of CMP 3 since the organization and location of articles is under the pervue of the Technical Correlating Committee.
2. CMP 3 refers this comment to the Technical Correlating Committee for action.
3. CMP 3 requests that it retain pervue over the article on temporary wiring.
4. CMP 3 requests that the article on temporary wiring be located in Chapter 7 because it relates to special conditions and occupancies.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
COMMENT ON AFFIRMATIVE:
FORSBERG: See my Comment on Affirmative on Comment 3-64.
KREINER: See my Comment on Affirmative on Comment 3-64.

(Log #29)

15- 6 - (305-2(c) (New)): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 3-119
RECOMMENDATION: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 15 for action in Chapter 5. The Technical Correlating Committee notes that by the action on Proposal 15-147, Article 702 will now apply to optional stand-by systems that utilize portable generators.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
PANEL STATEMENT: Refer to the recommendation and substantiation for Comment Log 15-105a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 18
VOTE ON PANEL ACTION:
AFFIRMATIVE: 18

(Log #29a)

3- 67 - (305-2(c) (New)): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 3-119
RECOMMENDATION: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 15 for action in Chapter 5. The Technical Correlating Committee notes that by the action on Proposal 15-147,

Article 702 will now apply to optional stand-by systems that utilize portable generators.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #30)

15- 7 - (305-2(c) (New)): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 3-120
RECOMMENDATION: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 15 for action in Chapter 5. The Technical Correlating Committee notes that by the action on Proposal 15-147, Article 702 will now apply to optional stand-by systems that utilize portable generators.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
PANEL STATEMENT: Refer to the recommendation and substantiation for Comment Log 15-105a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 18
VOTE ON PANEL ACTION:
AFFIRMATIVE: 18

(Log #30a)

3- 68 - (305-2(c) (New)): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 3-120
RECOMMENDATION: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 15 for action in Chapter 5. The Technical Correlating Committee notes that by the action on Proposal 15-147, Article 702 will now apply to optional stand-by systems that utilize portable generators.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1783)

3- 69 - (305-2(c)): Accept in Principle
SUBMITTER: Alan Manche, Square D Co.
COMMENT ON PROPOSAL NO: 3-119
RECOMMENDATION: The panel should reconsider and reject this proposal.
SUBSTANTIATION: The proposals accepted by Panel 15 to expand the scope of Article 702 to include portable generator sets makes the addition of this new paragraph 305-2(c) unnecessary. The first paragraph of the proposed section addressing portable generators and inadvertent interconnection is covered by a revised 702-1 and the present 702-6. The submitter states in his substantiation that 410-56(g) covers the second sentence of the part (c) proposal that addresses the prevention of a backfeed potential on the inlet plug, therefore it is not necessary to repeat the requirement in 305. Capacity and ratings of the generator are also already addressed in 702-5. Therefore, this proposal is only repeating the safety requirements already found in the NEC and should be rejected with the advent of the scope change in Article 702.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: The Technical Correlating Committee has sent both Proposals 3-119 and 120 to CMP-15 for their action and Comments 3-67 and 3-68 have been accepted by CMP-3 to indicate our acceptance of the Technical Correlating Committee direction.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1783a)

15- 8 - (305-2(c)): Accept in Principle
SUBMITTER: Alan Manche, Square D Co.
COMMENT ON PROPOSAL NO: 3-119
RECOMMENDATION: The panel should reconsider and reject this proposal.
SUBSTANTIATION: The proposals accepted by Panel 15 to expand the scope of Article 702 to include portable generator sets makes the addition of this new paragraph 305-2(c) unnecessary. The first paragraph of the proposed section addressing portable generators and inadvertent interconnection is covered by a revised 702-1 and the present 702-6. The submitter states in his substantiation that 410-56(g) covers the second sentence of the part (c) proposal that addresses the prevention of a backfeed potential on the inlet plug, therefore it is not necessary to repeat the requirement in 305. Capacity and ratings of the generator are also already addressed in 702-5. Therefore, this proposal is only repeating the safety requirements already found in the NEC and should be rejected with the advent of the scope change in Article 702.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Refer to the recommendation and substantiation for Comment Log 15-105a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 18
VOTE ON PANEL ACTION:
AFFIRMATIVE: 18

(Log #31)

3- 70 - (305-3(b)): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 3-124
RECOMMENDATION: The Technical Correlating Committee directs the Panel to review this Proposal in light of the Scope of Article 305. This action will be considered by the Panel as a Public Comment. In addition, the Technical Correlating Committee directs that this Proposal be forwarded to Code-Making Panels 2 and 18 for information.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
Accept the Technical Correlating Committee direction to address Proposal 3-124 based upon the scope as indicated in Section 305-1 and rejects the proposal.
PANEL STATEMENT: Since the scope and title of Article 305 addresses temporary installations, the recommendation, as indicated in the proposal, is outside the scope of Article 305 and must be rejected. See the panel action on Comment 3-71.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #335)

3- 71 - (305-3(b)): Accept in Part
SUBMITTER: Alan H. Nadon, City of Elkhart, IN
COMMENT ON PROPOSAL NO: 3-124
RECOMMENDATION: The proposed revision should be rejected.
SUBSTANTIATION: If inspectors cannot enforce the 90 day limitation, then they would be equally incapable of requiring AFCI protection. As the substantiation states "...they merely unplug the lighting string and call it disconnected."
PANEL ACTION: Accept in Part.

The panel agrees with the recommendation to delete the phrase, "unless provided with arc-fault circuit interrupter protection." The term "holiday" will be retained. The section should read as follows: Temporary electrical power and lighting installations shall be permitted for a period not to exceed 90 days for holiday decorative lighting and similar purposes.
PANEL STATEMENT: The word holiday was retained from the panel action on Proposal 3-124 to clarify the requirement to include all holiday temporary lighting.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #2022)

3- 72 - (305-4(b)): Reject
SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc.
COMMENT ON PROPOSAL NO: 3-126
RECOMMENDATION: In addition to the panel action, add the following as a new sentence following the sentence modified by the proposal:
Single-conductor cord sets not smaller than 2 AWG (6 AWG for an equipment grounding conductor) shall be permitted where identified for extra-hard usage in Table 400.4.
SUBSTANTIATION: For large feeders, the multiconductor cable rule is excessive. This wording comes from comparable material in 520.53(H)(1-2).
PANEL ACTION: Reject.
PANEL STATEMENT: In reviewing the referenced material, many details required for proper application of Section 520-53(h)(1&2) are missing and further information is necessary to expand this to apply to all temporary wiring.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #CC301)

3- 72a - (305-4(j)): Accept
SUBMITTER: CMP 3
COMMENT ON PROPOSAL NO: 3-132
RECOMMENDATION: Add new sentence to Section 305-4(j) (1999 NEC) to read:
Vegetation shall not be used for support of overhead spans of branch circuits or feeders.
SUBSTANTIATION: The panel had added this new language on the support of conductors from vegetation at the direction of the Technical Correlating Committee's comment on Proposal 3-132.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
PACE: There is no technical substantiation to change existing wording and there is no evidence submitted to indicate that this has been a problem. Existing language requires protection from physical damage regardless of the support method. Cable for temporary use can be installed on vegetation such that it is not subject to physical damage.

(Log #1664)

3- 73 - (305-4(j)): Reject
SUBMITTER: Melvin K. Sanders, TECo., Inc.
COMMENT ON PROPOSAL NO: 3-132
RECOMMENDATION: Change the title of 305-4(j) and add new 305-4(k) (1999 Edition) [527.4 (J) and add new 527.4(K) (2002 Draft)] as follows:
527.4(J) Means of Support. Cable assemblies and flexible cords and cables shall be supported in place at intervals that ensure that they will be protected from physical damage. Support shall be in the form of staples, cable ties, straps, or similar type fittings installed so as not to cause damage.
527.4 (K) Method of Support. Chapter Three and Chapter Four wiring methods utilized as service entrance, feeder or branch circuits shall be supported from the structure.
SUBSTANTIATION: Changing the title of 527.4(J) to Means of Support will clarify it covers how cable assemblies and flexible cords and cables are to be supported and what can be utilized. Adding proposed 527.4(K) clarifies that the method of support is by the structure as stated in the proposed definition (ROP 188) for Article 100.
New 527.4(K) addresses service entrances, feeders and branch circuits as detailed in 527.1 but not those installations as limited by 90.2(B). Use of vegetation, living or dead is not permitted because of concern about strength of the support, unpredictable whipping action of vegetation, the uncontrollable variety of vegetation requiring best guesses as to the which may or could be used, the flexing that stretches and relaxes conductors between supporting points over the life of the project, and the temporary rigging necessary in order to adapt supports intended for structural use to vegetation is just a minimal listing of the problems of concern. It is recognized by the panel members that poles are the direct result of a particular type of dead vegetation, but they are also altered, treated, strength rated, designed and intended to provide a particular structure duty. It is also recognized by the panel members that trees are merely poles that have not yet died.
PANEL ACTION: Reject.
PANEL STATEMENT: The suggested change in title does not totally reflect the information given in this subsection. The existing first sentence deals more with flexible cords and cables that must be supported at intervals so damage does not occur. The second sentence deals with the means for support of cables and cords. The more generic title allows both support of the cables and the means of support to be covered in the same subsection.
The second part of the recommendation introduces new material that has not had public review.
This comment does not have anything to do with the text of the original proposal. The panel reaffirms its position to not allow live vegetation to provide support for temporary electrical wiring. Stringing power cords or cable assemblies from tree to tree may subject the cords or cables to insulation damage or outside jacket damage due to wind or other natural causes. Poles can be installed at the temporary worksite to provide support for cords and cable assemblies for feeder and branch circuits. The text in Section 225-26 prohibits live vegetation from being used to support overhead spans of wiring systems for outside branch circuits and feeders and this prohibition should also apply for temporary wiring. Code Panel 3 asks the Technical Correlating Committee to please have the exception to Section 225-26 deleted.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #2320)

3- 74 - (305-4(j)): Reject
SUBMITTER: William M. Lewis, Eli Lilly and Co.
COMMENT ON PROPOSAL NO: 3-132
RECOMMENDATION: The proposal should be accepted as long as the 225-26 exception remains as worded.
SUBSTANTIATION: The panel statement only tells half of the story.
Point 1: While it is true that there are no current provisions in 305 which prohibit the attachment to temporary or permanent structures. Neither is there a provision which prohibits the attachment to vegetation.
Point 2: While it is true that there may be cases where attaching to vegetation may be more harmful to the cable; it is also true that there may be cases where not using convenient vegetation could be more harmful to the cable. These are the reasons why a commonly accepted practice should remain acceptable, but for temporary wiring only. The only reason for proposing the new wording was for correlation only.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel reaffirms its intent not to allow live vegetation to provide support for temporary branch circuits and feeders. Stringing power cords or cable assemblies from tree to tree may subject the cords or cables to insulation damage or outside jacket damage due to wind or other natural causes. Structures can be installed at the temporary work site to provide support for cords and cable assemblies for feeder and branch circuits. The text in Section 225-26 prohibits live vegetation from being used to support overhead spans of wiring systems for outside branch circuits and feeders and this prohibition should also apply for temporary wiring.

Code-Making Panel 3 recommends to the Technical Correlating Committee that the exception to Section 225-26 in the 1999 NEC be deleted. This change would prohibit overhead spans of branch circuits and feeders from being supported on live vegetation for all temporary installations. This change would not prohibit the use of decorative lighting strings from being supported by live vegetation.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1179)

3- 75 - (305-6): Reject
SUBMITTER: Frank Martucci, Fort Lee, NJ
COMMENT ON PROPOSAL NO: 3-135
RECOMMENDATION: Please accept this proposal.
After existing material add:
(c) Electrocution-proof cord and plug grounding system.
Receptacles of all voltages shall be protected in accordance to (1) and (2)
(1) Cords and cordsets shall be redundantly grounded with two insulated conductors. The grounding conductors shall be installed in cords and cordsets with the branch circuit conductors supplying the unfixed equipment. Attachment plugs and connector bodies shall be of the hospital grade type.
(2) Grounding Poles. Cord connectors, attachment plugs, and the internal connections of multiple outlet boxes shall be provided with two separate wiring sites at the grounding pole. The cord connectors, attachment plugs, and the multiple outlet boxes, shall be designed so that only the grounding pole can be wired with two conductors.
SUBSTANTIATION: For the past thirteen years I have submitted proposals for the 1990, 1993, 1996, 1999, and the forthcoming 2002 National Electrical code that will prevent thousands of electricians and fiery deaths each and every year. Yet, despite my serious admonitions and allegations, code panels continue to reject my proposals sight unseen, without any demonstrations or testing whatsoever.
It boggles my mind that members of code making panels, most with no cord expertise whatsoever, can display such an indifference to human life. What if my system works? Don't they have any fear of being liable for thousands of deaths these past 13 years? Don't they have any fear of being liable for the loss of hundreds of thousands of homes each and every year?
I, for one, would demand extensive tests before I rejected a system that may indeed save thousands of lives each and every year.
My reaction to a single electrocution bordered on the fanatical. I immediately replaced undersized 3 conductor cords with 4 conductor cords to provide two #14, (15 amapacity) grounding conductors for all medical devices.
In addition, costly, and time consuming, outlet modifications were made to provide the redundancy every other federal agency, or responsible engineer, resorts to whenever lives are at stake.
The same redundancy I proposed that, together with a slight component modification, will prevent thousands of electrocutions and fiery deaths each and every year.
The same redundancy code panel members have unanimously rejected, time and again, the past 13 years. They not only reject the concept of redundancy, but they adamantly defend the use of conductors sized up to 50% less than required by our original National Electrical Code.
The original code, written under the influence of insurance companies, distinctly states the equipment grounding conductor shall be no smaller than #14 (15 ampacity) when used on a typical 15 ampere branch circuit.
However, when the NFPA took over the code making process in 1911, they established exceptions to the code whereby a #18 (7 ampacity) conductor is permitted to protect our people form line drop, shock , and electrocution.
This is a clear violation of our electrical code and detrimental to the electrical safety of every, man, woman, and child in our nation.
And it boggles my mind that, during the past 13 years, not a single panel member ever endorsed the use of redundancy. How can code panel members dedicated to electrical and fire safety fight so vehemently to keep our people protected with a grounding conductor sized less than required by our original electric code?
If code panels see fit to jeopardize the lives of our people with undersized, rarely tested, equipment grounding conductors then at least provide two of them.
And this is what my proposal accomplishes. And to boot, a bonus wiring safeguard that will make our grounding system electrocution-proof and fire-proof.
And it is obvious that only a demonstration will convince the panels that two wire grounding redundancy together with a no-cost modification of existing cord components will indeed make the grounding system electrocution-proof and also fire-proof.
But until such a demonstration ever takes place, let me try again to convince the panel, in as plain English as possible, how little they know about our ill-conceived grounding system.
If the panels took the time to wire a plug each of the six ways it can be wired, they will discover that four of six ways will cause shock, electrocution or fiery death.
When plugged into a properly wired outlet, current will flow through inappropriate steel outlet mounting screws, outlet boxes, and raceways. Massive current from a heater or hotplate will cause overheating and possible undetectable fires inside the walls of dwellings.
And when plugged into an outlet, or extension cord, wired with reversed polarity, the exposed metal parts of appliances will become immediately charged with a full 120 volt potential.
A person holding a drill, for example, will become shocked, or electrocuted, because he, or she, is a poor conductor of electricity and lacks the impedance required to trip circuit breakers or blow fuses.
The wiring safeguard automatically provides the necessary impedance regardless of any wiring error and even though the wall outlet, or female connector of an extension cord, is wired with reversed polarity.
You see, by simply adding a second, redundant, grounding conductor there now exists three grounded conductors, two green and one white. If existing cord components are modified so that only the ground pole can be wired with two conductors, there is absolutely no possible way to wire a plug so as to cause a shock, electrocution or undetectable fires inside walls.
And the system is indeed a self-monitoring system unlike the existing system whereby four of six ways to wire existing cord components will electrocute or cause fiery deaths.
No costly assured grounding programs are required to assure proper wiring. Should miswiring cause a device to become energized, the second grounding conductor will automatically provide the necessary impedance required to activate branch circuit ground fault interrupters, converting them into GFCIs.
It is morally wrong for code panels to evaluate and reject proposals without any thorough demonstrations to prove the submitter's proposal is flawed.
How much easier it is to make live demonstrations. I could first demonstrate how I can make existing cord components electrocution-proof and fire-proof by simply drilling a hole or removing, or adding a tiny piece of metal.
And also make thorough demonstrations, with mock up outlets, exactly how the second ground conductor will prevent electrocutions, and fires inside walls, due to miswired cords.
I urge the panels to seek a demonstration before they reject my proposal.
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter has provided demonstrations of his systems to both the Standards Council and to the NFPA general assembly with the same results. The submitter should provide technical data that is verified as to the cause and origin of the electrocutions that he is claiming to be caused by improper cord installations.
The panel finds the technical substantiation in both the proposal and in the comment to support such a major change to be inadequate. Redundant (two conductor) grounding does not make a cord and plug system "electrocution-proof". The submitter provides no evidence that the cause of the mentioned electrocutions are related to wiring or grounding problems involving cord and plug sets or connected equipment. Other causes such as personnel error or other kinds of equipment could have been the cause.
Redundancy of grounding conductors is not the only effective way to achieve enhanced protection against electric shock. Use of GFCIs, double insulation, and assured equipment grounding programs are other ways. GFCI protection provides protection even if the equipment grounding conductor is inadvertently lost in the branch circuit or at the equipment. Redundancy of grounding conductors will not make GFCI's trip faster, or at a lesser current value.
The construction requirements of flexible cords are not within the jurisdiction of CMP-3. Article 400 is under the jurisdiction of CMP-6.

Section 3-3.3.3(f) of the NFPA Regulations Governing Committee projects does not allow physical demonstrations, experiments, or simulations at meetings of technical committees.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #606)

3- 76 - (305-6(a)): Reject
SUBMITTER: John E. Propst, Equilon Enterprises, LLC
COMMENT ON PROPOSAL NO: 3-138a
RECOMMENDATION: This comment is submitted to reject the action of the panel and reject the original proposal.
SUBSTANTIATION: The issues identified in Mr. Andrew's and Mr. Pace's comments provide adequate substantiation to reject this proposal. When properly applied, assured grounding is a safe option that is being effectively applied in industry today. To eliminate this option without substantiation would place an unnecessary burden on industries that already have significant investments in their programs.
PANEL ACTION: Reject.
PANEL STATEMENT: The proposal to delete the exception warrants acceptance based on the fact that there is no need for all receptacle outlets in industrial establishments to be exempted from GFCI protection. The panel disagrees with the statement of the submitter that requiring the use of ground-fault circuit- interrupter for personnel places an unnecessary burden on industry. See panel action and statement on Comment 3-80.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #656)

3- 77 - (305-6(a)): Reject
SUBMITTER: Tim Arendt, Western Code Advisory Task Group
COMMENT ON PROPOSAL NO: 3-138a
RECOMMENDATION: We as a group of over 40 IBEW/IAEI members, with experience installing and inspecting electrical systems, support this proposal to delete this exception.
SUBSTANTIATION: The proven reliability and safety record of GFCI protection makes an allowance for an assured equipment grounding conductor program obsolete.
PANEL ACTION: Reject.
PANEL STATEMENT: Based on the negative votes on Proposal 3-138a and comments 3-76, 3-79 and 3-80 the panel revised the language to Section 305-6(a) Exception No. 2. See panel action and statement on Comment 3-80.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #32)

5- 186 - (305-6(a) Exception No. 1): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 3-138
RECOMMENDATION: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 5 for action. This action will be considered by the Panel as a Public Comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
PANEL STATEMENT: The panel agrees with the action of CMP-3 to delete Exception No. 1 of 305-6(a).
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16
COMMENT ON AFFIRMATIVE:
SKUGGEVIG: My affirmative vote to delete the exception is intended to not discourage the use of ground-fault circuit-interrupters to reduce the risk of electric shock. However, deleting this exception would only cause 2-wire generators with no connection between the circuit output and the generator frame to be required to have GFCIs. This type of generator without the connection between one conductor and the frame is not suited for GFCI protection since GFCIs are differential current devices and need to have a complete path for differential current when a fault occurs. This is the reason for this exception in the first place. In my opinion, Proposal 3-138 is beyond an editorial change, and is based on a wrong premise. I do not agree with the substantiation given for Comment 3-138 that states that "250.34 does not permit a 2-wire single-phase portable or vehicle-mounted generator to have all circuit conductors insulated from the frame if system grounding is required, which is the case where supplying the receptacles of (a)". 250.34 does not require a connection between the 2-wire output circuit and the generator frame. For a 2-wire, 120-volt system with no other windings in proximity (such as with a transformer instead of a generator), 250.20 does not require grounding of the system because it is not possible for the isolated 120-volt winding to produce as much as 150 V, under normal or fault conditions. 250.26 states that either conductor may be selected to be the grounded conductor IF the system were either required to be grounded or voluntarily grounded. 250.34 permits the frame of the generator to serve as the grounding electrode with no connection to earth, but in this case, a system conductor does not have to be connected to the frame or to earth. For this change to be effective and be able to help reduce the risk of electric shock, a statement needs to be added to 305.6 to explicitly require GFCI-protected generators to have a connection between either conductor of a 2-wire system and the generator frame.

(Log #543)

3- 78 - (305-6(a) Exception No. 2): Reject
SUBMITTER: Robert B. Alexander, Fluor Daniel
COMMENT ON PROPOSAL NO: 3-139
RECOMMENDATION: Accept the proposal.
SUBSTANTIATION: Only if the panel asserts that the assured equipment grounding conductor program (AEGCP) is unsafe or ineffective does it warrant rejecting this proposal. In fact, the panel has asserted just the opposite in the panel statement for Proposal 3-135.

The panel statement fails to offer any documentation available for public review that would indicate that a GFCI program would have prevented death or injury where an effective AEGCP was in place. There is only a vague reference to OSHA citations. However, a simple review of the data readily available at the OSHA website (http://www.osha.gov/oshstats/std1.html) indicates the following:

1. Section 1926 404 was cited 1386 times from Oct. 1998 to Sept .1999.
2. Small construction projects (1-99 workers) accounted for 1357 (98 percent) of those citations.
3. For large construction projects (100-249 total workers) it was cited only 20 times.
4. For even larger construction projects (250 + total workers) it was cited only 9 times.

There is no comparable section in 29CFR1910, so it's not surprising that construction accumulated the bulk of the citations. Even assuming that all the citations issued were for substandard personnel ground-fault protection in temporary wiring, which is highly unlikely, it is obvious that large, well managed construction projects are as well equipped to guard worker safety, as general industrial users.

Worker Deaths by Electrocution: A Summary of Surveillance Findings and Investigative Case Reports, is available at http://www.cdc.gov/niosh/elecmono.html. It is a summary of worker electrocutions from 1982-1994. The recorded case studies indicate fewer than 5 worker deaths caused by electrocution would have been attributed to substandard personnel ground fault protection in temporary wiring for 15, 20 and 30A, 120 V systems in those twelve years.

The fact that the panel believes GFCI is superior is irrelevant, a "line" can only be properly drawn between "safe" and "unsafe" not between "safe" and "safer."

All other substantiations offered in Proposal 3-139 are still valid
PANEL ACTION: Reject.
PANEL STATEMENT: The panel disagrees with the statement of the submitter that it may only reject the proposal if the panel asserts that the assured equipment grounding conductor program (AEGCP) is unsafe or ineffective. This proposal is an attempt to expand the use of the AEGCP beyond the scope of the present exception. The submitter references the panel statement for Proposal 3-135. The panel lists the AEGCP third in a list of ways to

achieve enhanced protection against electric shock in response to a proposal on redundant grounding. The submitter should not infer that it is the intent of the panel to confer equal weight to the AEGCP to that of ground-fault circuit-interrupter for personnel (GFCI) protection in providing protection to personnel. The panel further states in that panel statement that GFCI protection provides protection even if the equipment grounding conductor is lost in the branch circuit or at the equipment. The AEGCP does not afford this protection. The panel again reaffirms its position that GFCI protection affords a higher level of protection, as stated in the panel statement for this proposal.

The submitter has provided no technical substantiation that would compel the panel to alter its position as stated in the panel statement for this proposal. To the contrary, the substantiation provided by the submitter bolsters the position of the panel. An examination of the "simple review of the data" mentioned by the submitter indicates there were 1,386 OSHA citations of 29CFR 1926.404 for the twelve-month period provided.
Furthermore, the panel does not see the need to discriminate against the size of the project as broken down by the submitter when applying the provisions of this exception.

The submitter is correct to state there is no comparable section in 29CFR 1910 regarding GFCI and the AEGCP. That regulation applies to general industry, not to construction. If a receptacle(s) is installed or exists as part of the permanent wiring of the building or structure and is used for temporary electric power, ground-fault circuit-interrupter for personnel shall be provided as stated in Section 305-6(a) of the NEC. The submitter has not provided substantiation supporting his conclusion that general industry users are well equipped to guard worker safety.

The panel also concludes that the information provided by the submitter in "Worker Deaths by Electrocution: A Summary of Surveillance Findings and Investigative Reports" indicating that fewer than 5 worker deaths caused by electrocution have been attributed to "substandard" GFCI protection in temporary wiring for 15, 20, and 30A, 125V systems in those twelve years, is further evidence that GFCI is safe and effective. A review of the web address noted in the comment substantiation did not produce this evidence, however.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #547)

3- 79 - (305-6(a) Exception No. 2): Reject
SUBMITTER: Robert B. Alexander, Fluor Daniel
COMMENT ON PROPOSAL NO: 3-138a
RECOMMENDATION: Reject the proposal.
SUBSTANTIATION: This proposal lacks sufficient substantiation. Only if the panel asserts that assured equipment grounding conductor program (AEGCP) is unsafe or ineffective does it warrant deleting the exception. In fact, the panel asserted just the opposite in the panel statement for Proposal 3-135.

The proposal substantiation fails to offer any documentation available for public review that would indicate that a GFCI prgram would have prevented death or injury where an effective AEGCP was in place.

The fact that the panel believes GFCI is superior is irrelevant, the "line" can only be properly drawn between "safe" and "unsafe" not between "safe" and "safer."
PANEL ACTION: Reject.
PANEL STATEMENT: The panel rejects the recommendation of the submitter. The panel disagrees with the statement of the submitter that it may only delete the exception if the panel asserts that the assured equipment grounding conductor program (AEGP) is unsafe or ineffective.

The submitter references the panel statement for Proposal 3-135. The panel lists the AEGCP third in a list of ways to achieve enhanced protection against electric shock in response to a proposal on redundant grounding. The submitter should not infer that it is the intent of the panel to confer equal weight to the AEGCP to that of GFCI protection in providing protection to personnel. The panel further states in that panel statement that ground fault circuit-interrupter for personnel (GFCI) protection provides protection even if the equipment grounding conductor is lost in the branch circuit or at the equipment. The AEGCP does not afford this protection. The panel again reaffirms its position that GFCI protection affords a higher level of protection, as stated in the panel statement for this proposal.

In Comment 3-80, the panel changed the last phrase "or having a design that is not compatible with GFCI protection" to make it clear that permission is given to operate equipment on a circuit that is not GFCI protected where the inherent design of the equipment does not allow it to operate properly on a GFCI protected circuit. This equipment is required to comply with Section 305-6(b)(2).
See panel action and statement on Comment 3-80.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
COMMENT ON AFFIRMATIVE:
CASPARRO: I feel the panel has remained consistent and steadfast in refusing to expand the use of the AEGCP beyond a narrowing scope of permitted use. Code-Making Panle 3 has yet again in the panel statement for this comment and for Proposal 3-139, as well as over the past several code cycles, reaffirmed its position that GFCI protection affords a higher level of protection and clearly has no desire to expand the use of the AEGCP. The attempt to expand the use of the AEGCP beyond the restrictive industrial establishment exception would have been a major step backward for worker safety.

(Log #1131)

3- 80 - (305-6(a) Exception No. 2): Accept in Principle
SUBMITTER: Paul Dobrowsky, Holley, NY
COMMENT ON PROPOSAL NO: 3-139
RECOMMENDATION: Revise the exception as follows:

Exception No. 2: In industrial establishments only, where conditions of maintenance and supervision ensure that only qualified personnel are involved, an assured equipment grounding conductor program as specified in Section ~~305-6(b)(2)~~ 527.6(B)(2) shall be permitted ~~to be utilized~~ for ~~all~~ only those receptacle outlets used to supply equipment that would create a greater hazard if power was interrupted or will not operate with GFCI protection.

SUBSTANTIATION: Some equipment such as magnetic based portable drills and vacuum based coring machines, that depend on being energized to maintain position, would be a greater hazard if power was interrupted due to a "nuisance" trip. Small 120 volt MIG welders are also commonly used which may not be operable with GFCI protection. These types of equipment are commonly used on industrial construction sites.

The exception may need to be renumbered as (1) depending on the final action on the existing (1999 NEC) Exception No. 1.
PANEL ACTION: Accept in Principle.
Revise the exception as follows:
Exception No. 2: In industrial establishments only, where conditions of maintenance and supervision ensure that only qualified personnel are involved, an assured equipment grounding conductor program as specified in Section 305-6(b)(2) shall be permitted for only those receptacle outlets used to supply equipment that would create a greater hazard if power was interrupted or having a design that is not compatible with GFCI protection.
PANEL STATEMENT: The panel changed the last phrase "or having a design that is not compatible with GFCI protection" to make it clear that permission is given to operate equipment on a circuit that is not GFCI protected where the inherent design of the equipment does not allow it to operate properly on a GFCI protected circuit. This equipment is required to comply with Section 305-6(b)(2).
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
CASPARRO: Continued acceptance of this exception is cause for concern. The fact that the panel recognized there was no need for all receptacle outlets to be included in this exception was a step in the right direction, however.

Substantiation was submitted referencing OSHA 29CFR1926.404 as a basis for retaining the AEGCP concept. The regulations pertaining to the AEGCP in the NEC and OSHA standards have significant differences. As an example, 1926.404(b)(1)(iii)(B) states the employer shall designate a "competent person" as defined in 1926.32(f) to implement the AEGCP. The NEC states in 305-6(b)(2) that one or more "designated persons" are to enforce the AEGCP. OSHA defines a "designated person" in 1926.32(d). Additionally, 1926.404(b)(1)(iii)(C) requires any equipment connected by cord and plug to be visually inspected before each

day's use for external defects and for possible internal damage. The NEC has no such requirement. OSHA requiring GFCI certainly has precedent. 29CFR1926.405(a)(2)(ii)(G) tells us 120-volt portable electric lighting used in wet and/or other conductive locations may be used if protected by GFCI, or be operated at 12 volts or less.

There should be no question that the AEGCP is an inferior people protector compared to GFCI. Ventricular fibrillation of adults can begin at around 50-ma. GFCI for personnel is designed to operate at 4 to 6-ma. Assurance an equipment-grounding conductor is in place does not provide anywhere near the same level of personnel protection afforded by GFCI protection for personnel. Perhaps we should question if the OSHA required tests to be performed under the AEGCP at intervals not to exceed 3 months and in some cases up to 6 months are often enough to assure the equipment-grounding conductor is not compromised in the often-hostile construction environment. Panel 3 is on record as recognizing that GFCI is designed to operate even if the equipment-grounding conductor is lost. It should be a matter of great concern to those who feel they have satisfied the restriction of this exception, that they are potentially exposing themselves to a greater shock hazard by using the AEGCP.

Some comments make reference to equipment that may not work with GFCI or could create a greater hazard. Technical substantiation of a greater hazard or of a GFCI incompatible design was not submitted. Therefore, the panel should not have altered the position it developed at the proposal stage to enhance personnel safety. Even if that substantiation was provided, I feel there would still be a need to prove there is no other means feasible for the task to be performed before personnel safety is compromised.

The panel action now includes language concerning a "greater hazard" and "a design that is not compatible". It would seem there are few "greater hazards" than electrocution of personnel. Who is qualified to make the determination as to what is a "greater hazard"? Is it the "qualified personnel as stated in this exception?" The same question needs to be asked of equipment design "not compatible with GFCI protection". Perhaps equipment having a design not compatible with GFCI protection for personnel is not equipment that should be used under construction conditions. We must bear in mind the NEC "contains provisions that are necessary for safety" but "not necessarily" "efficient, or convenient" as stated in 90-1(b). Could not the "exercise of ingenuity" as noted in 500-3 FPN eliminate these incompatible receptacle outlets? It seems likely these same "hazards" would exist if equipment lost power due to overcurrent operation, as those that would exist if the equipment with GFCI protection for personnel operated as intended to protect human life.

In summary, I feel the panel action taken at the comment stage represents an unfortunate compromise. The panel was faced with a difficult task. It had to decide between the decisive panel action it took at the proposal stage eliminating the exception for industrial establishments in an effort to enhance worker safety and the concern expressed by industry for relief. No technical substantiation was provided to support the request for relief, or that there is no alternative. Neither convenience nor economics should take precedence over safety. Increased safety should not be considered an "unnecessary burden" to industry. Elimination of this exception would cause the natural evolution of procedure. It would require users to adopt the "exercise of ingenuity" and for new safer methods to be employed. Recognizing we must develop code that is usable, let us also strive to make it a code we can live with literally as well as figuratively.

On an editorial note, I believe "GFCI protection" as used in the last sentence of this panel action should read "GFCI protection for personnel", to be consistent with language used in 305-6 and elsewhere in the NEC.

(Log #1914)

3- 81 - (305-6(a) Exception No. 2): Reject
SUBMITTER: Michael I. Callanan, International Brotherhood of Electrical Workers
COMMENT ON PROPOSAL NO: 3-138a
RECOMMENDATION: Continue to Accept this proposal.
SUBSTANTIATION: We agree with the panel action and panel statement. GFCI protection is available, affordable and results in a much more acceptable degree of safety for all persons.
This comment represents the official position of the International Brotherhood of Electrical Workers Codes & Standards Committee.
PANEL ACTION: Reject.
PANEL STATEMENT: Based on the negative votes on Proposal 3-138a and comments 3-76, 3-79 and 3-80 the panel revised the language to 305-6(a) Exception No. 2. See panel action and statement on Comment 3-80.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1915)

3- 82 - (305-6(a) Exception No. 2): Accept
SUBMITTER: Michael I. Callanan, International Brotherhood of Electrical Workers
COMMENT ON PROPOSAL NO: 3-139
RECOMMENDATION: Continue to Reject this proposal.
SUBSTANTIATION: We agree with the panel action and panel statement. GFCI protection is available, affordable and results in a much more acceptable degree of safety for all persons.
This comment represents the official position of the International Brotherhood of Electrical Workers Codes & Standards Committee.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1180)

3- 83 - (305-6(a) Exception No. 3): Reject
SUBMITTER: Frank Martucci, Fort Lee, NJ
COMMENT ON PROPOSAL NO: 3-140
RECOMMENDATION: Please accept this proposal.
After existing material add:
Exception No. 3: In all industrial establishments, a self monitoring, redundantly grounded, electrocution-proof, shall be permitted for all outlets.
SUBSTANTIATION: For the past thirteen years I have submitted proposals for the 1990, 1993, 1996, 1999, and the forthcoming 2002 National Electrical code that will prevent thousands of electricians and fiery deaths each and every year. Yet, despite my serious admonitions and allegations, code panels continue to reject my proposals sight unseen, without any demonstrations or testing whatsoever.

It boggles my mind that members of code making panels, most with no cord expertise whatsoever, can display such an indifference to human life. What if my system works? Don't they have any fear of being liable for thousands of deaths these past 13 years? Don't they have any fear of being liable for the loss of hundreds of thousands of homes each and every year?

I, for one, would demand extensive tests before I rejected a system that may indeed save thousands of lives each and every year.

My reaction to a single electrocution bordered on the fanatical. I immediately replaced undersized 3 conductor cords with 4 conductor cords to provide two #14, (15 amapacity) grounding conductors for all medical devices.

In addition, costly, and time consuming, outlet modifications were made to provide the redundancy every other federal agency, or responsible engineer, resorts to whenever lives are at stake.

The same redundancy I proposed that, together with a slight component modification, will prevent thousands of electrocutions and fiery deaths each and every year.

The same redundancy code panel members have unanimously rejected, time and again, the past 13 years. They not only reject the concept of redundancy, but they adamantly defend the use of conductors sized up to 50% less than required by our original National Electrical Code.

The original code, written under the influence of insurance companies, distinctly states the equipment grounding conductor shall be no smaller than #14 (15 ampacity) when used on a typical 15 ampere branch circuit.

However, when the NFPA took over the code making process in 1911, they established exceptions to the code whereby a #18 (7 ampacity) conductor is permitted to protect our people form line drop, shock , and electrocution.

This is a clear violation of our electrical code and detrimental to the electrical safety of every, man, woman, and child in our nation.

And it boggles my mind that, during the past 13 years, not a single panel member ever endorsed the use of redundancy. How can code panel members dedicated to electrical and fire safety fight so

vehemently to keep our people protected with a grounding conductor sized less than required by our original electric code?

If code panels see fit to jeopardize the lives of our people with undersized, rarely tested, equipment grounding conductors then at least provide two of them.

And this is what my proposal accomplishes. And to boot, a bonus wiring safeguard that will make our grounding system electrocution-proof and fire-proof.

And it is obvious that only a demonstration will convince the panels that two wire grounding redundancy together with a no-cost modification of existing cord components will indeed make the grounding system electrocution-proof and also fire-proof.

But until such a demonstration ever takes place, let me try again to convince the panel, in as plain English as possible, how little they know about our ill-conceived grounding system.

If the panels took the time to wire a plug each of the six ways it can be wired, they will discover that four of six ways will cause shock, electrocution or fiery death.

When plugged into a properly wired outlet, current will flow through inappropriate steel outlet mounting screws, outlet boxes, and raceways. Massive current from a heater or hotplate will cause overheating and possible undetectable fires inside the walls of dwellings.

And when plugged into an outlet, or extension cord, wired with reversed polarity, the exposed metal parts of appliances will become immediately charged with a full 120 volt potential.

A person holding a drill, for example, will become shocked, or electrocuted, because he, or she, is a poor conductor of electricity and lacks the impedance required to trip circuit breakers or blow fuses.

The wiring safeguard automatically provides the necessary impedance regardless of any wiring error and even though the wall outlet, or female connector of an extension cord, is wired with reversed polarity.

You see, by simply adding a second, redundant, grounding conductor there now exists three grounded conductors, two green and one white. If existing cord components are modified so that only the ground pole can be wired with two conductors, there is absolutely no possible way to wire a plug so as to cause a shock, electrocution or undetectable fires inside walls.

And the system is indeed a self-monitoring system unlike the existing system whereby four of six ways to wire existing cord components will electrocute or cause fiery deaths.

No costly assured grounding programs are required to assure proper wiring. Should miswiring cause a device to become energized, the second grounding conductor will automatically provide the necessary impedance required to activate branch circuit ground fault interrupters, converting them into GFCIs.

It is morally wrong for code panels to evaluate and reject proposals without any thorough demonstrations to prove the submitter's proposal is flawed.

How much easier it is to make live demonstrations. I could first demonstrate how I can make existing cord components electrocution-proof and fire-proof by simply drilling a hole or removing, or adding a tiny piece of metal.

And also make thorough demonstrations, with mock up outlets, exactly how the second ground conductor will prevent electrocutions, and fires inside walls, due to miswired cords.

I urge the panels to seek a demonstration before they reject my proposal.

PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Comment 3-75.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

ARTICLE 310 — CONDUCTORS FOR GENERAL WIRING

(Log #1630)

6- 4 - (Table 310-1): Accept
SUBMITTER: James M. Daly, BICC General
COMMENT ON PROPOSAL NO: 6-6
RECOMMENDATION: This proposal should be rejected.
SUBSTANTIATION: Relocating Table B-310-1 to Table 310-21 introduces a conflict in the Code as noted in the Technical Correlating Committee Comment since two tables now specify different amapcities for the same three conductor cable. The following table comparing the ampacities in Tables 310-21 and 310-16 for a three conductor cable with 90°C conductors. In all but one instance, Table 310-21 has slightly lower ampacities than Table 310-16. For the small difference in values, it does not support adding another ampacity table into Chapter 3.

Allowable Ampacities of Insulated Conductors Rated 0 through 2000 Volts, 90°C Not More than Three Current-Carrying Conductors in a Cable

Conductor (AWG/kcmil)	Table 310-21 30°C	Table 310-16 30°C
18		14
16		18
14*	21	25
12*	27	30
10*	36	40
8	48	55
6	65	75
4	89	95
3	102	110
2	119	130
1	137	150
1/0	163	170
2/0	186	195
3/0	214	225
4/0	253	260
250	276	290
300	317	320
350	345	350
400	371	380
500	427	430
600	468	475
700	514	520
750	529	535
800	543	555
900	570	585
1000	617	615
1250		665
1500		705
1750		735
2000		750

Table 310-16 already defines the ampacity of not more than three current-carrying conductors in a cable and includes sizes up to 2000 kcmil.

Table 310-21 limits the number of conductors to "two or three insulated conductors." If the equipment grounding conductor is insulated, then only two insulated current-carrying conductors would be permitted in the cable without derating. Table 310-21 also does not include conductors larger than 1000 kcmil.
PANEL ACTION: Accept.
PANEL STATEMENT: See panel action and submitter's substantiation on Comment 6-36.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Ferrell

(Log #2395)

6- 5 - (310-4): Reject
Note: The Technical Correlating Committee notes that the submitter's recommendation does not comply with Section 4-4.5 of the Regulations Governing Committee Projects.
SUBMITTER: Jonathan Henry, Arrow Dynamics
COMMENT ON PROPOSAL NO: 6-11
RECOMMENDATION: Determine minimum conductor size rated for ampacity of circuit. Use area in circular mills of single conductor divided by number of conductors in parallel to size parallel conductors.
SUBSTANTIATION: Not clear whether conductors are sized by finding a conductor that will be rated for desired current capacity and find a combination with game circular mill area or if desired

current capacity is divided by number of conductors to be used and then sized by the Tables in 310.
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter's recommendation in this comment does not comply with the NFPA Style Manual.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Ferrell

(Log #409)

6- 6 - (310-4 Exception No. 4): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
COMMENT ON PROPOSAL NO: 6-8
RECOMMENDATION: Accept in Part as follows:
Exception No. 4: Under engineering supervision, grounded neutral conductors ~~in sizes No. 2 and larger~~ shall be permitted to be run in parallel ~~for~~ with and existing ~~installation~~ 2 AWG or 1 AWG neutral conductor of a three-phase 4-wire wye-connected circuit where overheating of the existing neutral occurs due to high content of triplen currents.
Delete FPN.
SUBSTANTIATION: The present wording is broader and more permissive than what was apparently intended. The exception should apply to No. 2 and No. 1 conductors as "and larger" includes size 1/0 and larger conductors which may be paralleled by right of 310-4 without engineering supervision. Present wording permits paralleling of No. 2 and No. 1 grounded neutral of any existing installation, whether the circuit is single-phase or direct-current. It is my impression this exception was intended to relieve neutral circuit conductors in the 100 to 125 ampacity range where overloading had occured due to high harmonic currents. The FPN may explain the intended purpose but there is no mandatory requirement that limits the exception to this purpose.
PANEL ACTION: Reject.
PANEL STATEMENT: Present text of Section 310.4 Exception No. 4 is adequate. Since the Code limits the size of conductors to 1/0 AWG and larger for parallel runs, this exception was added to permit paralleling of conductors smaller than 1/0 AWG. This exception is applicable for existing installations where such change is essential and is performed under engineering supervision and the size of the neutral conductor is not smaller than 2 AWG.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Ferrell

(Log #2034)

6- 7 - (310-5 Exception No. 10 (New)): Reject
Note: The Technical Correlating Committee notes that the issue of redundant references will be submitted to the NEC Technical Correlating Committee Usability Task Group for the 2005 code cycle.
SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc.
COMMENT ON PROPOSAL NO: 6-14
RECOMMENDATION: Reject the proposal.
SUBSTANTIATION: If two wrongs don't make a right, surely ten don't either. If this proposal remains accepted, this laundry list will include ten references to Chapter 5, 6, or 7 articles, none of which are required by 90.3 and are supposed to no longer be allowable by 4.1 of the Style Manual. Furthermore, this consists of a one sentence rule and, now ten exceptions, which may well be the single most egregious violation of 3.1.4.2 in the Style Manual, prohibiting excessive numbers of exceptions. Enough.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel continues to accept Proposal 6-14.
The panel requests the Technical Correlating Committee to provide direction for the 2005 edition of the Code relative to eliminating unnecessary references to requirements contained in Chapters 5 thru 7 that modify Chapters 1 thru 4.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Ferrell

(Log #1868)

6- 8 - (310-8(d)): Reject
SUBMITTER: Timothy M. Croushore, Allegheny Power
COMMENT ON PROPOSAL NO: 6-17, 6-19 & 6-21
RECOMMENDATION: Code Making Panel 6 should accept Proposal 6-21.
SUBSTANTIATION: I agree with the substantiation of Mr. Cook, Mr. Cox and Mr. Schwan. I also agree with the explanation of negative statement of Mr. Burns. Conductors exposed at the weatherhead in the past have not been listed as sunlight resistant. Requiring the conductors be listed for sunlight resistance is a solution for a non-existent problem. Allegheny Power serves approximately 1.5 million customers in Pennsylvania, Virginia, West Virginia, Maryland and Ohio. Many of these customers have overhead electrical service. If this was truly a problem, we would see short circuits at the weatherhead and would be failing pole top transformers at a significant rate. Non-sunlight resistant wire at the weatherhead has not been a problem in the field.
PANEL ACTION: Reject.
PANEL STATEMENT: Sunlight deterioration is not a function of exposed cable length. The panel action ensures that the products exposed to sunlight meet the requirement for sunlight resistance.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Ferrell

(Log #2079)

6- 9 - (310-8(d)): Reject
SUBMITTER: Henry A. Jenkins, Wake County /Rep. NC Ellis Cannady Chapter IAEI
COMMENT ON PROPOSAL NO: 6-14a
RECOMMENDATION: None.
SUBSTANTIATION: If all cables and conductors are required to be listed as sunlight resistant then we support this proposal. If they are not then we do not support this proposal because we will have no way of knowing in the field which ones are and which ones are not.
PANEL ACTION: Reject.
PANEL STATEMENT: There is no recommendation provided or action requested in the comment.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Ferrell

(Log #726)

6- 10 - (310-8(d), Exception (New)): Reject
SUBMITTER: W. Creighton Schwan, Hayward, CA
COMMENT ON PROPOSAL NO: 6-22
RECOMMENDATION: Reconsider, and Accept this proposal.
SUBSTANTIATION: The millions of service drip loops installed over many decades with no failures attributed to the lack of sunlight resistance of the conductor insulation is evidence that this proposed exception is necessary.
A careful reading of the supporting comment strongly supports the need for this exception.
The fact that drip loops are well separated from each other, leave the service head in separate openings, are limited in length, and are in open air more than offsets the need for sunlight resistant insulation.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Comment 6-8. Supporting comment referenced in the substantiation supports the need for requirement for sunlight resistance in the Code to ensure that the products exposed to sunlight meet the requirement for sunlight resistance. It does not support the need for an exception as inferred by the submitter.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Ferrell

(Log #68)

6- 11 - (310-12(c)):

Note: It was the action of the Technical Correlating Committee that the panel action be rewritten as follows: "Exception: Conductor identification shall be permitted in accordance with 200-7". This action will remove the inconsistency in the wording of the title "Ungrounded Conductors" and the wording of the exception "Grounded Conductors".

SUBMITTER: Technical Correlating Committee National Electrical Code

COMMENT ON PROPOSAL NO: 6-35

RECOMMENDATION: The Technical Correlating Committee directs the panel to revise the Exception to form a complete sentence in accordance on the Style Manual. This action will be considered by the Panel as a Public Comment.

SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.

PANEL ACTION: Accept.

The panel accepts the direction of the Technical Correlating Committee.

Revise the Exception to 310-12(c) to read: Exception: Identification of grounded conductors shall be permitted in accordance with 200-7.

PANEL STATEMENT: Panel action revises the wording of the exception to comply with the NEC Style Manual.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 10

NOT RETURNED: 1 Ferrell

(Log #431)

6- 12 - (310-13): Reject

SUBMITTER: Dan Leaf, Palmdale, CA

COMMENT ON PROPOSAL NO: 6-39

RECOMMENDATION: Accept proposal.

SUBSTANTIATION: None of the wiring methods specified in Chapter 3 covers the overhead aerial open conductors between buildings, structure, or poles as noted in 225-4, 225-6, 225-14, 225-18, 225-19. Section 90-3 states Chapters 1, 2, 3, and 4 apply generally which I assume means they are of equal rank and Article 225 does not amend Chapter 3 nor does exception to that effect. Without a specific reference in Article 225 re: the type of conductors it is assumed insulated conductors will be a suitable type listed in the conductor tables. This section appears to be in literal conflict with the open aerial conductors of Article 225.

PANEL ACTION: Reject.

PANEL STATEMENT: There is no conflict between the installation requirements specified in 225-4, 225-6, 225-14, 225-18, and 225-19; and conductor construction and applications requirements specified in 310-13.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 10

NOT RETURNED: 1 Ferrell

(Log #834)

6- 13 - (310-13 Table 310-61): Accept in Principle

Note: The Technical Correlating Committee notes that Article 600 is under the purview of Code-Making Panel 18. The Technical Correlating Committee accepts the panel action of Code-Making Panel 6 to revise 600-32. This material will be under the jurisdiction of Code-Making Panel 18 after completion of the 2002 code cycle.

SUBMITTER: Larry F. Miller, National Electrical Manufacturers Association (NEMA)

COMMENT ON PROPOSAL NO: 6-40

RECOMMENDATION: The Panel should accept the original proposal in Principal in Part. Create a new table as shown and place in Article 600.

(table shown below)

SUBSTANTIATION: GTO cable is being used by electricians today as evidenced by no less than three articles in the Jan/Feb 2000 IAEI News. GTO cables are listed in the 1998 CEC Table D1 and are also described in the UL Greenbook in section ZTQX.

PANEL ACTION: Accept in Principle.

Revise 600-32(b) as follows:

(b) Insulation and Size. Conductors shall be insulated, listed as Gas Tube Sign and Ignition Cable, Type GTO, for the purpose, rated for 5, 10 or 15 kV, in sizes the voltage, not smaller than No. 18 AWG, and have a minimum temperature rating of 105ºC (221ºF).

PANEL STATEMENT: This material is not suitable for general wiring. The panel agrees with the submitter that this material is more appropriate in Article 600. CMP-6 provided these revisions to meet the intent of the submitter and requests that the TCC review this action and forward this material to CMP-18.

UL Directory states that: "Gas tube sign and ignition cable is Listed as single conductor Type GTO-5 (5,000 volts), GTO-10 (10,000), or GTO-15 (15,000 volts), in sizes Nos. 18-10 AWG copper, and Nos. 12-10 AWG aluminum and copper-clad aluminum. This material is intended for use with gas tube signs, oil burners, and inside lighting."

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 10

NOT RETURNED: 1 Ferrell

(Log #1064)

6- 14 - (310-13 Table 310-61): Reject

SUBMITTER: Lanny McMahill, Rep. IAEI SW Section

COMMENT ON PROPOSAL NO: 6-40

RECOMMENDATION: We support the intent of the proposal to include type GTO cable in Article 310 other appropriate article.

SUBSTANTIATION: Type GTO cable is mentioned as a conductor type in Article 600; however, there is no reference to this cable type in Articles 310, 400, 402, or 600. This oversight should be corrected.

PANEL ACTION: Reject.

Forward this comment to CMP-18 for information.

PANEL STATEMENT: See panel action and statement on Comment 6-13.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 10

NOT RETURNED: 1 Ferrell

Conductor Application and Insulation

Trade Name	Type Letter	AWG	Maximum Operating Temperature	Application Provision	Insulation	Outer Covering
Gas Tube And Ignition Cable	GTO[1]	18-10	105ºC[2]	Dry or wet Locations Rated 5, 10, or 15kV	Thermoplastic Or Thermoset	Jacket[3]

[1]Type GTO cable shall be restricted to a maximum ampacity of 300 milliamperes where installed for the secondary circuit conductors as required by Section 600-23(d).

[2]Higher temperature ratings are available when insulations with requisite properties are used.

[3]Some insulations do not require and outer jacket.

(Log #1541)

6- 15 - (310-13, Table 310-61): Reject
SUBMITTER: Michael J. Johnston, International Association of Electrical Inspectors
COMMENT ON PROPOSAL NO: 6-40
RECOMMENDATION: The panel should reconsider the intent and merit of this proposal. Although the location and code section may not appear to be appropriate for the proposed revision, the submitter does raise an excellent, and important point that leads to other issues that should be addressed in the NEC.
Original proposal: Add an additional type of conductor to this Table 310-61. Remainder of this section to remain as now shown in this table.
SUBSTANTIATION: Original Substantiation: Article 600 refers to a GTO Type of cable that has no reference in Article 310 and no one really knows what this conductor is.
Substantiation: This type conductor which is a high voltage application cable is and has been used by the sign industry for many years. This conductor is and has been listed by NRTLs for many years under UL Standard 814. The code has never defined Type GTO cable in Article 310 leaving confusion within the inspection community.
Comment: GTO cable is referred to by Article 600 as both a cable such as in Section 600-32(e) and (j) and as a conductor in other sections such as Section 600-32(a) through (h). This is an inconsistency that should be addressed by either Panel 6 or Panel 18 or both. This GTO cable is used as a conductor in Article 600 and is required to be installed in a wiring method as specified in Chapter 3 just as other conductors and cables covered by Chapter 3 of the code. The panels should consider inclusion of this type of conductor in Table 310-13 and the inclusion of all its properties and permitted uses as indicated for the other types of conductors listed in Table 310-13. I agree with the panel's comment about not including the GTO conductor or cable in Table 310-61, but I don't agree totally with the rejection of the proposal completely. There are serious issues with GTO conductors and cables that should be addressed, both in Standard 814 and the NEC. For example, the Code requires that conductors and cables installed in wet locations be of a type marked with a "W" or be listed for use in wet locations [(310-8(c)]. GTO conductors or cables are not even listed as suitable for wet locations, yet they are continuously and regularly used in wet locations outdoors in neon and cold-cathode high voltage secondary circuits. There are many fires that are linked to secondary circuits of neon signs or neon outline lighting systems. Perhaps this issue should be addressed and looked at from the standpoint that maybe GTO conductors or cables that carry high voltage are contributing to this problem. This may not be able to be addressed by Panel 6 in this cycle, but should be referred to Panel 18 or held for further study and appropriate action taken to investigate the standard for these conductors and cables and how the code requires them to be used. That use should be within the limitations of the standard and the code. Recommend supporting the intent of the proposal to include type GTO cable in Article 310 or other appropriate code article. Type GTO cable is mentioned as a conductor type in Article 600; however, there is no reference to this cable type in Articles 310, 400, 402 or 600. This oversight should be corrected.
PANEL ACTION: Reject.
Forward this comment to CMP-18 for information.
PANEL STATEMENT: See panel action and statement on Comment 6-13.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Ferrell

(Log #1372)

6- 16 - (310-15(a)): Reject
SUBMITTER: Kari Barrett, American Chemistry Council
COMMENT ON PROPOSAL NO: 6-49
RECOMMENDATION: The Panel should Accept this proposal as submitted.
SUBSTANTIATION: This is an attempt to make the NEC more "user friendly". Providing cross-reference tables will add to the usability of the NEC. The cross reference tables do not add to the usability of the individual tables but do add to the usability of the numerous tables contained in the Article. The number of Ampacity tables included in the mandatory portion of the NEC has increased and so has the probability of error. The goal of the Code-Making Panels should be to reduce the probability of error in using the NEC. Assisting users in selecting the correct table helps assure a correct installation.
PANEL ACTION: Reject.
PANEL STATEMENT: No new technical substantiation to support the recommendation has been provided. The titles of the ampacity tables are self-explanatory.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 9
NEGATIVE: 1
NOT RETURNED: 1 Ferrell
EXPLANATION OF NEGATIVE:
PETTIGREW: The panel should accept this comment. The cross-reference table(s) would assist the code user in locating the correct ampacity table for their application. They would provide a convenient reference in one place for all listed applications, steering the code user directly to the correct ampacity table and reducing the probability of selecting the incorrect table in error. Aiding code users in selecting the correct table helps to assure a safe and correct installation. Providing the cross-reference table(s) will also add to the usability of the NEC. The number of ampacity tables included in the mandatory portion of the NEC has increased, resulting in a greater probability of error by the user in the field. Adding the cross-reference table(s) will reduce the margin of error in using the NEC.

(Log #1373)

6- 17 - (310-15(a)): Reject
SUBMITTER: Kari Barrett, American Chemistry Council
COMMENT ON PROPOSAL NO: 6-48
RECOMMENDATION: The Panel should Accept this proposal as submitted.
SUBSTANTIATION: This is an attempt to make the NEC more "user friendly". Providing cross-reference tables will add to the usability of the NEC. The cross reference tables do not add to the usability of the individual tables but do add to the usability of the numerous tables contained in this Article. The number of Ampacity tables included in the mandatory portion of the NEC has increased and so has the probability of error. The goal of the Code-Making Panels should be to reduce the probability of error in using the NEC. Assisting users in selecting the correct table helps assure a correct installation.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Comment 6-16.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 9
NEGATIVE: 1
NOT RETURNED: 1 Ferrell
EXPLANATION OF NEGATIVE:
PETTIGREW: See my explanation of negative vote on Comment 6-16.

(Log #2218)

6- 18 - (310-15(a)): Reject
SUBMITTER: Robert H. Keis, Dover, DE
COMMENT ON PROPOSAL NO: 6-51
RECOMMENDATION: This proposal should be accepted.
SUBSTANTIATION: This proposal should be accepted provided the test data has been submitted and is true. Having wired many, many houses I cannot think of any situation where bundled cables would be subjected to any thing near the rating of the cables when in dwelling use. The loads simply are not there. If the tests were to run using 12.5 amp per cable as stated, this would be greatly exaggerated load for dwellings. There is simply no way that these loads would ever be applied in a dwelling. There is too much diversity.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel can only act on data submitted with the recommendation. No data was submitted with either the proposal or the comment.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Ferrell

(Log #1708)

6- 19 - (310-15(a)(1)): Reject
SUBMITTER: Jason Mesner, Niles, MI
COMMENT ON PROPOSAL NO: 6-52
RECOMMENDATION: Change Reject to Accept in Principle and in the place of "electrical" use qualified.
SUBSTANTIATION: Many engineers other than electrical engineers are qualified to deal with electrical code issues. Many electrical engineers are not qualified based on their training and experience.
PANEL ACTION: Reject.
PANEL STATEMENT: Engineering supervision does not require additional qualifiers to ensure that a particular installation complies with the applicable requirements of the Code.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Ferrell

(Log #1676)

6- 20 - (310-15(a)(2), Exception): Reject
SUBMITTER: Joel Norton, Manistique, MI
COMMENT ON PROPOSAL NO: 6-56
RECOMMENDATION: Change "reject" to accept in principal.
Delete remainder of exception starting with ten feet and substitute the following words
450 mm (18 in).
SUBSTANTIATION: It is my understanding that a testing laboratory has determined that the wire will cool in only a few inches. A distance of ten feet is excessive in this situation. In 410-67(c) for Recessed Fixtures where temperature of wires can be extreme, a distance of eighteen inches is required. Once again, proving that ten feet is an excessive distance.
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter provided no data with either the proposal or the comment.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Ferrell

(Log #1374)

6- 21 - (310-15(b)): Reject
SUBMITTER: Kari Barrett, American Chemistry Council
COMMENT ON PROPOSAL NO: 6-58
RECOMMENDATION: The Panel should Accept this proposal as submitted.
SUBSTANTIATION: This is an attempt to make the NEC more "user friendly". Providing cross-reference tables will add to the usability of the NEC. The cross reference tables do not add to the usability of the individual tables but do add to the usability of the numerous tables contained in this Article. The number of Ampacity tables included in the mandatory portion of the NEC has increased and so has the probability of error. The goal of the Code-Making Panels should be to reduce the probability of error in using the NEC. Assisting users in selecting the correct table helps assure a correct installation.
PANEL ACTION: Reject.
PANEL STATEMENT: No new technical substantiation to support the recommendation has been provided. The titles of the ampacity tables are self-explanatory.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 9
NEGATIVE: 1
NOT RETURNED: 1 Ferrell
EXPLANATION OF NEGATIVE:
PETTIGREW: See my explanation of negative vote on Comment 6-16.

(Log #1379)

6- 22 - (310-15(b)(2)): Reject
SUBMITTER: Kari Barrett, American Chemistry Council
COMMENT ON PROPOSAL NO: 6-239
RECOMMENDATION: Panel should Accept this proposal as submitted.
SUBSTANTIATION: This is an attempt to make the NEC more "user friendly". Providing cross-reference tables will add to the usability of the NEC. The cross reference tables do not add to the usability of the individual tables but do add to the usability of the numerous tables contained in this Article. The number of Ampacity tables included in the mandatory portion of the NEC has increased and so has the probability of error. The goal of the Code- Making Panels should be to reduce the probability of error in using the NEC. Assisting users in selecting the correct table helps assure a correct installation.
PANEL ACTION: Reject.
PANEL STATEMENT: No new technical substantiation to support the recommendation has been provided. The titles of the ampacity tables are self-explanatory.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 9
NEGATIVE: 1
NOT RETURNED: 1 Ferrell
EXPLANATION OF NEGATIVE:
PETTIGREW: See my explanation of negative vote on Comment 6-16.

(Log #1729)

6- 23 - (310-15(b)(2)): Reject
SUBMITTER: Don Ganiere, Ottawa, IL
COMMENT ON PROPOSAL NO: 6-59
RECOMMENDATION: This proposal should be accepted.
SUBSTANTIATION: The panel statement that "this requirement does not deal with the sizing of equipment grounding conductors" is exactly my point. An adjustment in size of the EGC is not required, but many field inspectors are applying the adjustment factor to both the current carrying and equipment grounding conductors.
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter appears to be mixing the requirements of Section 310-15(b)(2) for current-carrying conductors with the requirement stated in Section 250-122(b) for equipment grounding conductor.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Ferrell

(Log #780)

8- 4 - (Table 310-15(b)(2)9; Chapter 9, Table1 ; Appendix Table C1): Reject
SUBMITTER: Reuben R. Hearn, Heranco Electric Co. Inc.
COMMENT ON PROPOSAL NO: N/A
RECOMMENDATION: Delete these tables and code section. Have 1 table for conduit fill for size of conduit and number of conductors with derating factor in the table.
SUBSTANTIATION: Inspectors and electricians have problems with conduit fill with derating of conductor. Please see if this can be made simpler for users of the code.
PANEL ACTION: Reject.
PANEL STATEMENT: Section 4-4.5(b) of the NFPA Regulations Governing Committee Projects requires a submitted comment to include the proposal number to which the comment is directed. This comment contained no proposal reference.
Section 4-4.5(c) of the NFPA Regulations Governing Committee Projects requires a submitted comment to include "proposed text of the comment, including the wording to be added, revised (and how revised), or deleted." This comment did not contain "the wording to be added, revised (and how revised), or deleted."
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #432)

6- 24 - (310-15(b)(2)a Exception No. 5 (New)): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
COMMENT ON PROPOSAL NO: 6-71
RECOMMENDATION: Accept proposal, or Accept in Principle revised as follows:

Exception No. 5: Where multiple sets of conductors of the same circuit are installed in the same portion of a raceway covered by Articles 354, 356, or 358, and each set of conductors is terminated at only one outlet, the total number of such conductors shall be permitted to be counted as that number of current-carrying conductors that comprise one set of conductors, for de-rating purposes.

SUBSTANTIATION: The intent of the proposal and the comment is to mitigate the draconian reduction in allowable ampacity which results where a succession of outlets in a run of raceways covered by Articles 354, 356, or 358 are individually fed from a header or trench duct or junction box by an individual set of conductors terminating at only one outlet but connected to the same circuitry.

For example, consider an underfloor raceway with twelve receptacle outlets at intervals along the raceway, each outlet individually fed by a set (two) of conductors and all sets connected to the same 20-ampere circuit. The total number of conductors is twenty-four which requires an allowable ampacity reduction to 45 percent of the conductor ampacity. If 75 degree C. copper conductors are used, a minimum No. 8 supply conductors to the receptacles is required, even if the computed load for each receptacle is a minimum 180 volt-amperes (1.5 amperes). The application of this section to such installations results in:

(1) An unrealistic reduction in the allowable current for such conductors; (2) the oversize conductors diminish the available 40% fill area of the raceway; (3) an unrealistic reduction of allowable ampacity of all other conductors in the same portion of the raceway; (4) inefficient use of resources (conductors); (5) economic incentives to install such outlets in a "daisy chain" configuration, loop-wired and fed by a single set of conductors.

Where such outlets are loop-wired in a "daisy chain" configuration and the first supplied outlet is removed, there is a greater likelihood the conductors will be reinsulated and not removed, rather than resupply the next downstream outlet with a new set of conductors. This violation of Code is difficult to prevent or detect since generally no inspection is required for removal of wiring.

The total voltage drop and heat generated in multiple sets of conductors as indicated in the example would be less than that occurring where a single set of conductors supplies multiple outlets.

PANEL ACTION: Reject.

PANEL STATEMENT: There is no assurance in the recommendation or in the substantiation that either one or more receptacles will be limited to 1.5 amperes or only one receptacle will operate at any given time. Code requirements are to ensure safe installation and not necessarily for less or more expensive installations. Typically, a fact-finding report is provided to amend such requirements. Further, the Code does not prohibit the proposed recommendation, whereby separate conductors feed each outlet when other applicable requirements are met.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 10

NOT RETURNED: 1 Ferrell

(Log #428)

6- 25 - (310-15(b)(3)): Reject

SUBMITTER: Dan Leaf, Palmdale, CA

COMMENT ON PROPOSAL NO: 6-76

RECOMMENDATION: Accept in principle revised:

"(3) Where bare or <u>covered</u> circuit conductors are used in close proximity with insulated conductors ~~their allowable ampacity shall be limited to those permitted for the adjacent insulators~~ <u>they shall be considered to have insulation equal to the lowest insulation temperature rating of the adjacent insulated conductors for the purpose of determining their allowable ampacity.</u>

<u>Exception: Uninsulated conductors of Type SE cable shall be considered to have the same ampacity of the insulated conductors."</u>

SUBSTANTIATION: Present text appears to allow bare conductors to have an ampacity equal to but not to exceed the allowable ampacity of the insulated conductors regardless of the size or material of the bare conductors. Code tables do not indicate ampacities of bare conductors in raceways or cables. The proposal specifies "lowest" insulation temperature rating since circuit conductors may have different insulation ratings. If a bare grounded neutral conductor is twice the size of the ungrounded insulated phase conductors to compensate for high harmonic currents, the present text limits the ampacity to that of the phase conductors.

PANEL ACTION: Reject.

PANEL STATEMENT: No new technical substantiation to change the requirement was provided. Further, Section 310-15(b)(3) correlates with Section 310-15(b)(4). Typically, an insulated grounded conductor would be used for applications that require a larger size grounded conductor to compensate for high harmonic currents.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 10

NOT RETURNED: 1 Ferrell

(Log #280)

6- 26 - (310-15(b)(4)(a)): Reject

SUBMITTER: James A. Popma, Engineering Design Assoc., Inc. (F.D.A. Inc.

COMMENT ON PROPOSAL NO: 6-77

RECOMMENDATION: Revise as follows:

(a) A <u>common</u> neutral conductor that carries only the unbalanced current from other conductors of the same <u>multi-wire</u> circuit shall not be required to be counted when applying the provisions of section 310-15(b)(2)(a).

SUBSTANTIATION: I know of contractors who are using this paragraph as an exception for not counting the neutrals of 120V, 2-wire circuits (when derating because of multiple conductors in the same raceway).

Example: Multiple lighting circuits in the same raceway, because dimming is required each circuit needs a separate neutral. The contractor is only counting the phase conductors as current carrying conductors when using Table 310-15(b)(2)(a). I think the above change would help clarify their misunderstanding.

PANEL ACTION: Reject.

PANEL STATEMENT: The proposed wording does not add any clarification to the existing requirement. The example given in the substantiation does not comply with the Code.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 10

NOT RETURNED: 1 Ferrell

(Log #427)

6- 27 - (310-15(b)(6)): Reject

SUBMITTER: Dan Leaf, Palmdale, CA

COMMENT ON PROPOSAL NO: 6-81

RECOMMENDATION: Accept in principle revised:

"For application of this section the main power feeder(s) shall be the feeder(s) between the ~~main disconnect~~ <u>service disconnecting means</u> and the lighting and appliance branch-circuit panelboard(s), and the feeder conductors shall not be required to ~~be larger~~ <u>have and ampere rating greater</u> than the service-entrance conductors."

SUBSTANTIATION: "Main disconnect" (singular) infers there is only one service switch or breaker. Service disconnecting means may consist of up to six devices. The table indicates an aluminum main power feeder size 4/0 is rated for 200 amperes. If the service-entrance conductor is copper, it may be rated for 200 amperes and be 2/0. The feeder would be larger. Ampere rating should be specified in lieu of "larger" which relates to size of the conductor.

PANEL ACTION: Reject.

PANEL STATEMENT: Present wording does not lead to the interpretation included in the substantiation provided by the submitter. "Larger than" means that a comparison of equals is made. If service-entrance is 4/0 AWG than the feeder is not required to be larger than 4/0 AWG (of same conductor material). Alternatively, if service-entrance is 2/0 AWG copper than the feeder is not required to be larger than 2/0 AWG copper (or the electrical equivalent 4/0 AWG aluminum).

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 10

NOT RETURNED: 1 Ferrell

(Log #2035)

6- 28 - (310-15(b)(6)): Accept
SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc.
COMMENT ON PROPOSAL NO: 6-84
RECOMMENDATION: Reject the proposal.
SUBSTANTIATION: This does not belong in Article 310. Code-Making Panel 7 has made the necessary revision in Art. 338.
PANEL ACTION: Accept.
PANEL STATEMENT: The panel understands that Code-Making Panel 7's action on Proposal 7-205 and Comment 7-97 will correct an inadvertent oversight in Article 338. By accepting this comment, panel has reviewed its action on Proposal 6-84 and rejects the recommendation made in Proposal 6-84, as it is no longer necessary.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Ferrell

(Log #CC600)

6- 28a - (310-15(b)(7)): Accept
Note: The Technical Correlating Committee understands that this Comment is on Proposal 6-90 and not 6-89.
SUBMITTER: CMP 6
COMMENT ON PROPOSAL NO: 6-89
RECOMMENDATION: To correlate with panel action on Comment 6-30, change the action on Proposal 6-90 from "Accept in Principle" to "Accept". This action will delete Section 310-15(b)(7).
SUBSTANTIATION: The panel action by CMP-7 on Comment 7-13 which modified Proposal 7-88 satisfies the panel action and panel statement on Proposal 6-90. Also see panel action and statement on Comment 6-30.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Ferrell

(Log #1555)

6- 29 - (310-15(b)(7)): Reject
SUBMITTER: Ravindra H. Ganatra, Alcan Cable
COMMENT ON PROPOSAL NO: 6-89
RECOMMENDATION: Continue to accept Proposal as Accept in Principle in Part and revise 310.15(B)(7) shown in ROP Draft as shown below:
"(7) Mineral-Insulated, Metal-Sheathed Cable. The temperature limitations on which the ampacities of mineral-insulated, metal-sheathed cable are based shall be determined by the insulating materials used in the end seal fitting. The conductor temperature at the termination shall not exceed the listed temperature rating of the end seal fitting and the installation shall comply with temperature ratings of termination and equipment. When mineral insulated cable is bundled in accordance with ~~330.16~~330.10(11), ampacities from applicable ampacity tables ~~can be used in accordance with 110.14 provided the temperature limit of the cable's end seal fitting is not exceeded~~ are permitted to be used, provided the temperature limit of the cable's end seal fitting is not exceeded and the installation is in compliance with temperature ratings of termination and equipment."
SUBSTANTIATION: See my comment submitted with affirmative vote on this proposal.
To correlate with actions taken by CMP 7 to develop 330.40(B) and 330.80. Proposed revision of 330.80 (shown in ROP Draft) submitted to CMP 7 on Proposal 7-88 is as follows:
330.80 Ampacity.
(A) General. The ampacity of Type MI cable shall be determined in accordance with 310.15. The conductor temperature at the end seal fitting shall not exceed the ~~listed~~ temperature rating of the listed end seal fitting and the installation shall comply with temperature ratings of termination and equipment.
(B) Type MI Cable Installed in Cable Tray. The ampacities for Type MI cable installed in cable tray shall be determined in accordance with 318.11 and the installation shall comply with temperature ratings of termination and equipment.
(C) Single Type MI Conductors Grouped Together. Where single Type MI conductors are grouped together in a triangular or square configuration, as required by ~~330.16~~330.10(11), and installed on a messenger or as open runs with a maintained free air space of not less than 2.15 times one conductor diameter (2.15 x O.D.) of the largest conductor contained within the configuration and adjacent conductor configurations or cables, the ampacity of the conductors shall not exceed the allowable ampacities of Table 310.17 and the installation shall comply with temperature ratings of termination and equipment.
~~The conductor temperature at the end seal fitting shall not exceed the listed temperature rating of the end seal fitting.~~
Via this comment, CMP 6 is requested to revise 310.15(B)(7) to clarify the use of ampacity values for MI Cable while supporting enforcement of other applicable requirements (i.e. temperature limitation) for installation.
Notes for this comment:
(1) Acceptance of this comment will facilitate acceptance of a separate comment, on Proposal 7-88 to revise 330.80 (as shown above), by CMP 7.
(2) Acceptance of this comment supports correlation between actions taken on Proposals 6-88, 89, 90, 91, 92, 93, 94, 106, and 113; and 7-82, 83, 86 and 88.
(3) Request that this comment be forwarded to CMP 1 and CMP 7 for their information.
Alternatively, since CMP 6 has the responsibility for ampacity, CMP 6 may consider revising 310.15(B)(7) as follows:
310.15(B)(7). Ampacity and Temperature Limitations. Ampacity values allowed in Table 310.16 are used to determine temperature ratings of termination and equipment as identified in 110.14(C). Unless permitted specifically in the Code, use of all other values of ampacity greater than those allowed in Table 310-16 and determined in accordance with 310.15(B) or 310.15(C) shall be identified and the installation shall comply with temperature ratings of termination and equipment.
Since this is new text and other correlated changes may be necessary, CMP 6 is requested to send this suggestion (with or without making a judgement at the present time) to the Usability Task Group.
PANEL ACTION: Reject.
Delete 310-15(b)(7).
PANEL STATEMENT: See panel action and statement on Comment 6-30.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Ferrell
COMMENT ON AFFIRMATIVE:
GANATRA: See my Comment on Affirmative on Comment 6-30.

(Log #1776)

6- 30 - (310-15(b)(7)): Reject
SUBMITTER: Jim Pauley, Square D Company
COMMENT ON PROPOSAL NO: 6-91
RECOMMENDATION: Revise the wording from the ROP as follows:
The conductor temperature at the end seal termination shall not exceed the listed temperature rating of the end seal fitting. When mineral insulated cable is bundled in accordance with 330-16, ampacities from applicable ampacity tables ~~can~~ shall be permitted to be used. At the termination to equipment, the ampacity of the MI cable shall be based on requirements specified in 110-14(C). ~~in accordance with 110-14 provided the temperature limit of the cable's end seal fitting is not exceeded.~~
SUBSTANTIATION: The wording as accepted by the panel can easily be misinterpreted to allow MI cable to have increased ampacities at equipment terminations. The confusions comes from the use of the word "termination" in the first sentence. To address that issue, the words "end seal" have been added to make it clear that it is the termination to the end seal that is being discussed and not the termination to the equipment.
The third sentence of the proposal language introduces further confusion. MI cable cannot be used to meet 110-14 at equipment terminations if the ampacities are based on other those found in 310-16. The language from the panel implies that you can use Tables 310-17 and 310-18 for the ampacity and still be in compliance with 110-14. This is not true. CMP 1 accepted proposal 1-227 to clearly address the issue about which table can be used when selecting ampacity of conductors at the termination. The language included with this comment is to make it clear that when you get to the equipment termination, the rules set forth in

110-14(C) must be followed. This will limit selection to the proper table for the equipment termination.
Leaving the section as worded in the ROP introduces what can be interpreted as a direct conflict with 110-14(C).
PANEL ACTION: Reject.
Delete 310-15(b)(7).
PANEL STATEMENT: Code-Making Panel 6 has reviewed panel action on Proposal 7-88 and agrees with the action taken by Code-Making Panel 7. Panel action by CMP-7 negates the need for 310-15(b)(7). The rejection by CMP-6 of this comment and panel action on Proposal 6-90 will result in deletion of Section 310-15(b)(7).
The action is consistent with the action taken on Proposal 6-90.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Ferrell
COMMENT ON AFFIRMATIVE:
GANATRA: Panel Action refers to Comment 7-88. Reference should be to Proposal 7-88. Although we agree with the intent of the panel action that 310-15(B)(7) can be deleted from its present location. However, Panel 7's action on Proposal 7-88 should include reference to 110-14 to provide a complete assurance that temperature of MI Cable will not exceed its rating of 90 degrees C. Panel 6 should insist on such clarification.
Panel 6 should review the following comment with negative vote on Comment 7-15 (on Proposal 7-88).

(Log #926)

6- 31 - (310-15(c)): Reject
SUBMITTER: John E. Conley, Stratford, CT
COMMENT ON PROPOSAL NO: 6-92
RECOMMENDATION: Accept the proposal.
SUBSTANTIATION: These comments apply, individually, and collectively, to the following proposed actions published in the ROP for the 2002 NEC.
1-101 (100-Ampacity)
6-92 (310-15(c))
6-120 (310-60(d))
6-126 (Table 310-67)
6-127 (Table 310-68)
6-128 (Table 310-69)
6-129 (Table 310-70)
6-130 (Table 310-71)
6-131 (Table 310-72)
6-132 (Table 310-73)
6-133 (Table 310-74)
6-134 (Table 310-75)
6-135 (Table 310-76)
6-136 (Table 310-77)
6-137 (Table 310-78)
6-138 (Table 310-79)
6-139 (Table 310-80)
6-140 (Table 310-81)
6-141 (Table 310-82)
6-142 (Table 310-83)
6-143 (Table 310-84)
6-144 (Table 310-85)
6-145 (Table 310-86)
6-223 (B-310-15(b)(1))
6-226 (Table B-310-1)
6-228 (B-310-15(b)(2))
6-231 (Table B-310-3)
6-232 (Table B-310-5)
6-233 (Table B-310-6)
6-234 (Table B-310-7)
6-235 (Table B-310-8)
6-236 (Table B-310-9)
6-237 (Table B-310-10)
All of these proposals should be accepted.
Individual panel comments seem to fall into three major categories: (1) 'Scientific ampacity' does not appear in the NEC; (2) The present definition is entirely satisfactory; (3) All NEC ampacities are scientific
My comments:
(1) These proposals were inspired by the panel's rejection, three years ago, for this very reason. Proposal 1-101 deals with the definition; the others deal with introducing the term into the text where appropriate.
(2) The present definition is great; very carefully crafted. It is not wrong, but it is inadequate. It applies only for those ampacities based strictly on thermal considerations, such as those in the tables listed above. Other ampacities are based on a multiplicity of factors (see section 310-15(b) FPN) beyond the scope of the existing definition. An objective observer would certainly conclude that the present definition is not entirely satisfactory.
(3) This is a very interesting observation. It can be reasonably stated that everything in the Code is scientific, but that obscures the point that a tremendous amount of judgment often modifies pure science. That is as it should be. In this case, what I have called scientific ampacities are pure science. They are calculated using only recognized scientific principles; nothing judgmental. They spring from the field of technology and computers. Other ampacities come from the field of wisdom, and cannot be calculated scientifically.
PANEL ACTION: Reject.
PANEL STATEMENT: Replacing the word "conductor" with "scientific" would make the text inconsistent with the rest of the section that addresses the ampacity of conductors.
See panel statement on Comment 6-43.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Ferrell

(Log #2108)

6- 32 - (310-15(c)): Reject
SUBMITTER: Truman C. Surbrook, Michigan State University
COMMENT ON PROPOSAL NO: 6-94
RECOMMENDATION: Change Reject to Accept.
SUBSTANTIATION: If this section makes reference to the calculations of conductor ampacity in Appendix B, then it should also permit the tables in the Appendix to be used. The section uses the phrase "shall be permitted," therefore, this is not a requirement.
PANEL ACTION: Reject.
PANEL STATEMENT: No new technical substantiation provided. The recommendation would use non-mandatory text from the appendix as mandatory requirements. Tables provided in Appendix B provide examples of the formula provided in Section 310-15(c) under specific conditions. Formula provided in Section 310-15(c) is used under engineering supervision for given applications.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Ferrell

(Log #69)

6- 33 - (Table 310-20): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 6-113
RECOMMENDATION: It was the action of the Technical Correlating Committee that this Proposal be reconsidered and correlated with the action on Proposal 7-88. This action will be considered by the Panel as a Public Comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
PANEL STATEMENT: There is no correlation issue between the panel action on Proposal 7-88 as modified by Comment 7-13 and the panel action on Proposal 6-113.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Ferrell

(Log #1709)

6- 34 - (Table 310-20): Accept in Principle
SUBMITTER: Jeff Palovich, Flint, MI
COMMENT ON PROPOSAL NO: 6-112
RECOMMENDATION: Change "accept in principle" to accept.

SUBSTANTIATION: The original proposal clearly includes duplex, triplex, and quadruplex. The panel's action appears to be ruling out quadruplex by referring to only three current carrying conductors. A three phase four wire feeder has four current carrying conductors.
PANEL ACTION: Accept in Principle.
Revise the title of Table 310-20 to read:
Table 310-20. Ampacities of not more than Three Single- Insulated Conductors, Rated 0 Through 2000 Volts, Supported on a Messenger, Based on Ambient Air Temperature of 40oC (104oF).
PANEL STATEMENT: Title was revised to provide ampacities for duplex, triplex and quadraplex. Where the messenger is a current-carrying conductor and acting as a neutral, the insulated conductors need not be derated per 310-15(b)(4)(a).
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Ferrell

(Log #2036)

6- 35 - (Table 310-20): Reject
SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc.
COMMENT ON PROPOSAL NO: 6-113
RECOMMENDATION: In addition to the panel action accepting the proposal, and in order to correlate with the result of Code-Making Panel 7 action on Proposal 7-88, add an asterisk note to the MI designation as follows:
"Multiconductor cable; for single conductor cable, see 330.80." Then add "MI**" to the 90°C copper column of Table 310.17 with the following note: "**Single conductors as allowed in 330.80. For multiconductor cable see Table 310.16 or Table 310.20 where run on a messenger."
SUBSTANTIATION: This provides the necessary correlation to address the Technical Correlating Committee note.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Comment 6-33.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Ferrell

(Log #1554)

6- 36 - (Table 310-21): Accept
SUBMITTER: Ravindra H. Ganatra, Alcan Cable
COMMENT ON PROPOSAL NO: 6-6
RECOMMENDATION: Reject this proposal.
Note: Panel action was to renumber existing Table 310-21 to 310-23 and relocate Table B-310-1 as Table 310.21. Also, Panel Action on Proposal 6-115 was to relocate Table B-310-3 as Table 310.22. A separate comment has been submitted to reject that Panel Action also. If both comments are accepted then Tables B-310-1 and B-310-3 will remain in Appendix B and will be numbered as B.310.1 and B.310.3, respectively. Existing Table 310-21 will remain as is and will be numbered as Table 310.21.
SUBSTANTIATION: Table B-310-1 should be used where ampacity is calculated under engineering supervision as stated in Appendix B. Where cables are installed in raceways and ampacities are not determined under engineering supervision, Table 310-16 provides allowable ampacities.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Ferrell

(Log #70)

6- 37 - (Table 310-22): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 6-115
RECOMMENDATION: It was the action of the Technical Correlating Committee that this Proposal be reconsidered and correlated with Table 310-16. This proposal will be refered to Code Making Panel 7 for information. This action will be considered by the Panel as a Public Comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
PANEL STATEMENT: See panel action on Comment 6-38.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Ferrell

(Log #1556)

6- 38 - (Table 310-22): Accept
SUBMITTER: Ravindra H. Ganatra, Alcan Cable
COMMENT ON PROPOSAL NO: 6-115
RECOMMENDATION: Reject this proposal.
Note: Panel action was to renumber existing Table 310-21 to 310-23 and relocate Table B-310-3 as Table 310.22. Also, Panel Action on Proposal 6-6 was to relocate Table B-310-1 as Table 310.21. A separate comment has been submitted to reject that Panel Action also. If both comments are accepted then Tables B-310-1 and B-310-3 will remain in Appendix B and will be numbered as B.310.1 and B.310.3, respectively. Existing Table 310-21 will remain as is and will be numbered as Table 310.21.
SUBSTANTIATION: Table B-310-3 should be used where ampacity is calculated under engineering supervision as stated in Appendix B. Use of this table will create a conflict with Table 310-16 as the values provided in Table 310-16 are used (without engineering supervision) for conductors in multiconductor cables in ambient air at 30 degree C. If needed, adjustment can be made for ambient temperature of 40 degree C.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Ferrell

(Log #1629)

6- 39 - (Table 310-22): Accept
SUBMITTER: James M. Daly, BICC General
COMMENT ON PROPOSAL NO: 6-115
RECOMMENDATION: This proposal should be rejected.
SUBSTANTIATION: Addition of Table 310-22 introduces a conflict in the Code as noted in the Technical Correlating Committee Comment since two tables now specify different ampacities for the same three conductor cable in air. See the table comparing the ampacities for a three conductor cable with 90°C conductors in air when Table 310-22 is corrected to 30°C. Table 310-22 permits significantly higher ampacities than those allowed by Table 310-16.

Allowable Ampacities of Insulated Conductors Rated 0 through 2000 Volts, 90°C Not More than Three Current-Carrying Conductors in a Cable

Conductors	Table 310-22		Table 310-16
(AWG/kcmil)	40°C	30°C	
18	11*	12	14
16	16*	18	18
14*	25*	28	25
12*	32*	35	30
10*	43*	47	40
8	59	65	55
6	79	87	75
4	104	114	95
3	121	133	110
2	138	152	130
1	161	177	150
1/0	186	205	170
2/0	215	237	195
3/0	249	274	225
4/0	287	316	260
250	320	352	290
300	357	393	320
350	394	433	350

400	425	468	380
500	487	536	430
600	538	592	475
700	589	648	520
750	615	677	535
800	633	696	555
900	670	737	585
1000	707	778	665
1250			665
1500			705
1750			735
2000			750

Table 310-6 already defines the ampacity of not more than three current-carrying conductors in a cable and includes sizes up to 2000 kcmil.

Table 310-22 limits the number of conductors to "not more than three insulated conductors." If the equipment grounding conductor is insulated, then only two insulated current-carrying conductors would be permitted in the cable without derating. Table 310-22 also does not include conductors larger than 1000 kcmil.

Table 310-22 is based on an ambient temperature of 40°C while Tables 310-16 and 310-17 are based on 30°C. If another Table is to be added into 310, the parameters should be consistent with the existing Tables.

Table 310-22 is not as conservative as Tables 310-16 and 310-17. If Table 310-22 is added, then Tables 310-16 and 310-17 should be completely revised to be consistent with Table 310-22.

PANEL ACTION: Accept.
PANEL STATEMENT: See panel action and submitter's substantiation on Comment 6-38.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Ferrell

(Log #2037)

6- 40 - (Table 310-22): Accept
SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc.
COMMENT ON PROPOSAL NO: 6-115
RECOMMENDATION: Reject the proposal.
SUBSTANTIATION: For the specified cable types in Table B-310-3 (including UF, MC, etc.) this action results in two conflicting ampacities for similar conductors, which will create chaos. For example compare the ampacity of No. 6 Type MC cable. In Table 310.16 at 75°C, its ampacity is 65A. The new table makes the same cable 77A, figured at the same temperature limitation (after correcting or the ambient temperature differences between the tables, which will be its own source of endless discussion.) Will the real MC cable ampacity please take a bow? The difference for this common wire size is a full standard overcurrent device.

When this table was created in the 80s, it was in the context of removing these types from Table 310-16, which internally correlated but raised hob with established trade practice. Now it may also conflict with international harmonization efforts. This table should stay put. If it does move, note that it contains MI cable, which will need its own asterisk note comparable to the one suggested for Proposal 6-113.

PANEL ACTION: Accept.
PANEL STATEMENT: See panel action and submitter's substantiation on Comment 6-38.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Ferrell

(Log #1375)

6- 41 - (310-60(c)): Reject
SUBMITTER: Kari Barrett, American Chemistry Council
COMMENT ON PROPOSAL NO: 6-118
RECOMMENDATION: The Panel should Accept this proposal as submitted.
SUBSTANTIATION: This is an attempt to make the NEC more "user friendly". Providing cross-reference tables will add to the usability of the NEC. The cross reference tables do not add to the usability of the individual tables but do add to the usability of the numerous tables contained in this Article. The number of Ampacity tables included in the mandatory portion of the NEC has increased and so has the probability of error. The goal of the Code-Making Panels should be to reduce the probability of error in using the NEC. Assisting users in selecting the correct table helps assure a correct installation.
PANEL ACTION: Reject.
PANEL STATEMENT: No new technical substantiation to support the recommendation has been provided. The titles of the ampacity tables are self-explanatory.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 9
NEGATIVE: 1
NOT RETURNED: 1 Ferrell
EXPLANATION OF NEGATIVE:
PETTIGREW: See my explanation of negative vote on Comment 6-16.

(Log #927)

6- 42 - (310-60(d)): Reject
SUBMITTER: John E. Conley, Stratford, CT
COMMENT ON PROPOSAL NO: 6-120
RECOMMENDATION: Accept the proposal.
SUBSTANTIATION: These comments apply, individually, and collectively, to the following proposed actions published in the ROP for the 2002 NEC.
1-101 (100-Ampacity)
6-92 (310-15(c))
6-120 (310-60(d))
6-126 (Table 310-67)
6-127 (Table 310-68)
6-128 (Table 310-69)
6-129 (Table 310-70)
6-130 (Table 310-71)
6-131 (Table 310-72)
6-132 (Table 310-73)
6-133 (Table 310-74)
6-134 (Table 310-75)
6-135 (Table 310-76)
6-136 (Table 310-77)
6-137 (Table 310-78)
6-138 (Table 310-79)
6-139 (Table 310-80)
6-140 (Table 310-81)
6-141 (Table 310-82)
6-142 (Table 310-83)
6-143 (Table 310-84)
6-144 (Table 310-85)
6-145 (Table 310-86)
6-223 (B-310-15(b)(1))
6-226 (Table B-310-1)
6-228 (B-310-15(b)(2))
6-231 (Table B-310-3)
6-232 (Table B-310-5)
6-233 (Table B-310-6)
6-234 (Table B-310-7)
6-235 (Table B-310-8)
6-236 (Table B-310-9)
6-237 (Table B-310-10)

All of these proposals should be accepted.

Individual panel comments seem to fall into three major categories: (1) 'Scientific ampacity' does not appear in the NEC; (2) The present definition is entirely satisfactory; (3) All NEC ampacities are scientific

My comments:

(1) These proposals were inspired by the panel's rejection, three years ago, for this very reason. Proposal 1-101 deals with the definition; the others deal with introducing the term into the text where appropriate.

(2) The present definition is great; very carefully crafted. It is not wrong, but it is inadequate. It applies only for those ampacities based strictly on thermal considerations, such as those in the tables listed above. Other ampacities are based on a multiplicity of factors (see section 310-15(b) FPN) beyond the scope of the existing definition. An objective observer would certainly conclude that the present definition is not entirely satisfactory.

(3) This is a very interesting observation. It can be reasonably stated that everything in the Code is scientific, but that obscures the point that a tremendous amount of judgment often modifies pure science. That is as it should be. In this case, what I have called scientific ampacities are pure science. They are calculated using only recognized scientific principles; nothing judgmental. They spring from the field of technology and computers. Other ampacities come from the field of wisdom, and cannot be calculated scientifically.
PANEL ACTION: Reject.
PANEL STATEMENT: By replacing the word "conductor" with "scientific" would make the text inconsistent with the rest of the section that addresses the ampacity of conductors.
See panel statement on Comment 6-43.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Ferrell

(Log #928)

6- 43 - (Table 310-67): Reject
SUBMITTER: John E. Conley, Stratford, CT
COMMENT ON PROPOSAL NO: 6-126
RECOMMENDATION: Accept the proposal.
SUBSTANTIATION: These comments apply, individually, and collectively, to the following proposed actions published in the ROP for the 2002 NEC.
1-101 (100-Ampacity)
6-92 (310-15(c))
6-120 (310-60(d))
6-126 (Table 310-67)
6-127 (Table 310-68)
6-128 (Table 310-69)
6-129 (Table 310-70)
6-130 (Table 310-71)
6-131 (Table 310-72)
6-132 (Table 310-73)
6-133 (Table 310-74)
6-134 (Table 310-75)
6-135 (Table 310-76)
6-136 (Table 310-77)
6-137 (Table 310-78)
6-138 (Table 310-79)
6-139 (Table 310-80)
6-140 (Table 310-81)
6-141 (Table 310-82)
6-142 (Table 310-83)
6-143 (Table 310-84)
6-144 (Table 310-85)
6-145 (Table 310-86)
6-223 (B-310-15(b)(1))
6-226 (Table B-310-1)
6-228 (B-310-15(b)(2))
6-231 (Table B-310-3)
6-232 (Table B-310-5)
6-233 (Table B-310-6)
6-234 (Table B-310-7)
6-235 (Table B-310-8)
6-236 (Table B-310-9)
6-237 (Table B-310-10)
All of these proposals should be accepted.
Individual panel comments seem to fall into three major categories: (1) 'Scientific ampacity' does not appear in the NEC; (2) The present definition is entirely satisfactory; (3) All NEC ampacities are scientific
My comments:
(1) These proposals were inspired by the panel's rejection, three years ago, for this very reason. Proposal 1-101 deals with the definition; the others deal with introducing the term into the text where appropriate.
(2) The present definition is great; very carefully crafted. It is not wrong, but it is inadequate. It applies only for those ampacities based strictly on thermal considerations, such as those in the tables listed above. Other ampacities are based on a multiplicity of factors (see section 310-15(b) FPN) beyond the scope of the existing definition. An objective observer would certainly conclude that the present definition is not entirely satisfactory.
(3) This is a very interesting observation. It can be reasonably stated that everything in the Code is scientific, but that obscures the point that a tremendous amount of judgment often modifies pure science. That is as it should be. In this case, what I have called scientific ampacities are pure science. They are calculated using only recognized scientific principles; nothing judgmental. They spring from the field of technology and computers. Other ampacities come from the field of wisdom, and cannot be calculated scientifically.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel stands by its statement on the referenced proposal. The submitter has not provided any new technical substantiation to change these requirements.
The use of the present definition of ampacity in Article 100 and compliance with the present requirements of Section 310-15 results in safe installations. For a given installation, requirements in Section 310-15 provide sufficient details to the user to use either the ampacity values provided in the tables or calculate ampacity values under engineering supervision in accordance with Section 310-15(c). Where calculated in accordance with Section 310-15(c), the values in the Medium Voltage Tables and the Tables in Annex B take into account the most common values for the variables that affect the computation of ampacity. In addition, the application of Section 310-15(c) permits the user to compute more specific (i.e. scientific, as suggested by the submitter) value of ampacity for a given installation with a specific set of variables.
It is understood that the ampacity values in the Medium Voltage Tables and those contained in Annex B are "scientific" because they were calculated using the engineering formula in Section 310-15(c) for the specific installation. It is not necessary to repeat the word "scientific" in each of the tables. The use of the words "conductor ampacity" is well understood by the users of the Code and the addition of the word "scientific" would not add clarity.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Ferrell

(Log #929)

6- 44 - (Table 310-68): Reject
SUBMITTER: John E. Conley, Stratford, CT
COMMENT ON PROPOSAL NO: 6-127
RECOMMENDATION: Accept the proposal.
SUBSTANTIATION: These comments apply, individually, and collectively, to the following proposed actions published in the ROP for the 2002 NEC.
1-101 (100-Ampacity)
6-92 (310-15(c))
6-120 (310-60(d))
6-126 (Table 310-67)
6-127 (Table 310-68)
6-128 (Table 310-69)
6-129 (Table 310-70)
6-130 (Table 310-71)
6-131 (Table 310-72)
6-132 (Table 310-73)
6-133 (Table 310-74)
6-134 (Table 310-75)
6-135 (Table 310-76)
6-136 (Table 310-77)
6-137 (Table 310-78)
6-138 (Table 310-79)
6-139 (Table 310-80)
6-140 (Table 310-81)
6-141 (Table 310-82)
6-142 (Table 310-83)
6-143 (Table 310-84)
6-144 (Table 310-85)
6-145 (Table 310-86)
6-223 (B-310-15(b)(1))
6-226 (Table B-310-1)
6-228 (B-310-15(b)(2))
6-231 (Table B-310-3)
6-232 (Table B-310-5)
6-233 (Table B-310-6)
6-234 (Table B-310-7)
6-235 (Table B-310-8)
6-236 (Table B-310-9)
6-237 (Table B-310-10)
All of these proposals should be accepted.
Individual panel comments seem to fall into three major categories: (1) 'Scientific ampacity' does not appear in the NEC; (2) The present definition is entirely satisfactory; (3) All NEC ampacities are scientific
My comments:

(1) These proposals were inspired by the panel's rejection, three years ago, for this very reason. Proposal 1-101 deals with the definition; the others deal with introducing the term into the text where appropriate.
(2) The present definition is great; very carefully crafted. It is not wrong, but it is inadequate. It applies only for those ampacities based strictly on thermal considerations, such as those in the tables listed above. Other ampacities are based on a multiplicity of factors (see section 310-15(b) FPN) beyond the scope of the existing definition. An objective observer would certainly conclude that the present definition is not entirely satisfactory.
(3) This is a very interesting observation. It can be reasonably stated that everything in the Code is scientific, but that obscures the point that a tremendous amount of judgment often modifies pure science. That is as it should be. In this case, what I have called scientific ampacities are pure science. They are calculated using only recognized scientific principles; nothing judgmental. They spring from the field of technology and computers. Other ampacities come from the field of wisdom, and cannot be calculated scientifically.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Comment 6-43.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Ferrell

(Log #930)

6- 45 - (Table 310-69): Reject
SUBMITTER: John E. Conley, Stratford, CT
COMMENT ON PROPOSAL NO: 6-128
RECOMMENDATION: Accept the proposal.
SUBSTANTIATION: These comments apply, individually, and collectively, to the following proposed actions published in the ROP for the 2002 NEC.
1-101 (100-Ampacity)
6-92 (310-15(c))
6-120 (310-60(d))
6-126 (Table 310-67)
6-127 (Table 310-68)
6-128 (Table 310-69)
6-129 (Table 310-70)
6-130 (Table 310-71)
6-131 (Table 310-72)
6-132 (Table 310-73)
6-133 (Table 310-74)
6-134 (Table 310-75)
6-135 (Table 310-76)
6-136 (Table 310-77)
6-137 (Table 310-78)
6-138 (Table 310-79)
6-139 (Table 310-80)
6-140 (Table 310-81)
6-141 (Table 310-82)
6-142 (Table 310-83)
6-143 (Table 310-84)
6-144 (Table 310-85)
6-145 (Table 310-86)
6-223 (B-310-15(b)(1))
6-226 (Table B-310-1)
6-228 (B-310-15(b)(2))
6-231 (Table B-310-3)
6-232 (Table B-310-5)
6-233 (Table B-310-6)
6-234 (Table B-310-7)
6-235 (Table B-310-8)
6-236 (Table B-310-9)
6-237 (Table B-310-10)
All of these proposals should be accepted.
Individual panel comments seem to fall into three major categories: (1) 'Scientific ampacity' does not appear in the NEC; (2) The present definition is entirely satisfactory; (3) All NEC ampacities are scientific
My comments:
(1) These proposals were inspired by the panel's rejection, three years ago, for this very reason. Proposal 1-101 deals with the definition; the others deal with introducing the term into the text where appropriate.
(2) The present definition is great; very carefully crafted. It is not wrong, but it is inadequate. It applies only for those ampacities based strictly on thermal considerations, such as those in the tables listed above. Other ampacities are based on a multiplicity of factors (see section 310-15(b) FPN) beyond the scope of the existing definition. An objective observer would certainly conclude that the present definition is not entirely satisfactory.
(3) This is a very interesting observation. It can be reasonably stated that everything in the Code is scientific, but that obscures the point that a tremendous amount of judgment often modifies pure science. That is as it should be. In this case, what I have called scientific ampacities are pure science. They are calculated using only recognized scientific principles; nothing judgmental. They spring from the field of technology and computers. Other ampacities come from the field of wisdom, and cannot be calculated scientifically.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Comment 6-43.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Ferrell

(Log #931)

6- 46 - (Table 310-70): Reject
SUBMITTER: John E. Conley, Stratford, CT
COMMENT ON PROPOSAL NO: 6-129
RECOMMENDATION: Accept the proposal.
SUBSTANTIATION: These comments apply, individually, and collectively, to the following proposed actions published in the ROP for the 2002 NEC.
1-101 (100-Ampacity)
6-92 (310-15(c))
6-120 (310-60(d))
6-126 (Table 310-67)
6-127 (Table 310-68)
6-128 (Table 310-69)
6-129 (Table 310-70)
6-130 (Table 310-71)
6-131 (Table 310-72)
6-132 (Table 310-73)
6-133 (Table 310-74)
6-134 (Table 310-75)
6-135 (Table 310-76)
6-136 (Table 310-77)
6-137 (Table 310-78)
6-138 (Table 310-79)
6-139 (Table 310-80)
6-140 (Table 310-81)
6-141 (Table 310-82)
6-142 (Table 310-83)
6-143 (Table 310-84)
6-144 (Table 310-85)
6-145 (Table 310-86)
6-223 (B-310-15(b)(1))
6-226 (Table B-310-1)
6-228 (B-310-15(b)(2))
6-231 (Table B-310-3)
6-232 (Table B-310-5)
6-233 (Table B-310-6)
6-234 (Table B-310-7)
6-235 (Table B-310-8)
6-236 (Table B-310-9)
6-237 (Table B-310-10)
All of these proposals should be accepted.
Individual panel comments seem to fall into three major categories: (1) 'Scientific ampacity' does not appear in the NEC; (2) The present definition is entirely satisfactory; (3) All NEC ampacities are scientific
My comments:
(1) These proposals were inspired by the panel's rejection, three years ago, for this very reason. Proposal 1-101 deals with the definition; the others deal with introducing the term into the text where appropriate.
(2) The present definition is great; very carefully crafted. It is not wrong, but it is inadequate. It applies only for those ampacities based strictly on thermal considerations, such as those in the tables listed above. Other ampacities are based on a multiplicity of factors (see section 310-15(b) FPN) beyond the scope of the existing definition. An objective observer would certainly conclude that the present definition is not entirely satisfactory.
(3) This is a very interesting observation. It can be reasonably stated that everything in the Code is scientific, but that obscures the point that a tremendous amount of judgment often modifies pure

science. That is as it should be. In this case, what I have called scientific ampacities are pure science. They are calculated using only recognized scientific principles; nothing judgmental. They spring from the field of technology and computers. Other ampacities come from the field of wisdom, and cannot be calculated scientifically.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Comment 6-43.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Ferrell

(Log #932)

6- 47 - (Table 310-71): Reject
SUBMITTER: John E. Conley, Stratford, CT
COMMENT ON PROPOSAL NO: 6-130
RECOMMENDATION: Accept the proposal.
SUBSTANTIATION: These comments apply, individually, and collectively, to the following proposed actions published in the ROP for the 2002 NEC.
1-101 (100-Ampacity)
6-92 (310-15(c))
6-120 (310-60(d))
6-126 (Table 310-67)
6-127 (Table 310-68)
6-128 (Table 310-69)
6-129 (Table 310-70)
6-130 (Table 310-71)
6-131 (Table 310-72)
6-132 (Table 310-73)
6-133 (Table 310-74)
6-134 (Table 310-75)
6-135 (Table 310-76)
6-136 (Table 310-77)
6-137 (Table 310-78)
6-138 (Table 310-79)
6-139 (Table 310-80)
6-140 (Table 310-81)
6-141 (Table 310-82)
6-142 (Table 310-83)
6-143 (Table 310-84)
6-144 (Table 310-85)
6-145 (Table 310-86)
6-223 (B-310-15(b)(1))
6-226 (Table B-310-1)
6-228 (B-310-15(b)(2))
6-231 (Table B-310-3)
6-232 (Table B-310-5)
6-233 (Table B-310-6)
6-234 (Table B-310-7)
6-235 (Table B-310-8)
6-236 (Table B-310-9)
6-237 (Table B-310-10)

All of these proposals should be accepted.

Individual panel comments seem to fall into three major categories: (1) 'Scientific ampacity' does not appear in the NEC; (2) The present definition is entirely satisfactory; (3) All NEC ampacities are scientific

My comments:

(1) These proposals were inspired by the panel's rejection, three years ago, for this very reason. Proposal 1-101 deals with the definition; the others deal with introducing the term into the text where appropriate.

(2) The present definition is great; very carefully crafted. It is not wrong, but it is inadequate. It applies only for those ampacities based strictly on thermal considerations, such as those in the tables listed above. Other ampacities are based on a multiplicity of factors (see section 310-15(b) FPN) beyond the scope of the existing definition. An objective observer would certainly conclude that the present definition is not entirely satisfactory.

(3) This is a very interesting observation. It can be reasonably stated that everything in the Code is scientific, but that obscures the point that a tremendous amount of judgment often modifies pure science. That is as it should be. In this case, what I have called scientific ampacities are pure science. They are calculated using only recognized scientific principles; nothing judgmental. They spring from the field of technology and computers. Other ampacities come from the field of wisdom, and cannot be calculated scientifically.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Comment 6-43.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Ferrell

(Log #933)

6- 48 - (Table 310-72): Reject
SUBMITTER: John E. Conley, Stratford, CT
COMMENT ON PROPOSAL NO: 6-131
RECOMMENDATION: Accept the proposal.
SUBSTANTIATION: These comments apply, individually, and collectively, to the following proposed actions published in the ROP for the 2002 NEC.
1-101 (100-Ampacity)
6-92 (310-15(c))
6-120 (310-60(d))
6-126 (Table 310-67)
6-127 (Table 310-68)
6-128 (Table 310-69)
6-129 (Table 310-70)
6-130 (Table 310-71)
6-131 (Table 310-72)
6-132 (Table 310-73)
6-133 (Table 310-74)
6-134 (Table 310-75)
6-135 (Table 310-76)
6-136 (Table 310-77)
6-137 (Table 310-78)
6-138 (Table 310-79)
6-139 (Table 310-80)
6-140 (Table 310-81)
6-141 (Table 310-82)
6-142 (Table 310-83)
6-143 (Table 310-84)
6-144 (Table 310-85)
6-145 (Table 310-86)
6-223 (B-310-15(b)(1))
6-226 (Table B-310-1)
6-228 (B-310-15(b)(2))
6-231 (Table B-310-3)
6-232 (Table B-310-5)
6-233 (Table B-310-6)
6-234 (Table B-310-7)
6-235 (Table B-310-8)
6-236 (Table B-310-9)
6-237 (Table B-310-10)

All of these proposals should be accepted.

Individual panel comments seem to fall into three major categories: (1) 'Scientific ampacity' does not appear in the NEC; (2) The present definition is entirely satisfactory; (3) All NEC ampacities are scientific

My comments:

(1) These proposals were inspired by the panel's rejection, three years ago, for this very reason. Proposal 1-101 deals with the definition; the others deal with introducing the term into the text where appropriate.

(2) The present definition is great; very carefully crafted. It is not wrong, but it is inadequate. It applies only for those ampacities based strictly on thermal considerations, such as those in the tables listed above. Other ampacities are based on a multiplicity of factors (see section 310-15(b) FPN) beyond the scope of the existing definition. An objective observer would certainly conclude that the present definition is not entirely satisfactory.

(3) This is a very interesting observation. It can be reasonably stated that everything in the Code is scientific, but that obscures the point that a tremendous amount of judgment often modifies pure science. That is as it should be. In this case, what I have called scientific ampacities are pure science. They are calculated using only recognized scientific principles; nothing judgmental. They spring from the field of technology and computers. Other ampacities come from the field of wisdom, and cannot be calculated scientifically.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Comment 6-43.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Ferrell

(Log #934)

6- 49 - (Table 310-73): Reject
SUBMITTER: John E. Conley, Stratford, CT
COMMENT ON PROPOSAL NO: 6-132
RECOMMENDATION: Accept the proposal.
SUBSTANTIATION: These comments apply, individually, and collectively, to the following proposed actions published in the ROP for the 2002 NEC.
1-101 (100-Ampacity)
6-92 (310-15(c))
6-120 (310-60(d))
6-126 (Table 310-67)
6-127 (Table 310-68)
6-128 (Table 310-69)
6-129 (Table 310-70)
6-130 (Table 310-71)
6-131 (Table 310-72)
6-132 (Table 310-73)
6-133 (Table 310-74)
6-134 (Table 310-75)
6-135 (Table 310-76)
6-136 (Table 310-77)
6-137 (Table 310-78)
6-138 (Table 310-79)
6-139 (Table 310-80)
6-140 (Table 310-81)
6-141 (Table 310-82)
6-142 (Table 310-83)
6-143 (Table 310-84)
6-144 (Table 310-85)
6-145 (Table 310-86)
6-223 (B-310-15(b)(1))
6-226 (Table B-310-1)
6-228 (B-310-15(b)(2))
6-231 (Table B-310-3)
6-232 (Table B-310-5)
6-233 (Table B-310-6)
6-234 (Table B-310-7)
6-235 (Table B-310-8)
6-236 (Table B-310-9)
6-237 (Table B-310-10)

All of these proposals should be accepted.

Individual panel comments seem to fall into three major categories: (1) 'Scientific ampacity' does not appear in the NEC; (2) The present definition is entirely satisfactory; (3) All NEC ampacities are scientific

My comments:

(1) These proposals were inspired by the panel's rejection, three years ago, for this very reason. Proposal 1-101 deals with the definition; the others deal with introducing the term into the text where appropriate.

(2) The present definition is great; very carefully crafted. It is not wrong, but it is inadequate. It applies only for those ampacities based strictly on thermal considerations, such as those in the tables listed above. Other ampacities are based on a multiplicity of factors (see section 310-15(b) FPN) beyond the scope of the existing definition. An objective observer would certainly conclude that the present definition is not entirely satisfactory.

(3) This is a very interesting observation. It can be reasonably stated that everything in the Code is scientific, but that obscures the point that a tremendous amount of judgment often modifies pure science. That is as it should be. In this case, what I have called scientific ampacities are pure science. They are calculated using only recognized scientific principles; nothing judgmental. They spring from the field of technology and computers. Other ampacities come from the field of wisdom, and cannot be calculated scientifically.

PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Comment 6-43.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Ferrell

(Log #935)

6- 50 - (Table 310-74): Reject
SUBMITTER: John E. Conley, Stratford, CT
COMMENT ON PROPOSAL NO: 6-133
RECOMMENDATION: Accept the proposal.
SUBSTANTIATION: These comments apply, individually, and collectively, to the following proposed actions published in the ROP for the 2002 NEC.
1-101 (100-Ampacity)
6-92 (310-15(c))
6-120 (310-60(d))
6-126 (Table 310-67)
6-127 (Table 310-68)
6-128 (Table 310-69)
6-129 (Table 310-70)
6-130 (Table 310-71)
6-131 (Table 310-72)
6-132 (Table 310-73)
6-133 (Table 310-74)
6-134 (Table 310-75)
6-135 (Table 310-76)
6-136 (Table 310-77)
6-137 (Table 310-78)
6-138 (Table 310-79)
6-139 (Table 310-80)
6-140 (Table 310-81)
6-141 (Table 310-82)
6-142 (Table 310-83)
6-143 (Table 310-84)
6-144 (Table 310-85)
6-145 (Table 310-86)
6-223 (B-310-15(b)(1))
6-226 (Table B-310-1)
6-228 (B-310-15(b)(2))
6-231 (Table B-310-3)
6-232 (Table B-310-5)
6-233 (Table B-310-6)
6-234 (Table B-310-7)
6-235 (Table B-310-8)
6-236 (Table B-310-9)
6-237 (Table B-310-10)

All of these proposals should be accepted.

Individual panel comments seem to fall into three major categories: (1) 'Scientific ampacity' does not appear in the NEC; (2) The present definition is entirely satisfactory; (3) All NEC ampacities are scientific

My comments:

(1) These proposals were inspired by the panel's rejection, three years ago, for this very reason. Proposal 1-101 deals with the definition; the others deal with introducing the term into the text where appropriate.

(2) The present definition is great; very carefully crafted. It is not wrong, but it is inadequate. It applies only for those ampacities based strictly on thermal considerations, such as those in the tables listed above. Other ampacities are based on a multiplicity of factors (see section 310-15(b) FPN) beyond the scope of the existing definition. An objective observer would certainly conclude that the present definition is not entirely satisfactory.

(3) This is a very interesting observation. It can be reasonably stated that everything in the Code is scientific, but that obscures the point that a tremendous amount of judgment often modifies pure science. That is as it should be. In this case, what I have called scientific ampacities are pure science. They are calculated using only recognized scientific principles; nothing judgmental. They spring from the field of technology and computers. Other ampacities come from the field of wisdom, and cannot be calculated scientifically.

PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Comment 6-43.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Ferrell

(Log #936)

6- 51 - (Table 310-75): Reject
SUBMITTER: John E. Conley, Stratford, CT
COMMENT ON PROPOSAL NO: 6-134
RECOMMENDATION: Accept the proposal.
SUBSTANTIATION: These comments apply, individually, and collectively, to the following proposed actions published in the ROP for the 2002 NEC.
1-101 (100-Ampacity)
6-92 (310-15(c))
6-120 (310-60(d))
6-126 (Table 310-67)

6-127 (Table 310-68)
6-128 (Table 310-69)
6-129 (Table 310-70)
6-130 (Table 310-71)
6-131 (Table 310-72)
6-132 (Table 310-73)
6-133 (Table 310-74)
6-134 (Table 310-75)
6-135 (Table 310-76)
6-136 (Table 310-77)
6-137 (Table 310-78)
6-138 (Table 310-79)
6-139 (Table 310-80)
6-140 (Table 310-81)
6-141 (Table 310-82)
6-142 (Table 310-83)
6-143 (Table 310-84)
6-144 (Table 310-85)
6-145 (Table 310-86)
6-223 (B-310-15(b)(1))
6-226 (Table B-310-1)
6-228 (B-310-15(b)(2))
6-231 (Table B-310-3)
6-232 (Table B-310-5)
6-233 (Table B-310-6)
6-234 (Table B-310-7)
6-235 (Table B-310-8)
6-236 (Table B-310-9)
6-237 (Table B-310-10)

All of these proposals should be accepted.

Individual panel comments seem to fall into three major categories: (1) 'Scientific ampacity' does not appear in the NEC; (2) The present definition is entirely satisfactory; (3) All NEC ampacities are scientific

My comments:

(1) These proposals were inspired by the panel's rejection, three years ago, for this very reason. Proposal 1-101 deals with the definition; the others deal with introducing the term into the text where appropriate.

(2) The present definition is great; very carefully crafted. It is not wrong, but it is inadequate. It applies only for those ampacities based strictly on thermal considerations, such as those in the tables listed above. Other ampacities are based on a multiplicity of factors (see section 310-15(b) FPN) beyond the scope of the existing definition. An objective observer would certainly conclude that the present definition is not entirely satisfactory.

(3) This is a very interesting observation. It can be reasonably stated that everything in the Code is scientific, but that obscures the point that a tremendous amount of judgment often modifies pure science. That is as it should be. In this case, what I have called scientific ampacities are pure science. They are calculated using only recognized scientific principles; nothing judgmental. They spring from the field of technology and computers. Other ampacities come from the field of wisdom, and cannot be calculated scientifically.

PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Comment 6-43.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Ferrell

(Log #937)

6- 52 - (Table 310-76): Reject
SUBMITTER: John E. Conley, Stratford, CT
COMMENT ON PROPOSAL NO: 6-135
RECOMMENDATION: Accept the proposal.
SUBSTANTIATION: These comments apply, individually, and collectively, to the following proposed actions published in the ROP for the 2002 NEC.
1-101 (100-Ampacity)
6-92 (310-15(c))
6-120 (310-60(d))
6-126 (Table 310-67)
6-127 (Table 310-68)
6-128 (Table 310-69)
6-129 (Table 310-70)
6-130 (Table 310-71)
6-131 (Table 310-72)
6-132 (Table 310-73)
6-133 (Table 310-74)
6-134 (Table 310-75)
6-135 (Table 310-76)
6-136 (Table 310-77)
6-137 (Table 310-78)
6-138 (Table 310-79)
6-139 (Table 310-80)
6-140 (Table 310-81)
6-141 (Table 310-82)
6-142 (Table 310-83)
6-143 (Table 310-84)
6-144 (Table 310-85)
6-145 (Table 310-86)
6-223 (B-310-15(b)(1))
6-226 (Table B-310-1)
6-228 (B-310-15(b)(2))
6-231 (Table B-310-3)
6-232 (Table B-310-5)
6-233 (Table B-310-6)
6-234 (Table B-310-7)
6-235 (Table B-310-8)
6-236 (Table B-310-9)
6-237 (Table B-310-10)

All of these proposals should be accepted.

Individual panel comments seem to fall into three major categories: (1) 'Scientific ampacity' does not appear in the NEC; (2) The present definition is entirely satisfactory; (3) All NEC ampacities are scientific

My comments:

(1) These proposals were inspired by the panel's rejection, three years ago, for this very reason. Proposal 1-101 deals with the definition; the others deal with introducing the term into the text where appropriate.

(2) The present definition is great; very carefully crafted. It is not wrong, but it is inadequate. It applies only for those ampacities based strictly on thermal considerations, such as those in the tables listed above. Other ampacities are based on a multiplicity of factors (see section 310-15(b) FPN) beyond the scope of the existing definition. An objective observer would certainly conclude that the present definition is not entirely satisfactory.

(3) This is a very interesting observation. It can be reasonably stated that everything in the Code is scientific, but that obscures the point that a tremendous amount of judgment often modifies pure science. That is as it should be. In this case, what I have called scientific ampacities are pure science. They are calculated using only recognized scientific principles; nothing judgmental. They spring from the field of technology and computers. Other ampacities come from the field of wisdom, and cannot be calculated scientifically.

PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Comment 6-43.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Ferrell

(Log #938)

6- 53 - (Table 310-77): Reject
SUBMITTER: John E. Conley, Stratford, CT
COMMENT ON PROPOSAL NO: 6-136
RECOMMENDATION: Accept the proposal.
SUBSTANTIATION: These comments apply, individually, and collectively, to the following proposed actions published in the ROP for the 2002 NEC.
1-101 (100-Ampacity)
6-92 (310-15(c))
6-120 (310-60(d))
6-126 (Table 310-67)
6-127 (Table 310-68)
6-128 (Table 310-69)
6-129 (Table 310-70)
6-130 (Table 310-71)
6-131 (Table 310-72)
6-132 (Table 310-73)
6-133 (Table 310-74)
6-134 (Table 310-75)
6-135 (Table 310-76)
6-136 (Table 310-77)
6-137 (Table 310-78)
6-138 (Table 310-79)
6-139 (Table 310-80)
6-140 (Table 310-81)

6-141 (Table 310-82)
6-142 (Table 310-83)
6-143 (Table 310-84)
6-144 (Table 310-85)
6-145 (Table 310-86)
6-223 (B-310-15(b)(1))
6-226 (Table B-310-1)
6-228 (B-310-15(b)(2))
6-231 (Table B-310-3)
6-232 (Table B-310-5)
6-233 (Table B-310-6)
6-234 (Table B-310-7)
6-235 (Table B-310-8)
6-236 (Table B-310-9)
6-237 (Table B-310-10)

All of these proposals should be accepted.

Individual panel comments seem to fall into three major categories: (1) 'Scientific ampacity' does not appear in the NEC; (2) The present definition is entirely satisfactory; (3) All NEC ampacities are scientific

My comments:

(1) These proposals were inspired by the panel's rejection, three years ago, for this very reason. Proposal 1-101 deals with the definition; the others deal with introducing the term into the text where appropriate.

(2) The present definition is great; very carefully crafted. It is not wrong, but it is inadequate. It applies only for those ampacities based strictly on thermal considerations, such as those in the tables listed above. Other ampacities are based on a multiplicity of factors (see section 310-15(b) FPN) beyond the scope of the existing definition. An objective observer would certainly conclude that the present definition is not entirely satisfactory.

(3) This is a very interesting observation. It can be reasonably stated that everything in the Code is scientific, but that obscures the point that a tremendous amount of judgment often modifies pure science. That is as it should be. In this case, what I have called scientific ampacities are pure science. They are calculated using only recognized scientific principles; nothing judgmental. They spring from the field of technology and computers. Other ampacities come from the field of wisdom, and cannot be calculated scientifically.

PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Comment 6-43.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Ferrell

(Log #939)

6- 54 - (Table 310-78): Reject
SUBMITTER: John E. Conley, Stratford, CT
COMMENT ON PROPOSAL NO: 6-137
RECOMMENDATION: Accept the proposal.
SUBSTANTIATION: These comments apply, individually, and collectively, to the following proposed actions published in the ROP for the 2002 NEC.
1-101 (100-Ampacity)
6-92 (310-15(c))
6-120 (310-60(d))
6-126 (Table 310-67)
6-127 (Table 310-68)
6-128 (Table 310-69)
6-129 (Table 310-70)
6-130 (Table 310-71)
6-131 (Table 310-72)
6-132 (Table 310-73)
6-133 (Table 310-74)
6-134 (Table 310-75)
6-135 (Table 310-76)
6-136 (Table 310-77)
6-137 (Table 310-78)
6-138 (Table 310-79)
6-139 (Table 310-80)
6-140 (Table 310-81)
6-141 (Table 310-82)
6-142 (Table 310-83)
6-143 (Table 310-84)
6-144 (Table 310-85)
6-145 (Table 310-86)
6-223 (B-310-15(b)(1))
6-226 (Table B-310-1)
6-228 (B-310-15(b)(2))
6-231 (Table B-310-3)
6-232 (Table B-310-5)
6-233 (Table B-310-6)
6-234 (Table B-310-7)
6-235 (Table B-310-8)
6-236 (Table B-310-9)
6-237 (Table B-310-10)

All of these proposals should be accepted.

Individual panel comments seem to fall into three major categories: (1) 'Scientific ampacity' does not appear in the NEC; (2) The present definition is entirely satisfactory; (3) All NEC ampacities are scientific

My comments:

(1) These proposals were inspired by the panel's rejection, three years ago, for this very reason. Proposal 1-101 deals with the definition; the others deal with introducing the term into the text where appropriate.

(2) The present definition is great; very carefully crafted. It is not wrong, but it is inadequate. It applies only for those ampacities based strictly on thermal considerations, such as those in the tables listed above. Other ampacities are based on a multiplicity of factors (see section 310-15(b) FPN) beyond the scope of the existing definition. An objective observer would certainly conclude that the present definition is not entirely satisfactory.

(3) This is a very interesting observation. It can be reasonably stated that everything in the Code is scientific, but that obscures the point that a tremendous amount of judgment often modifies pure science. That is as it should be. In this case, what I have called scientific ampacities are pure science. They are calculated using only recognized scientific principles; nothing judgmental. They spring from the field of technology and computers. Other ampacities come from the field of wisdom, and cannot be calculated scientifically.

PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Comment 6-43.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Ferrell

(Log #940)

6- 55 - (Table 310-79): Reject
SUBMITTER: John E. Conley, Stratford, CT
COMMENT ON PROPOSAL NO: 6-138
RECOMMENDATION: Accept the proposal.
SUBSTANTIATION: These comments apply, individually, and collectively, to the following proposed actions published in the ROP for the 2002 NEC.
1-101 (100-Ampacity)
6-92 (310-15(c))
6-120 (310-60(d))
6-126 (Table 310-67)
6-127 (Table 310-68)
6-128 (Table 310-69)
6-129 (Table 310-70)
6-130 (Table 310-71)
6-131 (Table 310-72)
6-132 (Table 310-73)
6-133 (Table 310-74)
6-134 (Table 310-75)
6-135 (Table 310-76)
6-136 (Table 310-77)
6-137 (Table 310-78)
6-138 (Table 310-79)
6-139 (Table 310-80)
6-140 (Table 310-81)
6-141 (Table 310-82)
6-142 (Table 310-83)
6-143 (Table 310-84)
6-144 (Table 310-85)
6-145 (Table 310-86)
6-223 (B-310-15(b)(1))
6-226 (Table B-310-1)
6-228 (B-310-15(b)(2))
6-231 (Table B-310-3)
6-232 (Table B-310-5)
6-233 (Table B-310-6)
6-234 (Table B-310-7)
6-235 (Table B-310-8)
6-236 (Table B-310-9)

6-237 (Table B-310-10)
All of these proposals should be accepted.
Individual panel comments seem to fall into three major categories: (1) 'Scientific ampacity' does not appear in the NEC; (2) The present definition is entirely satisfactory; (3) All NEC ampacities are scientific
My comments:
(1) These proposals were inspired by the panel's rejection, three years ago, for this very reason. Proposal 1-101 deals with the definition; the others deal with introducing the term into the text where appropriate.
(2) The present definition is great; very carefully crafted. It is not wrong, but it is inadequate. It applies only for those ampacities based strictly on thermal considerations, such as those in the tables listed above. Other ampacities are based on a multiplicity of factors (see section 310-15(b) FPN) beyond the scope of the existing definition. An objective observer would certainly conclude that the present definition is not entirely satisfactory.
(3) This is a very interesting observation. It can be reasonably stated that everything in the Code is scientific, but that obscures the point that a tremendous amount of judgment often modifies pure science. That is as it should be. In this case, what I have called scientific ampacities are pure science. They are calculated using only recognized scientific principles; nothing judgmental. They spring from the field of technology and computers. Other ampacities come from the field of wisdom, and cannot be calculated scientifically.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Comment 6-43.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Ferrell

(Log #941)

6- 56 - (Table 310-80): Reject
SUBMITTER: John E. Conley, Stratford, CT
COMMENT ON PROPOSAL NO: 6-139
RECOMMENDATION: Accept the proposal.
SUBSTANTIATION: These comments apply, individually, and collectively, to the following proposed actions published in the ROP for the 2002 NEC.
1-101 (100-Ampacity)
6-92 (310-15(c))
6-120 (310-60(d))
6-126 (Table 310-67)
6-127 (Table 310-68)
6-128 (Table 310-69)
6-129 (Table 310-70)
6-130 (Table 310-71)
6-131 (Table 310-72)
6-132 (Table 310-73)
6-133 (Table 310-74)
6-134 (Table 310-75)
6-135 (Table 310-76)
6-136 (Table 310-77)
6-137 (Table 310-78)
6-138 (Table 310-79)
6-139 (Table 310-80)
6-140 (Table 310-81)
6-141 (Table 310-82)
6-142 (Table 310-83)
6-143 (Table 310-84)
6-144 (Table 310-85)
6-145 (Table 310-86)
6-223 (B-310-15(b)(1))
6-226 (Table B-310-1)
6-228 (B-310-15(b)(2))
6-231 (Table B-310-3)
6-232 (Table B-310-5)
6-233 (Table B-310-6)
6-234 (Table B-310-7)
6-235 (Table B-310-8)
6-236 (Table B-310-9)
6-237 (Table B-310-10)
All of these proposals should be accepted.
Individual panel comments seem to fall into three major categories: (1) 'Scientific ampacity' does not appear in the NEC; (2) The present definition is entirely satisfactory; (3) All NEC ampacities are scientific
My comments:
(1) These proposals were inspired by the panel's rejection, three years ago, for this very reason. Proposal 1-101 deals with the definition; the others deal with introducing the term into the text where appropriate.
(2) The present definition is great; very carefully crafted. It is not wrong, but it is inadequate. It applies only for those ampacities based strictly on thermal considerations, such as those in the tables listed above. Other ampacities are based on a multiplicity of factors (see section 310-15(b) FPN) beyond the scope of the existing definition. An objective observer would certainly conclude that the present definition is not entirely satisfactory.
(3) This is a very interesting observation. It can be reasonably stated that everything in the Code is scientific, but that obscures the point that a tremendous amount of judgment often modifies pure science. That is as it should be. In this case, what I have called scientific ampacities are pure science. They are calculated using only recognized scientific principles; nothing judgmental. They spring from the field of technology and computers. Other ampacities come from the field of wisdom, and cannot be calculated scientifically.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Comment 6-43.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Ferrell

(Log #942)

6- 57 - (Table 310-81): Reject
SUBMITTER: John E. Conley, Stratford, CT
COMMENT ON PROPOSAL NO: 6-140
RECOMMENDATION: Accept the proposal.
SUBSTANTIATION: These comments apply, individually, and collectively, to the following proposed actions published in the ROP for the 2002 NEC.
1-101 (100-Ampacity)
6-92 (310-15(c))
6-120 (310-60(d))
6-126 (Table 310-67)
6-127 (Table 310-68)
6-128 (Table 310-69)
6-129 (Table 310-70)
6-130 (Table 310-71)
6-131 (Table 310-72)
6-132 (Table 310-73)
6-133 (Table 310-74)
6-134 (Table 310-75)
6-135 (Table 310-76)
6-136 (Table 310-77)
6-137 (Table 310-78)
6-138 (Table 310-79)
6-139 (Table 310-80)
6-140 (Table 310-81)
6-141 (Table 310-82)
6-142 (Table 310-83)
6-143 (Table 310-84)
6-144 (Table 310-85)
6-145 (Table 310-86)
6-223 (B-310-15(b)(1))
6-226 (Table B-310-1)
6-228 (B-310-15(b)(2))
6-231 (Table B-310-3)
6-232 (Table B-310-5)
6-233 (Table B-310-6)
6-234 (Table B-310-7)
6-235 (Table B-310-8)
6-236 (Table B-310-9)
6-237 (Table B-310-10)
All of these proposals should be accepted.
Individual panel comments seem to fall into three major categories: (1) 'Scientific ampacity' does not appear in the NEC; (2) The present definition is entirely satisfactory; (3) All NEC ampacities are scientific
My comments:
(1) These proposals were inspired by the panel's rejection, three years ago, for this very reason. Proposal 1-101 deals with the definition; the others deal with introducing the term into the text where appropriate.
(2) The present definition is great; very carefully crafted. It is not wrong, but it is inadequate. It applies only for those ampacities based strictly on thermal considerations, such as those in the tables

listed above. Other ampacities are based on a multiplicity of factors (see section 310-15(b) FPN) beyond the scope of the existing definition. An objective observer would certainly conclude that the present definition is not entirely satisfactory.

(3) This is a very interesting observation. It can be reasonably stated that everything in the Code is scientific, but that obscures the point that a tremendous amount of judgment often modifies pure science. That is as it should be. In this case, what I have called scientific ampacities are pure science. They are calculated using only recognized scientific principles; nothing judgmental. They spring from the field of technology and computers. Other ampacities come from the field of wisdom, and cannot be calculated scientifically.

PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Comment 6-43.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Ferrell

(Log #943)

6- 58 - (Table 310-82): Reject
SUBMITTER: John E. Conley, Stratford, CT
COMMENT ON PROPOSAL NO: 6-141
RECOMMENDATION: Accept the proposal.
SUBSTANTIATION: These comments apply, individually, and collectively, to the following proposed actions published in the ROP for the 2002 NEC.
1-101 (100-Ampacity)
6-92 (310-15(c))
6-120 (310-60(d))
6-126 (Table 310-67)
6-127 (Table 310-68)
6-128 (Table 310-69)
6-129 (Table 310-70)
6-130 (Table 310-71)
6-131 (Table 310-72)
6-132 (Table 310-73)
6-133 (Table 310-74)
6-134 (Table 310-75)
6-135 (Table 310-76)
6-136 (Table 310-77)
6-137 (Table 310-78)
6-138 (Table 310-79)
6-139 (Table 310-80)
6-140 (Table 310-81)
6-141 (Table 310-82)
6-142 (Table 310-83)
6-143 (Table 310-84)
6-144 (Table 310-85)
6-145 (Table 310-86)
6-223 (B-310-15(b)(1))
6-226 (Table B-310-1)
6-228 (B-310-15(b)(2))
6-231 (Table B-310-3)
6-232 (Table B-310-5)
6-233 (Table B-310-6)
6-234 (Table B-310-7)
6-235 (Table B-310-8)
6-236 (Table B-310-9)
6-237 (Table B-310-10)

All of these proposals should be accepted.

Individual panel comments seem to fall into three major categories: (1) 'Scientific ampacity' does not appear in the NEC; (2) The present definition is entirely satisfactory; (3) All NEC ampacities are scientific

My comments:

(1) These proposals were inspired by the panel's rejection, three years ago, for this very reason. Proposal 1-101 deals with the definition; the others deal with introducing the term into the text where appropriate.

(2) The present definition is great; very carefully crafted. It is not wrong, but it is inadequate. It applies only for those ampacities based strictly on thermal considerations, such as those in the tables listed above. Other ampacities are based on a multiplicity of factors (see section 310-15(b) FPN) beyond the scope of the existing definition. An objective observer would certainly conclude that the present definition is not entirely satisfactory.

(3) This is a very interesting observation. It can be reasonably stated that everything in the Code is scientific, but that obscures the point that a tremendous amount of judgment often modifies pure science. That is as it should be. In this case, what I have called scientific ampacities are pure science. They are calculated using only recognized scientific principles; nothing judgmental. They spring from the field of technology and computers. Other ampacities come from the field of wisdom, and cannot be calculated scientifically.

PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Comment 6-43.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Ferrell

(Log #944)

6- 59 - (Table 310-83): Reject
SUBMITTER: John E. Conley, Stratford, CT
COMMENT ON PROPOSAL NO: 6-142
RECOMMENDATION: Accept the proposal.
SUBSTANTIATION: These comments apply, individually, and collectively, to the following proposed actions published in the ROP for the 2002 NEC.
1-101 (100-Ampacity)
6-92 (310-15(c))
6-120 (310-60(d))
6-126 (Table 310-67)
6-127 (Table 310-68)
6-128 (Table 310-69)
6-129 (Table 310-70)
6-130 (Table 310-71)
6-131 (Table 310-72)
6-132 (Table 310-73)
6-133 (Table 310-74)
6-134 (Table 310-75)
6-135 (Table 310-76)
6-136 (Table 310-77)
6-137 (Table 310-78)
6-138 (Table 310-79)
6-139 (Table 310-80)
6-140 (Table 310-81)
6-141 (Table 310-82)
6-142 (Table 310-83)
6-143 (Table 310-84)
6-144 (Table 310-85)
6-145 (Table 310-86)
6-223 (B-310-15(b)(1))
6-226 (Table B-310-1)
6-228 (B-310-15(b)(2))
6-231 (Table B-310-3)
6-232 (Table B-310-5)
6-233 (Table B-310-6)
6-234 (Table B-310-7)
6-235 (Table B-310-8)
6-236 (Table B-310-9)
6-237 (Table B-310-10)

All of these proposals should be accepted.

Individual panel comments seem to fall into three major categories: (1) 'Scientific ampacity' does not appear in the NEC; (2) The present definition is entirely satisfactory; (3) All NEC ampacities are scientific

My comments:

(1) These proposals were inspired by the panel's rejection, three years ago, for this very reason. Proposal 1-101 deals with the definition; the others deal with introducing the term into the text where appropriate.

(2) The present definition is great; very carefully crafted. It is not wrong, but it is inadequate. It applies only for those ampacities based strictly on thermal considerations, such as those in the tables listed above. Other ampacities are based on a multiplicity of factors (see section 310-15(b) FPN) beyond the scope of the existing definition. An objective observer would certainly conclude that the present definition is not entirely satisfactory.

(3) This is a very interesting observation. It can be reasonably stated that everything in the Code is scientific, but that obscures the point that a tremendous amount of judgment often modifies pure science. That is as it should be. In this case, what I have called scientific ampacities are pure science. They are calculated using only recognized scientific principles; nothing judgmental. They spring from the field of technology and computers. Other ampacities come from the field of wisdom, and cannot be calculated scientifically.

PANEL ACTION: Reject.

PANEL STATEMENT: See panel statement on Comment 6-43.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Ferrell

(Log #945)

6- 60 - (Table 310-84): Reject
SUBMITTER: John E. Conley, Stratford, CT
COMMENT ON PROPOSAL NO: 6-143
RECOMMENDATION: Accept the proposal.
SUBSTANTIATION: These comments apply, individually, and collectively, to the following proposed actions published in the ROP for the 2002 NEC.
1-101 (100-Ampacity)
6-92 (310-15(c))
6-120 (310-60(d))
6-126 (Table 310-67)
6-127 (Table 310-68)
6-128 (Table 310-69)
6-129 (Table 310-70)
6-130 (Table 310-71)
6-131 (Table 310-72)
6-132 (Table 310-73)
6-133 (Table 310-74)
6-134 (Table 310-75)
6-135 (Table 310-76)
6-136 (Table 310-77)
6-137 (Table 310-78)
6-138 (Table 310-79)
6-139 (Table 310-80)
6-140 (Table 310-81)
6-141 (Table 310-82)
6-142 (Table 310-83)
6-143 (Table 310-84)
6-144 (Table 310-85)
6-145 (Table 310-86)
6-223 (B-310-15(b)(1))
6-226 (Table B-310-1)
6-228 (B-310-15(b)(2))
6-231 (Table B-310-3)
6-232 (Table B-310-5)
6-233 (Table B-310-6)
6-234 (Table B-310-7)
6-235 (Table B-310-8)
6-236 (Table B-310-9)
6-237 (Table B-310-10)

All of these proposals should be accepted.

Individual panel comments seem to fall into three major categories: (1) 'Scientific ampacity' does not appear in the NEC; (2) The present definition is entirely satisfactory; (3) All NEC ampacities are scientific

My comments:

(1) These proposals were inspired by the panel's rejection, three years ago, for this very reason. Proposal 1-101 deals with the definition; the others deal with introducing the term into the text where appropriate.

(2) The present definition is great; very carefully crafted. It is not wrong, but it is inadequate. It applies only for those ampacities based strictly on thermal considerations, such as those in the tables listed above. Other ampacities are based on a multiplicity of factors (see section 310-15(b) FPN) beyond the scope of the existing definition. An objective observer would certainly conclude that the present definition is not entirely satisfactory.

(3) This is a very interesting observation. It can be reasonably stated that everything in the Code is scientific, but that obscures the point that a tremendous amount of judgment often modifies pure science. That is as it should be. In this case, what I have called scientific ampacities are pure science. They are calculated using only recognized scientific principles; nothing judgmental. They spring from the field of technology and computers. Other ampacities come from the field of wisdom, and cannot be calculated scientifically.

PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Comment 6-43.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Ferrell

(Log #946)

6- 61 - (Table 310-85): Reject
SUBMITTER: John E. Conley, Stratford, CT
COMMENT ON PROPOSAL NO: 6-144
RECOMMENDATION: Accept the proposal.
SUBSTANTIATION: These comments apply, individually, and collectively, to the following proposed actions published in the ROP for the 2002 NEC.
1-101 (100-Ampacity)
6-92 (310-15(c))
6-120 (310-60(d))
6-126 (Table 310-67)
6-127 (Table 310-68)
6-128 (Table 310-69)
6-129 (Table 310-70)
6-130 (Table 310-71)
6-131 (Table 310-72)
6-132 (Table 310-73)
6-133 (Table 310-74)
6-134 (Table 310-75)
6-135 (Table 310-76)
6-136 (Table 310-77)
6-137 (Table 310-78)
6-138 (Table 310-79)
6-139 (Table 310-80)
6-140 (Table 310-81)
6-141 (Table 310-82)
6-142 (Table 310-83)
6-143 (Table 310-84)
6-144 (Table 310-85)
6-145 (Table 310-86)
6-223 (B-310-15(b)(1))
6-226 (Table B-310-1)
6-228 (B-310-15(b)(2))
6-231 (Table B-310-3)
6-232 (Table B-310-5)
6-233 (Table B-310-6)
6-234 (Table B-310-7)
6-235 (Table B-310-8)
6-236 (Table B-310-9)
6-237 (Table B-310-10)

All of these proposals should be accepted.

Individual panel comments seem to fall into three major categories: (1) 'Scientific ampacity' does not appear in the NEC; (2) The present definition is entirely satisfactory; (3) All NEC ampacities are scientific

My comments:

(1) These proposals were inspired by the panel's rejection, three years ago, for this very reason. Proposal 1-101 deals with the definition; the others deal with introducing the term into the text where appropriate.

(2) The present definition is great; very carefully crafted. It is not wrong, but it is inadequate. It applies only for those ampacities based strictly on thermal considerations, such as those in the tables listed above. Other ampacities are based on a multiplicity of factors (see section 310-15(b) FPN) beyond the scope of the existing definition. An objective observer would certainly conclude that the present definition is not entirely satisfactory.

(3) This is a very interesting observation. It can be reasonably stated that everything in the Code is scientific, but that obscures the point that a tremendous amount of judgment often modifies pure science. That is as it should be. In this case, what I have called scientific ampacities are pure science. They are calculated using only recognized scientific principles; nothing judgmental. They spring from the field of technology and computers. Other ampacities come from the field of wisdom, and cannot be calculated scientifically.

PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Comment 6-43.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Ferrell

(Log #947)

6- 62 - (Table 310-86): Reject
SUBMITTER: John E. Conley, Stratford, CT
COMMENT ON PROPOSAL NO: 6-145
RECOMMENDATION: Accept the proposal.

SUBSTANTIATION: These comments apply, individually, and collectively, to the following proposed actions published in the ROP for the 2002 NEC.
1-101 (100-Ampacity)
6-92 (310-15(c))
6-120 (310-60(d))
6-126 (Table 310-67)
6-127 (Table 310-68)
6-128 (Table 310-69)
6-129 (Table 310-70)
6-130 (Table 310-71)
6-131 (Table 310-72)
6-132 (Table 310-73)
6-133 (Table 310-74)
6-134 (Table 310-75)
6-135 (Table 310-76)
6-136 (Table 310-77)
6-137 (Table 310-78)
6-138 (Table 310-79)
6-139 (Table 310-80)
6-140 (Table 310-81)
6-141 (Table 310-82)
6-142 (Table 310-83)
6-143 (Table 310-84)
6-144 (Table 310-85)
6-145 (Table 310-86)
6-223 (B-310-15(b)(1))
6-226 (Table B-310-1)
6-228 (B-310-15(b)(2))
6-231 (Table B-310-3)
6-232 (Table B-310-5)
6-233 (Table B-310-6)
6-234 (Table B-310-7)
6-235 (Table B-310-8)
6-236 (Table B-310-9)
6-237 (Table B-310-10)

All of these proposals should be accepted.

Individual panel comments seem to fall into three major categories: (1) 'Scientific ampacity' does not appear in the NEC; (2) The present definition is entirely satisfactory; (3) All NEC ampacities are scientific

My comments:

(1) These proposals were inspired by the panel's rejection, three years ago, for this very reason. Proposal 1-101 deals with the definition; the others deal with introducing the term into the text where appropriate.

(2) The present definition is great; very carefully crafted. It is not wrong, but it is inadequate. It applies only for those ampacities based strictly on thermal considerations, such as those in the tables listed above. Other ampacities are based on a multiplicity of factors (see section 310-15(b) FPN) beyond the scope of the existing definition. An objective observer would certainly conclude that the present definition is not entirely satisfactory.

(3) This is a very interesting observation. It can be reasonably stated that everything in the Code is scientific, but that obscures the point that a tremendous amount of judgment often modifies pure science. That is as it should be. In this case, what I have called scientific ampacities are pure science. They are calculated using only recognized scientific principles; nothing judgmental. They spring from the field of technology and computers. Other ampacities come from the field of wisdom, and cannot be calculated scientifically.

PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Comment 6-43.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Ferrell

ARTICLE 318 — CABLE TRAYS

(Log #441)

8- 5 - (318-3): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
COMMENT ON PROPOSAL NO: 8-14
RECOMMENDATION: Accept in principle, revise panel action:

Add after (b)(1)(a): Exception: Type MI cables without a nonmetallic jacket shall not be required to be listed and marked for use in cable trays.

SUBSTANTIATION: Type MI cable without a nonmetallic jacket is not indicated in the UL "white book" as a cable that is so marked.
PANEL ACTION: Reject.
PANEL STATEMENT: No data was submitted to substantiate the use of Type MI cable in cable tray where the Type MI cable is not listed and marked for cable tray use.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #352)

8- 6 - (318-3(a)): Reject
SUBMITTER: James M. Daly, BICC General
COMMENT ON PROPOSAL NO: 8-17
RECOMMENDATION: This Proposal should be Accepted in Principle in Part.

The wording should be revised to read as follows:

"Single conductors or multiconductor cables that comply with the requirements for both Type MV and Type MC, and are ~~identified~~ listed and marked as Type MV or MC ~~and~~ for use in cable tray shall also be permitted to be installed in cable tray."

SUBSTANTIATION: There are two types of MV cable for both single conductor and multiconductor constructions:

(1) Nonmetallic jacketed and identified as Type MV.

(2) Armored with interlocking tape armor or a continuous corrugated metallic sheath with an optional nonmetallic jacket under and/or over the armor. This cable carries the dual rating of Type MV or MC, provided the cable complies with the requirements of both product standards.

The Panel is correct that, in Article 318, Type MV single conductors are not permitted in cable tray in any occupancy and Type MV multiconductor cables are specifically restricted by 318-3(b)(2) to use only in industrial establishments. These restrictions, which are also specified in Section 326-3, apply to the nonmetallic jacketed constructions. I agree that nonmetallic jacketed (no armor) Type MV Medium Voltage single conductors should not be permitted in cable tray in any occupancy and nonmetallic jacketed (no armor) Type MV Medium Voltage multiconductor cables should be restricted to cable trays in industrial establishments and the proposal will not change this restriction.

If the single conductor or the multiconductor cable is armored (enclosed within an interlocking metal tape armor or a continuous corrugated metallic sheath), complies with the requirements for both Type MV and MC cables, and is labeled as "Type MV or MC", then the uses permitted can be in compliance with either Type MC (Section 334-3) or Type MV (Section 326-3) or both.

Section 334-3(8) permits MC cable to be installed as open runs with no restrictions regarding occupancy. MC cable, regardless of voltage, is permitted to be installed as open runs in any occupancy except where specifically not permitted, e.g., some hazardous locations.

Section 334-3(6) permits MC cable to be installed in cable tray "Unless specifically prohibited elsewhere in this Code and where not subject to physical damage." Section 318-3(a) permits Type MC cable "to be installed in cable tray systems under the conditions described in their respective articles and sections". There is no voltage restriction on the MC cable.

Therefore, since medium voltage Type MC cable, both single conductors and multiconductor cables, is currently permitted to be installed as open wiring in non-ndustrial occupancies, safety could be further enhanced by permitting the same identical cable construction to be installed in a cable tray to provide additional mechanical protection. Since Section 318-3(a) already permits Type MC cable (no voltage restriction) to be installed in cable tray in any occupancy, the proposed text would not authorize any additional use but would merely provide additional clarity in the Code.

PANEL ACTION: Reject.
PANEL STATEMENT: The panel does not agree with the submitter's substantiation. Section 318-3(a) permits Type MC cable. Any of the wiring methods permitted by Section 318-3(a) may have additional markings. For example, Type MC cable may also be marked as Type MV cable. However, only those methods given in Section 318-3(a) are permitted. Section 318-3(a) permits a cable marked as Type MC and Type MV but permits the cable to be utilized as only a Type MC cable.
The proposed additional language would cause confusion and could lead to cables with only a Type MV marking being used.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #774)

8- 7 - (318-3(b)): Reject
SUBMITTER: Richard E. Loyd, Perryville, AR
COMMENT ON PROPOSAL NO: 8-21
RECOMMENDATION: Reconsider and reject this proposal.
SUBSTANTIATION: Consideration should be given to the negative comment on the voting.
PANEL ACTION: Reject.
PANEL STATEMENT: The use of conductors and cables as permitted in Section 318-3(b)(1)&(2) in solid bottom cable tray is an acceptable practice in supervised industrial applications.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NEGATIVE: 2
EXPLANATION OF NEGATIVE:
LILLY: The proposal seeks to add solid bottom cable tray to those permitted cable tray types in "industrial establishments". There are no provisions in Section 318-10 covering the installation of single conductor cables rated 2000 volts or less in solid bottom cable tray. If the proposal is accepted, solid bottom cable tray would be permitted, but there would be no cable installation guidelines in Section 318-10. Additional proposals are necessary to address conductor installation requirements for single conductors in solid bottom cable tray.
Section 318-11 details the requirements for determining the ampacity of single conductor cables or single conductors cabled together nominally rated 2000 volts or less in cable tray. Only two of the terms contained in 318-11 could be used to determine the conductor ampacity for solid bottom cable tray. Item (b)(3) utilizes Tables 310-17 and 310-19. The conductor ampacity in both of these tables is based on free air. Item number (b)(4) utilizes conductors "supported on a messenger" which also uses the free air concept to determine conductor ampacity. Conductors lying on a solid bottom cable tray are not in free air. The resultant lack of free air could result in conductor insulation breakdown due to "hot spots" or long term exposure to temperatures slightly elevated above the insulation temperature rating. This situation could be made more severe as there are no provisions restricting the use of solid bottom cable trays with unventilated covers. Research is needed to demonstrate what effect, if any, the introduction of a solid bottom might have on the insulation integrity of conductors installed in cable tray.
LOYD: I agree with Mr. Lilly's comments expressed in his negative vote, and the comment on the negative vote on Proposal 8-21. There has been no substantiation for making this change in the Code.

(Log #1032)

8- 8 - (318-3(b), FPN (New)): Accept
SUBMITTER: Michael R. Borden, Cable Tray Institute
COMMENT ON PROPOSAL NO: 8-21
RECOMMENDATION: The Cable Tray Institute supports the acceptance of this proposal.
SUBSTANTIATION: Cables are installed within solid metal enclosures, i.e., conduit and wireway. There is no reason to exclude solid bottom tray from containing these cables as long as they are being installed by qualified individuals in industrial establishments and the fill requirements are consistent with the conservative numbers used for conduit and wireway.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NEGATIVE: 2
EXPLANATION OF NEGATIVE:
LILLY: The proposal seeks to add solid bottom cable tray to those permitted cable tray types in "industrial establishments". There are no provisions in Section 318-10 covering the installation of single conductor cables rated 2000 volts or less in solid bottom cable tray. If the proposal is accepted, solid bottom cable tray would be permitted, but there would be no cable installation guidelines in Section 318-10. Additional proposals are necessary to address conductor installation requirements for single conductors in solid bottom cable tray.
Section 318-11 details the requirements for determining the ampacity of single conductor cables or single conductors cabled together nominally rated 2000 volts or less in cable tray. Only two of the items contained in 318-11 could be used to determine the conductor ampacity for solid bottom cable tray. Item (b)(3) utilizes Tables 310-17 and 310-19. The conductor ampacity in both of these tables is based on free air. Item number (b)(4) utilizes conductors "supported on a messenger" which also uses the free air concept to determine conductor ampacity. Conductors lying on a solid bottom cable tray are not in free air. The resultant lack of free air could result in conductor insulation breakdown due to "hot spots" or long term exposure to temperatures slightly elevated above the insulation temperature rating. This situation could be made more severe as there are no provisions restricting the use of solid bottom cable trays with unventilated covers. Research is needed to demonstrate what effect, if any, the introduction of a solid bottom might have on the insulation integrity of conductors installed in cable tray.
LOYD: See my explanation of negative vote on comment 8-7.

(Log #1031)

8- 9 - (318-5(e), FPN (New)): Accept
SUBMITTER: Michael R. Borden, Cable Tray Institute
COMMENT ON PROPOSAL NO: 8-28
RECOMMENDATION: The Cable Tray Institute supports the accept in principle action on this proposal and the relocation to Section 318-1.
SUBSTANTIATION: This standard is an industry resource in the selection of cable trays including dimensions, finish and load rating.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #1029)

8- 10 - (318-5(f), FPN (New)): Accept
SUBMITTER: Michael R. Borden, Cable Tray Institute
COMMENT ON PROPOSAL NO: 8-30
RECOMMENDATION: The Cable Tray Institute supports the accept in principle action on this proposal and the relocation to Section 318-1.
SUBSTANTIATION: This standard is an industry resource in the selection of nonmetallic cable trays.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #772)

8- 11 - (318-6(a)): Reject
SUBMITTER: Richard E. Loyd, Perryville, AR
COMMENT ON PROPOSAL NO: 8-32
RECOMMENDATION: Reconsider and reject this proposal.
SUBSTANTIATION: The proposal does not consider the required physical protection needs of these open cables. No technical substantiation was provided with this proposal. Consideration should be given to the negative comment.
PANEL ACTION: Reject.
PANEL STATEMENT: The revisions contained in Proposal 8-32 are considered by the panel as a clarification of this section.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #87)

8- 12 - (318-6(j)): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 8-33
RECOMMENDATION: The Technical Correlating Committee directs that the panel clarify the last sentence of the Panel Statement relative to the action taken on Proposal 8-34. This action will be considered by the Panel as a Public Comment.

SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
Panel 8 accepts the direction of the Technical Correlating Committee to clarify the last sentence of the panel statement relative to the action taken on Proposal 8-34 where technical substantiation was provided.
The panel action on Proposal 8-33 should have been to accept in principle in part.
The panel action should have been to accept in principle in part that part of the proposal that strikes the word "outlet" from Section 318-6(j).
The panel action should have been to accept in principle in part that part of the proposal that adds the words "and conduit bodies" in the first sentence of Section 318-6(j) immediately following the word "boxes".
The panel rejects the remainder of Proposal 8-33 as stated in the first paragraph of the panel statement for the proposal.
PANEL STATEMENT: The action taken on this comment clarifies and correlates the action taken on Proposals 8-33 and 8-34 relative to "outlet boxes" and "conduit bodies".
See the substantiation, panel statement, and the panel action taken on Proposal 8-34.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #88)

8- 13 - (318-6(j)): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 8-34
RECOMMENDATION: The Technical Correlating Committee directs the panel to confirm the action on this Proposal relative to the position of the panel stated in the panel statement on Proposal 3-33. This action will be considered by the Panel as a Public Comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
PANEL STATEMENT: Code-Making Panel 8 assumes the Technical Correlating Committee meant to reference Proposal 8-33 not 3-33.
Panel 8 reaffirms the action taken on Proposal 8-34. For clarification of this issue see the panel action taken on Comment 8-12.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #394)

8- 14 - (318-6(j)): Accept in Principle in Part
SUBMITTER: Dan Leaf, Palmdale, CA
COMMENT ON PROPOSAL NO: 8-33
RECOMMENDATION: Accept in Principle revised:
RACEWAYS, CABLES ~~and OUTLET~~ BOXES and CONDUIT BODIES SUPPORTED from cable trays. In industrial facilities where conditions of maintenance and supervision ensure only qualified persons will service the installation and where cable trays are designed and installed to support the load, raceways, cables, ~~and outlet~~ boxes, and conduit bodies shall be permitted to be supported by cable trays. ~~For raceways,~~ Intermediate metal conduit, rigid metal conduit, and electrical metallic tubing terminating at, and secured to the tray with a listed cable tray clamp or adapter ~~shall be used and no nearby supports, such as a support within 3 ft (914 mm) shall be required~~ shall be permitted to be fastened in accordance with 345-12(a), 346-12(a), or 348-13 Exception No. 1.
For raceways or cables running parallel to, but under or ~~beside~~ on the side of a tray, supports shall be in accordance with the requirements of the appropriate raceway or cable article.
For ~~outlet~~ boxes and conduit bodies located under or beside on the side of a tray, support shall be in accordance with the requirements of ~~Article~~ 370-23.
SUBSTANTIATION: "Secured to" emphasizes the clamp or adapter is to be fastened to the tray. The relaxation of support "within 3 ft" applies to raceways of the flexible type or RNMC even though it appears related to requirements for IMC, RMC, RNMC, and EMT, since other raceways have different requirements where terminated. The 3 ft requirement is modified to 5 ft in Articles 345, 346, and 348 but not 347, nor for flexible types. The proposed references to 345-12(a), 346-12(a) and 348-13 Ex. No. 1 contain conditions (no support within 3 ft, unbroken EMT) which are not covered by present wording.
"Nearby support" is vague; how far is nearby? The 5 ft modification for IMC, RMC, and EMT is their respective articles is apparently predicated on the assumption of a termination that is secure such as a threaded connection or locknuts and bushings.
The Panel stated the raceway support is intended in accordance with the respective article, however the present wording doesn't provide consistency as indicated in the Style Manual Section 3.3.5.
PANEL ACTION: Accept in Principle in Part.
Revise Section 318-6(j) to read:
(j) Raceways, Cables, Boxes, and Conduit Bodies Supported from Cable Tray Systems. In industrial facilities where conditions of maintenance and supervision ensure that only qualified persons will service the installation and where the cable tray systems are designed and installed to support the load, such systems shall be permitted to support raceways and cables, and boxes and conduit bodies covered in 370-1. For raceways terminating at the tray, a listed cable tray clamp or adapter shall be used to securely fasten the raceway to the cable tray system. Additional supporting and securing of the raceway shall be in accordance with the requirements of the appropriate raceway article.
For raceways or cables running parallel to and attached to the bottom or side of a cable tray system, fastening and supporting shall be in accordance with the requirements of the appropriate raceway or cable article.
For boxes and conduit bodies attached to the bottom or side of a cable tray system, fastening and supporting shall be in accordance with the requirements of 370-23.
PANEL STATEMENT: The deletion of the word "outlet" and the addition of "conduit bodies" was accomplished by the panel action on Proposal 8-34.
The inclusion of the words "and installed" is accepted in the first sentence.
The words "to securely fasten the raceway to the cable tray system" in the second sentence of the first paragraph clarifies that the wording is meant to apply to all raceways.
The addition of a third sentence in the first paragraph alerts the user to the fact that regardless of the attachment of the raceway to the cable tray the securing and supporting requirements of the appropriate raceway article still apply.
The words "attached to the bottom or side" in the second and third paragraph clarifies that these are raceways, etc. that are mounted to the cable tray system.
The word "fastening" was added in the second and third paragraphs because there are both fastening and supporting requirements for raceways and boxes.
The reference to Section 370-23 is included in the last paragraph as it was added by the action taken on Proposal 8-34.
"Systems" was added to correlate with the definition of cable tray in Section 318-1.
The panel did not accept the text to add specific types of raceways.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #773)

8- 15 - (318-6(j)): Reject
SUBMITTER: Richard E. Loyd, Perryville, AR
COMMENT ON PROPOSAL NO: 8-34
RECOMMENDATION: Reconsider and reject this proposal.
SUBSTANTIATION: Consideration should be given to the negative comment on the voting. In my experience, cable tray installations are a combination of lightweight steel or more often aluminum channel (cable tray) supported by trapeze hangers or channel iron structural supports. The cable tray has very little structural strength. I have seen outlet boxes screwed to the side of the tray for various purposes but usually anything larger is

supported to the structural supports holding the cable tray. This proposal, if it is accepted, it will permit attaching to the cable tray itself any size junction box.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Comment 8-14.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #1030)

8- 16 - (318-6(j), FPN (New)): Accept
SUBMITTER: Michael R. Borden, Cable Tray Institute
COMMENT ON PROPOSAL NO: 8-37
RECOMMENDATION: The Cable Tray Institute supports the accept in principle action on this proposal and the relocation to Section 318-1.
SUBSTANTIATION: This standard is an industry resource for the installations of cable systems.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #1736)

8- 17 - (318-9(f)): Accept in Principle in Part
SUBMITTER: Rich Buschart, Cable Tray Institute
COMMENT ON PROPOSAL NO: 8-41, 8-42, 8-43, 8-44
RECOMMENDATION: The Cable Tray Institute supports the acceptance of this proposal. Add new text to read as follows:
(f) Solid Channel Cable Trays. Where solid channel cable trays contain multiconductor cables of any type, the following shall apply.
(1) Where only one multiconductor cable is installed, the cross-sectional area shall not exceed the value specified in column 1 of Table 318-9(f).
(2) Where more than one multiconductor cable is installed, the sum of the cross-sectional area of all cable shall not exceed the value specified in Column 2 of Table 318-9(f).
SUBSTANTIATION: Solid channel cable trays have been available for over 10 years but have not been recognized in previous NEC publications. On the other hand, solid bottom cable tray has been recognized by the NEC for over 20 years to contain multiconductor cables. The percent fill value shown in Columns 1 and 2 of Table 318-9(f) are based on the area fill values for installing one cable in conduit raceway or two cables in conduit raceway, respectively. This equates to a 53 percent fill for one cable and a 31 percent fill for more than one cable. Given the more stringent requirements for cables that are rated for cable tray use, along with the proven track record of both ventilated channel cable tray and solid bottom cable tray for more than 20 years, this proposal gives industry professionals another valuable alternative for installations that they feel require continuous support of their cables while still providing an open system for ease of installation and retrofit.
PANEL ACTION: Accept in Principle in Part.
The panel rejects the part of the comment to accept Proposal 8-41.
The panel accepts in principle that part of the comment that accepts Proposals 8-42, 8-43, and 8-44.
Revise the proposed wording of 318-9 (f)(1) of the comment to read as follows:
"(1) Where only one multiconductor cable is installed, the cross-sectional area of the cable shall not exceed the value specified in Column 1 of Table 318-9(f)."
Accept the table without the width: "200mm, 8 inch".
PANEL STATEMENT: The panel has accepted the 50mm, 2 inch size based on the submitter equating the fill requirement to Chapter 9, Table 1. The panel did not accept the inclusion of 200mm, 8 inch using the same approach to calculating the fill as there was no data provided for the 8 inch size.
The words "of the cable" were added to Section 318-9(f)(1) of the comment to make it clear that the cross-sectional area referred to is that of the cable not that of the cable tray.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #1735)

8- 18 - (318-10(b)): Accept in Principle in Part
SUBMITTER: Rich Buschart, Cable Tray Institute
COMMENT ON PROPOSAL NO: 8-46
RECOMMENDATION: Revise as follows:
(b) Ventilated Channel Cable Trays. Where 2 in. (51 mm), 3-in. (76 mm), 4 in. (102 mm), 6-in. (152 mm), or 8 in. (204 mm) wide ventilated channel cable trays contains single conductor cables, the sum of the diameters of tall single conductors shall not exceed the inside width of the channel.
The Cable Tray Institute supports the acceptance of this proposal.
SUBSTANTIATION: Two in. and 8 in. Channel Cable Tray are two widely available sizes that have been overlooked in previous NEC proposals. Due to continued inquires by the industry, adding the 2 in. and 8 in. sizes would increase the available options for installing amounts of cables while building on the proven installation practices of 3, 4, and 6 in. channel cable tray that have been used successfully for over 13 years.
PANEL ACTION: Accept in Principle in Part.
The panel accepts the inclusion of 50mm (2 inch) ventilated channel cable tray and rejects the inclusion of 200mm (8 inch) ventilated channel cable tray.
PANEL STATEMENT: The panel has accepted the 50mm, 2 inch size based on the submitter equating the fill requirement to Chapter 9, Table 1. The panel did not accept the inclusion of 200mm, 8 inch using the same approach to calculating the fill as there was no data provided for the 8 inch size. The panel has used hard metric conversions and reversed the dimension order to comply with the Style Manual.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
POHOLSKI: Reject panel action to accept this comment in principle in part and accept the proposal as submitted. Chapter 9, Table 1 is used for Conduit and Tubing and not Ventilated tray. The proposal should be accepted as submitted in Log #1735.

Table 318-9(f). Allowable Cable Fill Area for Multiconductor Cables in Solid Channel Cable Trays for Cables Rated 2000 Volts or Less

		Maximum Allowable Fill Area For Multiconductor Cables			
Inside Width of Cable Tray		Column 1 One Cable		Column 2 More than One Cable	
mm	in.	mm^2	$in.^2$	mm^2	$in.^2$
50	2	850	1.3	500	0.8
75	3	1300	2.0	700	1.1
100	4	2400	3.7	1400	2.1
150	6	3600	5.5	2100	3.2
200	8	4800	7.4	2800	4.3

ARTICLE 320 — OPEN WIRING ON INSULATORS

(Log #1439)

7- 4 - (320-3): Reject
SUBMITTER: Barry Bauman, Alliante Energy/Rep. American Society of Agricultural Engineers
COMMENT ON PROPOSAL NO: 7-12
RECOMMENDATION: 7-12 should be accepted as proposed.
SUBSTANTIATION: The clip on luminaries used in NEC 320 agricultural installations do not conform to NEC 547.8. Consequently, these installations do not conform to the NEC. Due to their loss experience, insurance companies will either not insure buildings wired with Open Wiring On Insulators or they will impose a much higher rate.
A similar comment is to be submitted for Proposal 19-14.
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter could be referencing Section 547-7 in place of Section 547-8. Since Chapters 5, 6 and 7 can modify the requirements provided in Chapters 1 through 4, 547-7 specifies the specific requirements for lighting fixtures suitable for use in agriculture buildings. There is no conflict between 320-3 and 547-7.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

ARTICLE 326 — MEDIUM VOLTAGE CABLE: TYPE MV

(Log #75)

7- 5 - (326-7): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 7-62
RECOMMENDATION: It was the action of the Technical Correlating Committee that further consideration be given to the comments expressed in the voting. This action will be considered by the Panel as a Public Comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
Reinstate Section 326-120 from Proposal 7-52a.
PANEL STATEMENT: The panel understands that the marking requirements will be located in Section 326-120.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #76)

7- 6 - (326-7): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 7-63
RECOMMENDATION: It was the action of the Technical Correlating Committee that further consideration be given to the comments expressed in the voting. This action will be considered by the panel as a public comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
PANEL STATEMENT: See panel action on Comment 7-5.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #413)

7- 7 - (326-10): Reject
Note: The Technical Correlating Committee notes that the issue raised in the panel statement will be sent to the NEC Technical Correlating Committee Usability Task Group for action in the 2005 cycle.
SUBMITTER: Dan Leaf, Palmdale, CA
COMMENT ON PROPOSAL NO: 7-52
RECOMMENDATION: Accept in Principle, revise Panel Action:
USES PERMITTED. Type MV cables shall be permitted for use on power systems rated up to 35,000 volts, nominal, in wet or dry locations, in raceways, in cable trays as specified in 318-3(b)(1), or directly buried in accordance with 300-50, ~~and~~ in messenger supported wiring, in cablebus assemblies, and as open wiring in accordance with 300-37.
SUBSTANTIATION: The first part of the sentence ending at "locations" should be sufficient to cover the following wiring methods. However, if they are to be specifically indicated they should be inclusive to avoid any confusion that the conductors cannot be used in cablebus, or as open wiring in transformer volt or switchgear rooms or as open aerial conductors as covered in Article 225. The panel stated in Proposal 7-57 that uses not specifically excluded permits all other use. Under that concept, "uses not permitted" negates the need for a litany of permitted uses.
PANEL ACTION: Reject.
PANEL STATEMENT: Code Making Panel 7 recognizes that not having an all inclusive list for "uses permitted" is an issue for this and other articles in the Code. The panel requests that the Technical Correlating Committee ask the Usability Task Group to review this issue, correlate with Section 110-8, and make recommendations for future editions of the Code.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

ARTICLE 328 — FLAT CONDUCTOR CABLE: TYPE FCC

(Log #77)

7- 8 - (328):
Note: It was the action of the Technical Correlating Committee that the words "in the following" be deleted from the first sentence of 328.12.
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 7-63a
RECOMMENDATION: The Technical Correlating Committee advises that Article Scope statements are the responsibility of the Technical Correlating Committee and the Technical Correlating Committee accepts the Panel Action.
The Technical Correlating Committee directs the Panel to reconsider Section 328-12 to be consistent with the other cable articles. See Proposals 7-89a, 7-128a, 7-247, and 7-265a. This action will be considered by the Panel as a Public Comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15
COMMENT ON AFFIRMATIVE:
STRANIERO: The panel action should include direction to delete the last three words "in the following" from the first sentence of 328-12 so that is clear as to what change is intended.

ARTICLE 330 — MINERAL-INSULATED, METAL-SHEATHED CABLE

(Log #78)

7- 9 - (330): Accept
Note: The Technical Correlating Committee notes that the action directed by the Technical Correlating Committee on this Comment was accomplished by the Panel Action on Comment 7-10.
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 7-69a
RECOMMENDATION: The Technical Correlating Committee advises that Article Scope statements are the responsibility of the Technical Correlating Committee and the Technical Correlating Committee accepts the Panel Action.
The Technical Correlating Committee directs the panel to move item (11), Uses Permitted, to
an appropriate part of the Article. This action will be considered by the Panel as a Public Comment.

SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #1330)

7- 10 - (330): Accept in Principle
SUBMITTER: James M. Daly, BICC General
COMMENT ON PROPOSAL NO: 7-69a
RECOMMENDATION: This proposal should be Accepted in Principle.
330-10(11) should be relocated to 330-31 and a Section heading added so the Section reads as follows:
330-31 Grouping of Single Conductors. Where single-conductor cables are used, all phase conductors and, where used, the neutral conductor shall be grouped together to minimize induced voltage on the sheath.
SUBSTANTIATION: Relocation of this requirement to 330-31 will address the Technical Correlating Committee Comment directing the Panel to move item (11), Uses Permitted, to an appropriate part of the Article.
Location of the text in a new Section 330-31 will provide consistency with a comment to locate similar text in 334-31; see my Comment on Proposal 7-126.
The numbering of this section will also coordinate with the section renumbering of Chapter 3 and XXX-31 should be added to the renumbering list and reserved for this specific requirement.
PANEL ACTION: Accept in Principle.
Change the section title to "Single Conductors."
PANEL STATEMENT: The title of the section has been revised to be consistent with the panel's action on Panel Comment 7-19a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #370)

7- 11 - (330-17): Accept in Principle
SUBMITTER: Dan Leaf, Palmdale, CA
COMMENT ON PROPOSAL NO: 7-69a
RECOMMENDATION: Accept in principle revised: 330-17 THROUGH or PARALLEL to FRAMING MEMBERS. Type MI cable shall comply with 300-4 where installed parallel to, or through framing members ~~studs,~~ joists, rafters, or similar wood members.
330-31 THROUGH FRAMING MEMBERS. Horizontal runs of type MI cable supported by openings in framing members at intervals not exceeding 1.8m (6 ft) shall be permitted.
SUBSTANTIATION: The text of 330-17 does not cover parallel installations noted in the heading. The text limits the requirements to wood members while 300-4(d) is not limited to wood members. Section 330-31 is proposed since 300-4(a)(1) only covers where cables are installed through holes but there is no explicit permission to do so, nor does this article have such permission. It must be assumed by inference. Other articles have explicit permission.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action on Comment 7-10a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #CC701)

7- 10a - (330-17): Accept
Note: The Technical Correlating Committee notes that the Recommendation relative to 334.17 should not be included with the action on Article 330, but is covered by Comment 7-22a.
SUBMITTER: CMP 7
COMMENT ON PROPOSAL NO: 7-69a
RECOMMENDATION: Add new 330-17 to read:
330-17. Through or Parallel to Framing Members. Type MI cable shall be protected in accordance with 300-4 where installed through or parallel to framing members.
Revise 334-17 to read:
334-17. Through or Parallel to Framing Members. Type MC cable shall be protected in accordance with 300-4 where installed through or parallel to framing members.
SUBSTANTIATION: In response to a public comment relative to this subject, the panel has added this section to be consistent with corresponding sections in Articles 333, 334 and 336.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15
COMMENT ON AFFIRMATIVE:
STRANIERO: The comment recommendation includes code sections from two different articles. The comment should cover only Section 330-17. Section 334-17 is covered by Comment 7-22a.

(Log #1631)

7- 12 - (330-20):
Note: It was the action of the Technical Correlating Committee that Comment 7-12 be reported as "Hold" since it introduces new material that has not had public review.
SUBMITTER: James M. Daly, BICC General
COMMENT ON PROPOSAL NO: 7-87
RECOMMENDATION: The proposal should be accepted in principle.
The section should be revised as follows:
Type MI cable conductors shall be of solid copper, nickel or nickel-coated ~~clad~~ copper with a resistance corresponding to standard AWG and kcmil sizes.
SUBSTANTIATION: The addition of the word "nickel" and the change of "clad" to "coated" will make the text consistent with the text used in Table 310-13 (PFAH and TFE), Tables 310-18 and 310-19, and Table 402-3 (PAF and PTF).
Many petroleum and chemical companies require both power and control cables that can withstand extreme fire conditions (1093°C (2000°F)) for a short period of time (20 to 30 minutes) to permit a safe shutdown of the process to protect personnel and to minimize damage to the facility. Since copper and nickel-coated copper conductors melt at 1082°C (1938°F), the only alternative is the use of solid nickel conductors which have a melting point of 1455°C (2651°F).
PANEL ACTION: Accept.
PANEL STATEMENT: The text was revised to be consistent with the sections referenced in the substantiation and is deemed to be editorial in nature.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NEGATIVE: 2
EXPLANATION OF NEGATIVE:
GUIDA: This comment should be held. There was no public review of the addition of nickel to Article 330. The adding of nickel to the 90°C columns of Tables 310-16; 310-17 and 310-20 should be part of this proposal.
TEMBLADOR: We believe that the recommendation is proposing new material. The Technical Correlating Committee should review the action. Further, no fact finding report was provided that suggests that the existing fittings listed for MI cable would work satisfactorily with nickel conductors. Although Table 310-18 provides ampacity for nickel-clad and nickel conductors, it does not mean that solid nickel conductors, when used in MI cable, would behave the same in all aspects. Tables 310-17 and 310-20 do not recognize both, nickel-clad and nickel. These tables are likely choices for MI cable and without a fact-finding report, safety of the installation would be compromised.

(Log #1559)

7- 13 - (330-80 (New)): Accept in Principle
Note: The Technical Correlating Committee understands that the Panel Action to delete the last phrase in 330.80(C) results in deleting the words "and the…equipment."
SUBMITTER: Ravindra H. Ganatra, Alcan Cable
COMMENT ON PROPOSAL NO: 7-88
RECOMMENDATION: Accept Proposal as Accept in Principle and revise 330.80 as follows:

330.80 Ampacity.
(A) General. The ampacity of Type MI cable shall be determined in accordance with 310.15. The conductor temperature at the end seal fitting shall not exceed the ~~listed~~ temperature rating of the listed end seal fitting and the installation shall comply with temperature ratings of termination and equipment.
(B) Type MI Cable Installed in Cable Tray. The ampacities for Type MI cable installed in cable tray shall be determined in accordance with 318.11 and the installation shall comply with temperature ratings of termination and equipment.
(C) Single Type MI Conductors Grouped Together. Where single Type MI conductors are grouped together in a triangular or square configuration, as required by ~~330.16~~330.10(11), and installed on a messenger or as open runs with a maintained free air space of not less than 2.15 times one conductor diameter (2.15 x O.D.) of the largest conductor contained within the configuration and adjacent conductor configurations or cables, the ampacity of the conductors shall not exceed the allowable ampacities of Table 310.17 and the installation shall comply with temperature ratings of termination and equipment.
~~The conductor temperature at the end seal fitting shall not exceed the listed temperature rating of the end seal fitting.~~
SUBSTANTIATION: Proposal suggests that construction of MI Cable provide a unique performance capability in regards to its permitted ampacity in various installations and configurations. However, the temperature ratings of other components (end seal fittings, through-penetration products, terminations, equipment, etc.) in the circuit are factors that limit the use of ampacity values at temperatures ratings higher than the temperature ratings of these components. Thus, compliance with 110.14(C) shall not be compromised. Further, since 90 degree C limitation referenced in 310.15(B)(7) for end seal fitting has been deleted, a clarification is needed regarding the applicable temperature limitations. Proposed wording does not compromise any innovation for end seal fittings.
Thus, two concepts need to be recognized to facilitate the use of performance capability of MI Cable. First, for the purpose of derating calculations in known installation methods for MI Cable, the higher values of ampacity (in accordance with 318.11 or Table 310.17) are permitted. However, this permission is based on the facts that the temperature rating of other components in the circuits is suitable for the purpose and the resulting derated ampacity value for MI Cable does not exceed the ampacity value used to establish temperature ratings of terminations and equipment as established in accordance with 110.14 (C).
Second, it is possible to configure the installation of MI Cable in such a manner that temperature rating of other components and compliance with 110.14 (C) are not compromised. Since these configurations could be very specific, they should be listed to ensure proper investigation and compliance. Further, it is essential that specific configurations of installation methods, other than those that are already recognized in this section and where ampacity is determined in accordance with 310.15, are evaluated for compliance with 110.14 (C) and then recognized in this Section for their permitted use. Code-Making Panel 7 needs to review such fact finding data prior to permitting applications at ampacities other than those permitted in this section.
Additional changes are editorial to facilitate rewriting of this section. The last sentence has been relocated in the first section titled, "(A) General." as it is applicable to all different types of installations of MI Cable. Reference to 330.16 has been corrected to 330.10(11) to correlate with the rewrite of the Article.
Notes:
(1) Acceptance of this comment will facilitate acceptance of a separate comment, on Proposal 6-89 to revise 310.15(B)(7), by Code-Making Panel 6.
Revised wording of 310.15(B)(7) submitted to Code-Making Panel 6 is shown below:
"(7) Mineral-Insulated, Metal-Sheathed Cable. The temperature limitations on which the ampacities of mineral-insulated, metal-sheathed cable are based shall be determined by the insulating materials used in the end seal fitting. The conductor temperature at the termination shall not exceed the listed temperature rating of the end seal fitting and the installation shall comply with temperature ratings of termination and equipment. When mineral insulated cable is bundled in accordance with ~~330.16~~330.10(11), ampacities from applicable ampacity tables ~~can be used in accordance with 110.14 provided the temperature limit of the cable's end seal fitting is not exceeded~~ are permitted to be used, provided the temperature limit of the cable's end seal fitting is not exceeded and the installation is in compliance with temperature ratings of termination and equipment."
(1) Acceptance of this comment supports correlation between actions taken on Proposals 6-88, 89, 90, 91, 92, 93, 94, 106, and 113; and 7-82, 83, 86 and 88.
(2) Request that this comment be forwarded to Code-Making Panel 1 and Code-Making Panel 6 for their information.
PANEL ACTION: Accept in Principle.
Revise text to read:
330.80 Ampacity. The ampacity of Type MI cable shall be determined in accordance with 310.15. The conductor temperature at the end seal fitting shall not exceed the temperature rating of the listed end seal fitting and the installation shall not exceed the temperature ratings of terminations or equipment.
Change "(B)" to "(A)", add the title and delete the underlined phrase.
Change "(C)" to "(B)", add the title, change 330-10(11) to 330-31 to agree with the panel action on Comment 7-10, and delete the last phrase.

PANEL STATEMENT: The panel action meets the intent of the submitter's comment.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #2040)
7- 14 - (330-80): Accept in Principle in Part
SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc.
COMMENT ON PROPOSAL NO: 7-88
RECOMMENDATION: Accept the Panel action in Principle.
Revise as follows:
330.70. Single Conductors. Where single conductor cables are used, all phase conductors and, where used, the neutral conductor shall be grouped together in a triangular or square configuration to minimize induced voltage on the sheath.
330.80. Ampacity. The ampacity of multiconductor Type MI cable shall be determined in accordance with 310.15. The ampacity of Type MI cable installed in cable tray shall be determined in accordance with 318.11. The ampacity of single-conductor Type MI cable shall be determined by (A) or (B).
(A) Maintained Spacing. Where the circuit groupings of Type MI cable required by 330.70 are installed on a messenger or as open runs with a maintained free air space of not less than 2.15 times one conductor diameter (2.15 x O.D.) of the largest conductor contained within the configuration and adjacent conductor configurations or cables, the ampacity of the conductors shall be permitted to be determined by Table 310.17. The installation shall comply with (1), (2), and (3).
(1) Heat Dissipation. At each point of cable termination at an enclosure, the bundles shall be spread so each cable has a maintained spacing from adjacent cables of not less than one cable diameter for a distance of not less than 450 mm (18 in.) and not more than 900 mm (30 in.).
(2) Adjacent Ampacities. The ampacity determined under this procedure shall not be used to establish temperature ratings of conductors at terminations. The provisions of 310.15(A)(2) Exception shall not apply.
(3) End Seal. The conductor temperature at the end seal fitting shall not exceed the listed temperature rating of the end seal fitting.
(B) Spacing Not Maintained. Where the spacing in (A) is not maintained, the ampacity shall be determined using a method that does not rely on the ampacities of single conductors run in free air.
SUBSTANTIATION: The NEC has to recognize that the cables are operating above 90°C under these conditions, admittedly harmless to the MI cable, but which need to correlate with Sec. 110-14(c), and Sec. 310-15(b)(2) and its exception. Some MI cable folks have already told me that they are relying on that exception to get them into an enclosure with terminations based on free-air temperatures over the run. That only works if the cable actually operates under free air conditions. For example, suppose the cable ran unbundled (not allowed; this is only for discussion). Then, for a 75°C allowable termination, I would agree that you could use the 75°C column of Table 310-17. However, you can't run the cable unbundled. Furthermore, product standards almost universally rely on Table 310-16 to provide enough headroom in conductor sizing to allow for the conductor to function as a heat sink from the device. Therefore:
1) The cable must be unbundled for some distance, which the Code needs to specify upon due input from third parties, sufficient to allow the elevated temperature within the bundle to fall to the

point where the end seals aren't affected. I have heard 1 ft as a number OK for 90° C end seals and somewhat greater for lower rated seals. Probably 2 ft is a good number, one that makes intuitive sense to users based on the nipple rule; this comment uses a range with that number in the middle.

2) Sec. 310-15(b) Exception relies on a length of higher ampacity (= cooler wires) to act as a heat sink for lower ampacity (= hotter wires) areas along the run. In this unique case if someone applies this exception to the conductors in the panelboard they would inadvertently be doing the reverse, that is, attempting to use hotter conductors as a heat sink for cooler conductors. Therefore this rule has to clearly stipulate how the allowable ampacity tables intersect with termination requirements.

This comment also suggests that Code-Making Panel 7 establish another standard number for the cable articles, namely, Section 70 (could be changed, of course) as the uniform repository of special requirements for single-conductor applications. That section would be used in this article, as well as Articles 334 and 339.

PANEL ACTION: Accept in Principle in Part.

PANEL STATEMENT: The panel action on Comment 7-13 addresses the submitter's concern regarding the proper use of the ampacity for MI Cables. Since there is no data provided to support specific recommendations for installations by the submitter, the panel does not accept that portion of the recommendation.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:

AFFIRMATIVE: 15

(Log #2149)

7- 15 - (330-80 (New)): Reject

SUBMITTER: Robert Konnik, Rockbestos-Suprenant Cable Corp.

COMMENT ON PROPOSAL NO: 7-88

RECOMMENDATION: Change Table 310-17 to 310-20.

SUBSTANTIATION: The use of Table 310-17 will result in conductor temperatures exceeding 90°C. An example is for the 8 AWG, the calculated ampacity is 72 amperes, and it is proposed to allow 80 amperes. In Table 310-17, for a 75°C conductor temperature, ampacity is 70 amperes (much closer to the 72 amperes). By extrapolation, it would appear that conductor temperature would be over 100°C if 80 amperes is allowed.

Additionally, the IEEE 835 Table cited is for no direct sunlight. MI cable may be installed outdoors, or indoors in sunlight. Under this circumstance, the use of the ampacities in Table 310-17 will result in conductor temperatures above 90°C. Using the same example of an 8 AWG, the allowable ampacity in IEEE 835 is 58 amperes with full sun (corrected to 30°C ambient). Compared to 60 amps for Table 310-17 with a 60°C conductor temperature (Delta of 30°C).

Note, excessive conductor temperature will be a concern for splices, terminations, possibly for adjacent cables rated at 90°C, etc. Additionally, the IEEE Tables cited can be used under engineering supervision in the proper installation, and are applicable to all cable types which conform to the assumptions.

It is suggested that Table 310-20 be used which is consistent with the proposal for Type MC (334-13, Proposals 7-125 and 6-113). Note though that compared to IEEE 835, most of the values fall somewhere between the full sun columns with 0 ft/sec and 2 ft/sec air movement.

PANEL ACTION: Reject.

PANEL STATEMENT: The substantiation provided with Proposal 7-88 supports the use of Table 310-17. Table 310-17 has been used for the ampacity of Type MI cables grouped together for many years. The panel has addressed the temperature rating of the terminations in Comment 7-13.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:

AFFIRMATIVE: 13

NEGATIVE: 2

EXPLANATION OF NEGATIVE:

GUIDA: This comment should be accepted. There is evidence that these cables will exceed 90°C when installed in a bunched configuration. Although this will not harm the cable that is rated for 250°C, it is a bad precedent to deliberately let cables exceed their rating and may be a hazard if they come in contact with some building materials.

TEMBLADOR: We are voting negative so that members of Code-Making Panel 7 will have one more opportunity to review the panel's action on this comment.

Recommendation: The Panel Action on Comment 7-88 should be revised, as recommended by Comment 7-15 and as intended by Comments 6-29 and 6-30, so that 330.80 reads as follows: (strikeout and underlined text highlight the changes to the panel action arrived at during the ROC Meeting):

330-80 Ampacity. The ampacity of Type MI cable shall be determined in accordance with 310.15. The conductor temperature at the end seal fitting shall not exceed the temperature rating of the listed end seal fitting <u>in accordance with 110.14(C)</u> and the installation shall not exceed the temperature ratings of terminations or equipment.

(A) Type MI Cable Installed in Cable Tray. The ampacity of Type MI cable installed in cable tray shall be determined in accordance with 318.11.

(B) Single Type MI Conductors Grouped Together. Where single type MI conductors are grouped together in a triangular or square configuration, as required by 330-31, and installed on a messenger or as open runs with a maintained free air space of not less than 2.15 times one conductor diameter (2.15 X O.D.) of the largest conductor contained within the configuration and adjacent conductor configuration or cables, the ampacity of the conductors shall not exceed the allowable ampacity of Table 310.17 <u>310.20</u>.

Substantiation: (1) For "in accordance with 110.14(C)" Although implied and very clear from the substantiation provided with Comments 7-88, 6-29 and 6-30, it is important that this text is part of this section so that there is no confusion about the requirement and the intent. Also, we believe that this action will then be in total and complete agreement with the willingness of Code-Making Panel 6 to delete 310-15(B)(7). Since all Nationally Recognized Testing Laboratories apply 110-14 to evaluate and list fittings, terminations, etc., it should be identified clearly.

(Note: If this change is accepted, then a similar change is essential in 334.80 also. We have submitted a comment with our affirmative vote on Panel Action on Comment 7-25.)

(2) For "Table 310.17" to "Table 310.20" Initially, Code-Making Panel 7 agreed to make this change on Proposal 7-88 during the ROC Meeting abased on the discussion and presentation on Comment 7-15. However, the item was reconsidered and the Comment 7-15 was rejected and the above change was eliminated from the revised 330.80.

A comparison between Tables 310-17 and 310-20, when adjusted for 30° C ambient, suggests that there is an increase of 25% in ampacity values of MI cable when Table 310-17 is used over Table 310-20 for the intended application of grouping of single conductors. While focusing the attention on the capability of MI cable, it appears that Panel 7 has overlooked a need of fact finding that confirms that other requirements in the code are not compromised. Since specific installation requirements are a part of such installation, it is essential that this data is provided to support the recommendation to use 310-17.

In addition to the fittings and terminations for MI cable, the investigation should also include fire stop and floor and wall penetration products. The actual temperature of cable within the portion of the run where these products are located would be significantly higher than 90°C when they are grouped as proposed and the ampacity values per Table 310-17 are permitted. Thus, the temperature ratings and other performance requirements of these products that may come in contact with the grouped single conductors of MI cable could be compromised. A comparison between Table 310-16 and 310-17, shown in the following table, suggests that the temperature rating of these components could be severely compromised.

Size AWG or kcmil	Ampacity at 75° C per Table 310-16 at 30° C (Used for compliance with 110-14)	Ampacity at 90° C per Table 310-20 at 40° C	Ampacity at 90°C per Table 310-20 adjusted to 30° C (Using 1.13 factor for temperature adjustment provided in Table 310-20	Ampacity at 90°C per Table 310-17 at 30° C	Percent Increase in Ampacity by using Table 310-17 (instead of Table 310-20) at 30° C	Percent Increase in Ampacity by using Table 310-17 at 90° C (instead of Table 310-16 at 75° C) at 30° C
8	50	57	64	70	23%	40%
6	65	76	86	95	25%	46%
4	85	101	114	125	24%	47%
3	100	118	133	145	23%	45%
2	115	135	153	170	26%	48%
1	130	158	179	195	23%	50%
1/0	150	183	207	230	26%	53%
2/0	175	212	240	265	25%	51%
3/0	200	245	277	310	27%	55%
4/0	230	287	324	360	25%	57%
250	255	320	362	405	27%	59%
300	285	359	406	445	24%	56%
350	310	397	449	505	27%	63%
400	335	430	486	545	27%	63%
500	380	496	560	620	25%	63%
600	420	553	625	690	25%	64%
700	460	610	689	755	24%	64%
750	475	638	721	785	23%	65%
800	490	660	746	815	23%	66%
900	520	704	796	870	24%	67%
1000	545	748	845	935	25%	72%

Since the Code is applicable for every manufacturer and installer of MI cable, proper installation requirements are essential to ensure compliance with the Code and to permit maximum capability of MI cable.

It should be noted that for 334.80, the panel Action on Comment 7-25 rejected the recommendation to use Table 310-17 instead of Table 310-20 for a similar application of grouping of MC cable.

In addition to the discussion on Comment 7-15 at the ROC meeting, we hope that this information is sufficient to help Panel 7 change its decsion to make this change from Table 310-17 to 310-20. Procedurally, to do so requires a negative vote on the panel Action at the ROC Meeting on Comment 7-15. Should it be successful, then the Techncial Correlating Committee will review this action for further decision(s).

Lastly, again in the interest of consensus, we are willing to support the present action on Comment 7-15 if there is sufficient information available to alleviate our concerns.

ARTICLE 331 — ELECTRICAL NONMETALLIC TUBING: TYPE ENT

(Log #1824)

8- 19 - (331-3 and 331-4): Accept

SUBMITTER: Marshall A. Klein, Marshall A. Klein & Assoc., Inc.

COMMENT ON PROPOSAL NO: 8-64

RECOMMENDATION: We support the Panel's rejection based on the supporting documentation in the original proposal.

SUBSTANTIATION: Article 331 was a new article in the 1984 NEC. In the 1984 NEC Section 331-3 was the same as Section 336-3. In the 1987 NEC Section 331-3 was revised to eliminate the three story limit on the use of ENT.

The use of ENT was recognized by the NEC, and permitted to be used in buildings above 3 stories, as a result of the U.S. Supreme Court case, from 1981-1988, Allied Tube & Conduit v. Indian Head, Inc. (which decided that the actions of Allied Tube & Conduit during the 1980 NFPA Annual Meeting were not protected from antitrust liability), NEC-TCR-86-A Code Proposal 8-49, and NEC TCD-86 Comments 8-32 and 8-33.

NEC-TCR-86-A Code Proposal 8-49 used as substantiation the report entitled "The Use of ENMT, Fire Hazard Analysis", by Benjamin/Clarke Associates, Inc., dated 9/85, to accept the use of ENT above three stories when concealed behind a 15 minute finish rated thermal barrier.

In 1998, Sullivan Code Group prepared a report entitled, "Type NM Cable Fire Hazard Analysis", based on the same type of analysis that was used by the Benjamin/Clarke Hazard Analysis for ENMT. The results of the Sullivan Report (which is based on cone calorimeter testing by Dr. Fred Mower, Fire Protection Engineering Department, University of MD, and a third party peer review by Dr. Fred Clarke, Benjamin/Clarke Associates) concludes that the fire hazard (or lack thereof) of NM Cable is equivalent to ENMT.

As submitter of the original proposal, I support the Panel's rejection of my proposal based on the documentation submitted that clearly shows that ENT, as well as N/M Cable "...provide no new substantiation to identify this use as a hazard." It was clear from the Panel's Statement that ENT is a safe wiring system. Since the report submitted with this proposal compared ENT with NM Cable based on this Panel's original approval of ENT in 1985, it is clear that this Panel, by default, would agree that the installation of NM Cable behind a 15 minute barrier would be expected to perform the same. The inconsistent treatment between two PVC wiring methods under the NEC Code, by virtue of Panel 7's continued resistance to remove the 3 story restriction on the use of NM Cable, when presented the same documentation (See Code Proposal 7-145-(336-5)), as well as NFPA Fire Data showing no major fire problem in the US with fixed wiring in Apartment Buildings, will require the NEC Technical Correlating Committee and/or the NFPA Standards Council to resolve. We are only attempting to gain consistency in the NEC, and between Panel Committees, on electrical wiring methods.

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

PANEL ACTION: Accept.

PANEL STATEMENT: The panel disagrees with the submitter's substantiation. The panel has not evaluated the suitability of installing Type NM cable behind a 15 minute finish rated assembly, nor has the panel made a comparison evaluation of ENT to Type NM cable. CMP-7 has the jurisdiction over the technical issues associated with Type NM cable and CMP-8 offers no opinion on the cable data provided by the submitter.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:

AFFIRMATIVE: 14

(Log #1605)

8- 20 - (331-3(2)): Accept in Principle
SUBMITTER: James K. Lathrop, Koffel Assoc., Inc.
COMMENT ON PROPOSAL NO: 8-65
RECOMMENDATION: Accept proposal as originally submitted.
SUBSTANTIATION: The Panel has not provided a valid technical reason for rejecting the proposal. The Panel Statement does not address legitimate issues presented in the Proposal Substantiation. In addition to the substantiation provided with the proposal, this comment is supported by the following.

This proposal simply allows an automatic sprinkler system to substitute for the 15-minute finish rating. There are many walls and ceilings even in a "fire rated" building that are not required to have a fire resistance rating. For example, in a Type II (222) building, if the ceiling is not part of the rating of the floor or roof assembly any ceiling tile, including no ceiling tile, is permitted. Similarly, if a wall is not a bearing wall, and is not required elsewhere to be rated, no fire resistance is required. To require materials that have a finish rating in a sprinklered building, just because of the existence of ENT is not justified. This is based on: analysis of the hazard, the fire record, and the litigation record.

In a sprinklered building, ENT that happens not to be protected behind a 15-minute finish rating is better protected than in a non-sprinklered building installed behind a 15-minute finish rating. NFPA fire data is clear that sprinkler protection is very successful, especially in the type of multi-story building being addressed in this provision. In order to have ENT or RNMC burn, a sustained fire exposure is needed. This is less likely in a sprinklered building than behind a 15-minute finish rating in a non-sprinklered building.

NFPA's fire records do not show any increase in fire incidents involving fixed electrical wiring since ENT has been permitted; in fact there is an overall decrease. There is no fire data that justifies the rejection of this proposal.

ENT has been used for decades without the 15-minute finish rating. In today's very litigious society if there were any injuries or deaths or serious fires in which ENT played a role, the manufacturer would be quickly aware of it. Carlon is not aware of such cases. There is no justification for the 15-minute finish rating, therefore there should be no problem substituting a sprinkler system for the barrier.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Comment 8-22.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NEGATIVE: 2
EXPLANATION OF NEGATIVE:
DOLLINS: See my explanation of negative vote on Comment 8-21.
LOYD: See my Explanation of Negative on Comment 8-22.

(Log #1807)

8- 21 - (331-3(2)): Reject
SUBMITTER: Tim Andrassy, Steel Tube Inst.
COMMENT ON PROPOSAL NO: 8-65
RECOMMENDATION: This proposal should continue to be rejected.
SUBSTANTIATION: To date, the building codes have restricted use of ENT in Types I and II construction. Even though the NEC requires a thermal barrier, ENT is only permitted in accordance with a National Evaluation Report (NER-290). This report only covers use in noncombustible, fire-resistive nonbearing walls and floor-ceiling assemblies. The limitations are based on testing provided by the company submitting Proposal 8-65.

The report requires that only specific outlet boxes (per NER-140) be used with the ENT. It covers only trade sizes 1/2 and 3/4, although ENT is produces through trade size 2 in. Gypsum wallboard is required to be 5/8 Type X. For a two-hour rated wall only three runs in any 6 foot length of wall is permitted, and there can be no more than two tubes in any one stud cavity. In one-hour rated walls only two tubes are permitted in any one stud cavity. In addition, the tubing must be wrapped in a specific 1-1/2 inch thick fiberglass insulation. (A proposal previously submitted to the CMP shows that this wrap substantially increases the temperature of the conductors and additional derating is required.) Nonmetallics are addressed as a whole in a floor-ceiling assembly and are permitted up to a three-hour rating. The distance from the top of the ceiling membrane to the bottom of the floor or roof deck above shall not be less than 16 3/8 inches. The total volume of rigid nonmetallic conduit, electrical nonmetallic tubing and liquidtight conduit shall not exceed 380 cubic inches per 100 square feet of ceiling area. This value also takes into account the amount of fittings and junction boxes necessary for installation. A table is provided to show the maximum linear feet/100 square feet of ceiling area. ALL types must be added together and the total must fall below the limit. None of these requirements appears in the NEC.

The current building code cycle has just ended. There appears to be a lack of correlation between two committees of the ICC Building Code this cycle. The General Occupancy Committee passed proposal G-113-00 which ordinarily addresses combustibles in nonconcealed spaces of Type I and Type II buildings. The Fire Safety Committee rejected the same type of proposal in FS-46-00 dealing with concealed spaces in these same buildings. Both proposals would permit the use of electrical wiring methods with combustible insulation, tubing, raceways and related components when installed in accordance with the ICC Electrical Code (this references the NEC.) The reason given by the Fire Safety Committee for not permitting these products in concealed spaces was that it was inappropriate because electrical wiring has a built-in source of ignition. However, a reference to the General Occupancy section makes it unclear if the Fire Safety decision can be enforced. We will try to clear this up next cycle, but in the meantime we must rely on the NEC for protection in these buildings.

Even before we get to Type I and II buildings, there is a problem. Some buildings will often be one-hour rated buildings. This one-hour rating is permitted to be reduced to 1/2 hour for tenant separation and guest rooms when the building has sprinklers. In some instances even the corridor and incidental common areas are not required to be separated. Even a full NFPA 13 does not require sprinklers where the exposed portions of the concealed space are constructed entirely of fire-retardant treated wood as defined by NFPA 703. Also, there is no data to indicate if nonmetallic wiring in these spaces will overwhelm the sprinklers such as has occurred in plastic storage situations. As Dr. Jack Snell has noted so frequently in the past, redundancy is necessary in fire safety. That redundancy is fast disappearing. This is especially troubling as buildings age and maintenance may not be sufficient.

With regard to the "fire history" of ENT, we quote Dr. Wesley Clayton, formerly a TAC member (6-23-89), "I am interested in the statement that you have had 'no claims.' I grew up in DuPont and have learned statements of that nature are questionable. Can you document this for the whole industry?" In addition, it has been our experience that every time we started to track down the specifics of nonmetallic fires the case has been settled and the court records sealed. It is extremely difficult to secure the data.

The NFPA Research Foundation is in the process of trying to determine the answers to concerns regarding incapacitation and lasting injury from the products of combustion. These answers are not available, but would follow-up on concerns expressed by the last TAC relative to endpoints other than death. This same concern in currently under review internationally. It is untimely to reduce the protection for ENT.

The codes, both the NEC and the building codes, provide a way to use nonmetallic wiring methods in a specific building or area if equivalency of specific details to permitted wiring methods can be provided. Permitting broad use is not in the interest of public safety and the mission of the Code.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Comment 8-22.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NEGATIVE: 2
EXPLANATION OF NEGATIVE:
DOLLINS: This comment should be accepted. It brings up many concerns that are not addressed either by Proposal 8-65 or the comments submitted in support of Proposal 8-65.
LOYD: See my Explanation of Negative on Comment 8-22.

(Log #1822)

8- 22 - (331-3(2)): Accept

Note: The panel's mandatory reference to another standard is in violation of Section 4.2 of the NEC Style Manual. To resolve the issue, the Technical Correlating Committee directs that 331.10(2) be revised to read as follows:

"(2) In any building exceeding three floors above grade, ENT shall be concealed within walls, floors, and ceilings where the walls, floors, and ceilings provide a thermal barrier of material that has at least a 15-minute finish rating as identified in listings of fire-rated assemblies. The 15-minute finish rated thermal barrier shall be permitted to be used for combustible walls, floors, and ceilings.

Exception: Where an approved fire sprinkler system(s) is installed on all floors as a complete system, ENT shall be permitted to be used within walls, floors, and ceilings, exposed or concealed, in buildings exceeding three floors above grade.
FPN 1: For further information on fire sprinkler system(s), see NFPA 13 – Standard for the Installation of Sprinkler Systems.
FPN 2: [remains as published in ROP 8-65].”

SUBMITTER: Joseph B. Zicherman, Fire Cause Analysis/Rep. Carlon, Lamson & Sessions
COMMENT ON PROPOSAL NO: 8-65
RECOMMENDATION: Revise text to read as follows:
(2) In any building exceeding three floors above grade, electrical nonmetallic tubing shall be concealed within walls, floors and ceilings where the walls, floors and ceilings provide a thermal barrier of material that has at least a 15-minute finish rating as identified in listings of fire-rated assemblies. The 15-minute finish rated thermal barrier shall be permitted to be used for combustible walls, floors and ceilings.
Exception: When a fire sprinkler system(s) is installed in accordance with NFPA 13, Installation of Sprinkler Systems on all floors, ENT is permitted to be used within walls, floors and ceilings exposed or concealed in buildings exceeding three floors above grade.
FPN: A finish rating is established for assemblies containing combustible (wood) supports. The finish rating is defined as the time at which the wood stud or wood joist reaches an average temperature rise of 121°C (250°F) or an individual temperature of 163°C (325°F) as measured on the plane of the wood nearest the fire. A finish rating is not intended to represent a rating for a membrane ceiling.
SUBSTANTIATION: Problem: Code Panel 8 rejected the original proposal pending: (a) input from the NFPA Toxicity Advisory Committee (which met to consider this item in October 2000) and (b) because "There was no substantiation provided to demonstrate the safety record of the product as stated by the submitter." This ROP comment is provided to give Code Panel 8 the desired substantiation to the panel beyond the comments on the subject provided in the original proposal.
Substantiation: ENT was allowed to be used in buildings up to three stories in height without requiring its installation behind a material with a minimum 15-minute finish rating from 1984 to 1987. Subsequent to that ENT has been used extensively with [minimum] 15-minute finish rated materials without verifiable reports of fire incidents or fire incidence data developing in the available databases.
In terms of fire incidents - the occurrences from which fire incidence data is developed - a search of the available literature shows that no systematic references can be found to ENT being a first item ignited or ENT leading to spread of fires. Sources researched include the fire incident reporting databases such as the National Fire Incident Reporting System, NFIRS compiled initially by individual jurisdictions and the NFPA as well as those on the forensic side such as Nexus, Westaw and Lexus.
Reviews of other sources of information such as the monthly anecdotal listings in the NFPA Fire Journal are also consistent with this lack of fire incidence related to ENT use. Evaluation of the peer reviewed Journal of the International Association of Arson Investigators (the IAAI) does not contain a single reference to ENT being involved in either the cause or spread of unwanted fires. In contrast to the lack of data on ENT involvement in fires, this same IAAI Journal includes references to electrical causation of fires in every issue published under many types of scenarios and for many types of wiring and installation methods. Given this lack of fire incidence information related to the use of millions of feet of ENT installed in all sorts of occupancies since 1984, it is not surprising that the original proposal could not provide extensive substantiation of fire occurrences involving ENT as none have been reported.
Additional substantiation that the installation method proposed would not diminish levels of fire safety achieved can be found in at least four additional sources. These include:
1. Review of the results of "Operation San Francisco: Smoke/Sprinkler Test" which documented full-scale fire tests with functioning NFPA 13 compliant sprinkler systems in 1984. That testing included ENT products in fire exposed rooms and compartments. A copy of the study referenced is provided for the panel's consideration.
2. Review of a technical report conducted relating to electrical and fire safety hazards posed in using PVC RNMC, a chemically identified precursor to ENT by Factory Mutual published in 1984 which demonstrated that faulting electrical of conductors installed in PVC based raceways does not lead to increased fire hazard. A copy of the study referenced is provided for the panel's consideration.
3. Review of comments in Chapters 3 and 5 included in "Fire Safety of PVC Raceways and the Model Building Codes" describing the response of ENT to fire conditions. A copy of the study is provided for the panel's consideration.
4. Study of a detailed analysis of both ENT and RMC materials exposed to electrical fault and fire conditions in a fire incident documented recently in San Jose, California which illustrates the resistance of ENT to ignition and fire spread in the field. These results showed in fact that the ENT raceway was significantly less effected than the RMC. The performance of the latter specifically led to fire growth and spread. See report including photos which I have provided.
Note: Supporting material is available for review at NFPA Headquarters.
PANEL ACTION: Accept.
PANEL STATEMENT: Based on Comment 8-24 from the Toxicity Technical Advisory Committee and the substantiation for Comment 8-22, the reference to NFPA 13 is necessary as part of the requirements of this section. The panel agrees that the use of a Fine Print Note reference to NFPA 13 is not appropriate because a FPN is not enforceable. The panel understands that the reference to NFPA 13 in the text of the requirement does not comply with Section 4.2 of the NEC Style Manual, but in lieu of extracting the applicable sections of NFPA 13 into the NEC, the action is justified and the panel requests that the Technical Correlating Committee permit this action to stand.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NEGATIVE: 2
EXPLANATION OF NEGATIVE:
DOLLINS: See my explanation of negative vote on Comment 8-21.
LOYD: The TTAC substantiation does not support their recommendation nor the technical committee's action. Two major items cause me to find this insufficient for approving removal of the thermal barrier. The TAC decision was determined primarily on toxicity alone, using death as the endpoint.
1. Current international work is examining the role of toxic combustion gases in incapacitation of fire victims to the extent their escape is inhibited. (Work at ISO and the NFPA Research Foundation.) The jury is not in on this matter and we should not load our concealed building spaces with combustible materials until we have the answers to the questions being raised. It is important to remember that HCL, an extremely irritant gas from PVC, has a strong effect on the eyes, nose, and respiratory system and could be very incapacitating. In addition, however, PVC produces prolific carbon monoxide, the primary killer in fires. The TAC has not convinced me that they fully evaluated a fire originating in concealed spaces, especially in suspended ceilings. This is where I see use of ENT increasing the most because currently ceiling tiles with a finish rating are limited. If no finish rating is required, it is possible the NET will be installed behind non-fire rated tiles. This would be even more apt to occur in hi-rise buildings where this grid ceiling is used purely for esthetics and service concealment and the floor above it is the fire barrier. The TAC has focused more on the contribution of ENT in the event a fire originates in a room, and thus is incomplete. Looking at overall risk assessment of ENT permitted without the currently required thermal barrier I find there is a foreseeable hazard involved and do not believe it is justified. The courts are looking seriously at codes and standards that ignore these foreseeable hazards.
2. The trend of trading of important safety issues and depending strictly on sprinklers for fire protection is of concern. Everyone is aware that when some of the more serious fires have occurred the sprinkler system (failed) did not perform properly or the sprinkler system was down for repairs. There is no question sprinklers are very valuable for controlling fire spread until the fire department arrives but there is still a lot of smoke. Also, the building codes have already permitted numerous trade-offs, such as reducing the fire rating required for some assemblies to as little as 1/2 hour. Protection of corridors has been reduced or eliminated. Permitting this unrestricted use of a nonmetallic wiring method throughout buildings where combustibles have long been regulated opens the door for even more combustibles and further reduction in safety. Redundant fire protection is fast disappearing and I do not believe the NEC should be part of this deterioration.
The committee agrees that any building above three stories using ENT without the thermal barrier must be protected with a fire sprinkler system installed in accordance with NFPA 13. This was

intended to assure that the building was protected with a minimum level of safety, and verifies that the ENT could be a safety hazard. I believe this is sufficient reason to provide the extra safety measure of a thermal barrier.

NFPA has repeatedly marketed the NEC as in international document. This requirement may not be know or used in some countries where the NEC is adopted and used. I would urge the committee to vote "negative" on the written ballot on comments 8-20, 8-21, 8-22, 8-25, 8-26 and 8-27 to accept the concept at this time.

COMMENT ON AFFIRMATIVE:

DAUBERGER: NEMA recognizes that the mandatory reference to NFPA 13 is in violation of NFPA NEC Style Manual, and makes the following recommendations:

Revise 331-10(2) of the 2002 NEC Draft to read:

(2) In any building exceeding three floors above grade, ENT shall be concealed within walls, floors, and ceilings where the walls, floors, and ceilings provide a thermal barrier of material that has at least a 15-minute finish rating as identified in listings of fire-rated assemblies. The 15-minute finish rated thermal barrier shall be permitted to be used for combustible walls, floors, and ceilings.

Exception: When an approved fire sprinkler system(s) is installed on all floors as a complete system, ENT shall be permitted to be used within walls, floors, and ceilings, exposed or concealed, in buildings exceeding three floors above grade.

FPN 1: For further information on fire sprinkler system(s), see standard NFPA 13, Installation of Sprinkler Systems.

FPN 2: A finish rating is established for assemblies containing combustible (wood) supports...

KENDALL: I agree with George Dauberger and the NEMA affirmative statement on Comment 8-22. An approved sprinkler system installed completely on all floors is an acceptable practice and is in compliance with local codes.

(Log #89)

8- 23 - (331-3(2), Exception (New)): Accept

SUBMITTER: Technical Correlating Committee National Electrical Code

COMMENT ON PROPOSAL NO: 8-65

RECOMMENDATION: The Technical Correlating Committee directs that this Proposal be referred to the NFPA Toxicity Advisory Committee for comment on the toxicity issues relative to the use of ENT in buildings over three stories. The Technical Correlating Committee directs that Code-Making Panel 8 act on the technical merits of the proposal outside of presumed toxicity issues.

SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.

PANEL ACTION: Accept.

PANEL STATEMENT: See panel action and statement on Comment 8-22.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:

AFFIRMATIVE: 14

(Log #2377)

8- 24 - (331-3(2), Exception (New)): Accept

SUBMITTER: Toxicity Technical Advisory Committee

COMMENT ON PROPOSAL NO: 8-65

RECOMMENDATION: The TTAC finds that this change would not significantly increase toxic hazard to occupants.

SUBSTANTIATION: Summary of Proposal: The use of ENT would be expanded to permit the concealed and exposed installation in buildings over three stories in height without a 15-minute finish rated barrier when the building is sprinklered in accordance with NFPA 13.

Toxicity Issues: The expanded use of exposed ENT in buildings over three stories and sprinklered throughout is not likely to decrease appreciably the time to the incapacitation of the occupants or slow their rates of egress. A properly installed sprinkler system should control the fire, reducing the overall smoke and thus the exposure of occupants to toxic gases, and more than compensating for any modest change in toxicity properties.

The toxic potency of the ENT smoke is not a primary issue. In a serious fire, far more fuel than the ENT would be involved. The lethal toxic potency of smoke from well-ventilated flaming of unplasticized PVC (such as in current ENT) is about 25 g/m^3 (NFPA 269)[1] which is comparable to values for most common fuels in buildings.[2] A similar value is estimated for post-flashover toxic potency.[3] A lethal toxic potency value for the smoke from thermally degraded unplasticized PVC is about 20 g/m^3, which is comparable to the values for flaming combustion.[4] The incapacitating exposures from smoke are generally taken as about one-third of the lethal exposures.[5] The toxic potency of ENT is already mandated in NEC Section 331-1 to be no greater than that of unplasticized PVC.

There is the potential for the ENT-generated fraction of the smoke to have a different toxicological impact on occupants, e.g., irritation by HC1 in addition to asphyxia caused by CO. This would affect the rate at which occupants are able to progress effectively from the hazardous zones in a building. The ENT fraction of the total fuel in a serious fire is likely to be small and the yields of irritant from the other (ordinary) fuels varies and is not regulated. Thus, it is not possible to estimate whether there is a significant and different toxic impact of the increased presence of ENT. However, since the control of the burning rate by the sprinkers should more than offset modest (if any) increases in the irritancy of the smoke from the ENT. The TTAC did not expect that the expanded use of ENT would result in a meaningful change in smoke density and thus, e.g., in the ability to view exit signs or doors.

It is possible that the exposure of occupants to fire smoke would be more lengthy and involve more people in tall buildings than in those of three or fewer floors. The TTAC noted that a building code provides many requirements that would mitigate any increase in hazard due to expnaded use of ENT. However, there are international and domestic locales where the NEC is used without building or fire code enforcement. Even in absence of a building or fire code, serious fires are likely to be dominated by fuels other than ENT, and thus the contribution to toxic hazard by ENT is likely to be modest at best.

The NEC panel statement for this proposal indicates that the TTAC would review the use of automatic sprinklers as a substitute for a 15-minute finish rating. A full benefit analysis is outside the role of the TTAC. However, should the water reach the burning fuels, the control of the fire would more than offset any increase in toxic hazard due to additional exposed ENT.

General comments on the offered sprinkler protection: The proposal should be clarified to use sprinkler terminology found in current building and fire codes. For example "Exception: In buildings protected throughout with a fire sprinkler system installed in accordance with NFPA 13, Installation of Sprinkler Systems, ENT is permitted to be used...". Consideration should be given to sprinkler systems installed according to NFPA 13R for four story residential buildings. The accumulation of C/D electrical products in non-combustible concealed spaces may become large enough to require sprinkler protection in those spaces.

General Statements: This comment was developed by the NFPA Toxicity Technical Adviosry Committee. Members of this committee are as follows: Richard G. Gann, Ph.D., Chair; Craig Beyler, Ph.D; Edward V. Clougherty, Ph.D; Christopher Laux, AIA, CBO; James P. Lyon, Ph.D; and Richard Pehrson, Ph.D.

The 12 proposals for the 2002 NEC that were forwarded to the Toxicitiy Technical Advisory Committee (TTAC) on May 26, 2000 for comment all involve potential changes in the mass and location of combustible or degradable (C/D) materials within a building. Such changes might affect the fire's rate of heat release, the single most important variable affecting hazard to people since it is the driving force leading to the spread of fire and products of combustion. Having been advised that the NEC task groups contain the necessary expertise to address fire growth and overall fire hazard, the TTAC is only submitting comments on the impacts of the proposed changes on smoke toxicity and toxic hazard.

In the following comments, references to "occupants" are meant to include firefighters operating in accordance with NFPA 1500.

The composition of the C/D products, and thus the smoke generated in a fire, may evolve over time. Thus, the TTAC comments apply to general changes in the mass and location of C/D products and are not limited to the current formulation of such products.

Section 331-1 of the NEC requires that the toxicity characteristics of NMT be no worse than those of unplasticized PVC, but does not name those characteristics nor cite a test method for measuring them. NFPA 269 was developed for such purposes. It can be used to provide (a) data on the lethal toxic potency of smoke and (b) gas yields of key toxicants for use in fire hazard modeling. Section 331-1 should be modified to note both the method to be used and that these are the data to be provided. A prescriptive (e.g., LC_{50}) comparison with unplasticized PVC should be replaced by a comparison of Toxic hazard of the proposed product and unplasticized PVC.

1 Babrauskas, V., Harris, Jr., R.H., Braun, E., Levin, B.C., Paabo, M., and Gann, R.G., The Role of Bench-Scale Test Data in Asssessing Real-Scale Fire Toxicity, NIST Tech Note 1284, National Institute of Standards and Technology, 1991.

2 Peacock, R.D., Jones, W.W., Bukowski, R.W., and Forney, C.L., "Technical Reference Guide for the HAZARD I Fire Hazard Assessment Method," NIST Handbook 146, National Institute of Standards and Technology, Gaithersburg, MD, 1991.

3 Data from reference 1, with estimated correction for loss of HCI; personal communication from R. Gann.

4 Huggett, C., and Levin, B.C., "Toxicity of the Pyrolysis and Combustion Products of Poly (Vinyl Chlorides): A Literature Assessment," Fire and mateirals 11, 131-142 (1987).

5 From ISO TC92 (Committee on Fire Safety) SC3 (Fire Threat to People and the Environment), personal communication from R. Gann.

PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
SIMPSON: I would agree with the panel action if there is a way to word enforcement of NFPA - 13 sprinkling guidelines as proposed, however, during panel discussion there is concern of such enforcement. Therefore, without such enforcement my vote would be to reject 8-24.

(Log #1606)

8- 25 - (331-3(5)): Accept in Principle
SUBMITTER: James K. Lathrop, Koffel Assoc., Inc.
COMMENT ON PROPOSAL NO: 8-66
RECOMMENDATION: Accept proposal as originally submitted.
SUBSTANTIATION: The Panel has not provided a valid technical reason for rejecting the proposal. The Panel Statement does not address legitimate issues presented in the Proposal Substantiation. In addition to the substantiation provided with the proposal, this comment is supported by the following.

This proposal simply allows an automatic sprinkler system to substitute for the 15-minute finish rating. There are many walls and ceilings even in a "fire rated" building that are not required to have a fire resistance rating. For example, in a Type II (222) building, if the ceiling is not part of the rating of the floor or roof assembly any ceiling tile, including no ceiling tile, is permitted. Similarly, if a wall is not a bearing wall, and is not required elsewhere to be rated, no fire resistance is required. To require materials that have a finish rating in a sprinklered building, just because of the existence of ENT is not justified. This is based on: analysis of the hazard, the fire record, and the litigation record.

In a sprinklered building, ENT that happens not to be protected behind a 15-minute finish rating is better protected than in a non-sprinklered building installed behind a 15-minute finish rating. NFPA fire data is clear that sprinkler protection is very successful, especially in the type of multi-story building being addressed in this provision. In order to have ENT or RNMC burn, a sustained fire exposure is needed. This is less likely in a sprinklered building than behind a 15-minute finish rating in a non-sprinklered building.

NFPA's fire records do not show any increase in fire incidents involving fixed electrical wiring since ENT has been permitted; in fact there is an overall decrease. There is no fire data that justifies the rejection of this proposal.

ENT has been used for decades without the 15-minute finish rating. In today's very litigious society if there were any injuries or deaths or serious fires in which ENT played a role, the manufacturer would be quickly aware of it. Carlon is not aware of such cases. There is no justification for the 15-minute finish rating, therefore there should be no problem substituting a sprinkler system for the barrier.

PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Comment 8-26.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
LOYD: See my Explanation of Negative on Comment 8-26.

(Log #1821)

8- 26 - (331-3(5)): Accept

Note: The panel's mandatory reference to another standard is in violation of Section 4.2 of the NEC Style Manual. To resolve the issue, the Technical Correlating Committee directs that 331-3(5) be revised to read as follows:

"(5) Above suspended ceilings where the suspended ceilings provide a thermal barrier of material that has at least a 15-minute finish rating as identified in listings of fire-rated assemblies, except as permitted in Section 331-10(1)(a).

Exception: Where an approved fire sprinkler system(s) is installed on all floors as a complete system, ENT shall be permitted to be used above suspended ceilings without a 15-minute finish rated thermal barrier material.

FPN: For further information on fire sprinkler system(s), see NFPA 13 – Standard for the Installation of Sprinkler Systems."

SUBMITTER: Joseph B. Zicherman, Fire Cause Analysis/Rep. Carlon, Lamson & Sessions
COMMENT ON PROPOSAL NO: 8-66
RECOMMENDATION: Revise text to read as follows:

(5) Above suspended ceilings where the suspended ceilings provide a thermal barrier of material that has at least a 15-minute finish rating as identified in listings of fire-rated assemblies, except as permitted in Section 331-3(1)(a).

Exception: When a fire sprinkler system(s) is installed in accordance with NFPA 13, Installation of Sprinkler Systems, on all floors, ENT is permitted to be used above suspended ceilings without 15-minute finish rated thermal barrier material.

SUBSTANTIATION: Problem: Code Panel 8 rejected the original proposal pending: (a) input from the NFPA Toxicity Advisory Committee (which met to consider this item in October 2000) and (b) because "There was no substantiation provided to demonstrate the safety record of the product as stated by the submitter." This ROP comment is provided to give Code Panel 8 the desired substantiation to the panel beyond the comments on the subject provided in the original proposal.

Substantiation for comment: ENT was allowed to be used in buildings up to three stories in height without requiring its installation behind a material with a minimum 15-minute finish rating from 1984 to 1987. Subsequent to that ENT has been used extensively with [minimum] finish rated materials without verifiable reports of fire incidents or fire incidence data developing in the available databases.

In terms of fire incidents - the occurrences from which fire incidence data is developed - a search of the available literature shows that no systematic references can be found to ENT being a first item ignited or ENT leading to spread of fires. Sources researched include the fire incident reporting databases such as the National Fire Incident Reporting System, NFIRS compiled initially by individual jurisdictions and the NFPA as well as those on the forensic side such as Nexus, Westlaw and Lexus.

Reviews of other sources of information such as the monthly anecdotal listings in the NFPA Fire Journal are also consistent with this lack of fire incidence related to ENT use. Evaluation of the peer reviewed Journal of the International Association of Arson Investigators (the IAAI) does not contain a single reference to ENT being involved in either the cause or spread of unwanted fires. In contrast to the lack of data on ENT involvement in fires, this same IAAI Journal includes references to electrical causation of fires in every issue published under many types of scenarios and for many types of wiring and installation methods. Given this lack of fire incidence information related to the use of millions of feet of ENT installed in all sorts of occupancies since 1984, it is not surprising that the original proposal could not provide extensive substantiation of fire occurrences involving ENT as none have been reported.

Additional substantiation that the installation method proposed would not diminish levels of fire safety achieved can be found in at least four additional sources. These include:

1. Review of the results of "Operation San Francisco: Smoke/Sprinkler Test" which documented full-scale fire tests with functioning NFPA 13 compliant sprinkler systems in 1984. That testing included ENT products in fire exposed rooms and compartments. A copy of the study referenced is provided for the panel's consideration.

2. Review of a technical report conducted relating to electrical and fire safety hazards posed in using PVC RNMC, a chemically identified precursor to ENT by Factory Mutual published in 1984 which demonstrated that faulting electrical of conductors installed in PVC based raceways does not lead to increased fire hazard. A copy of the study referenced is provided for the panel's consideration.

3. Review of comments in Chapters 3 and 5 included in "Fire Safety of PVC Raceways and the Model Building Codes" describing the response of ENT to fire conditions. A copy of the study referenced is provided for the panel's consideration.

4. Study of a detailed analysis of both ENT and RMC materials exposed to electrical fault and fire conditions in a fire incident documented recently in San Jose, California which illustrates the resistance of ENT to ignition and fire spread in the field. These results showed in fact that the ENT raceway was significantly less effected than the RMC. The performance of the latter specifically led to fire growth and spread. I have provided a copy of the report including photos.

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

PANEL ACTION: Accept.

PANEL STATEMENT: Based on Comments 8-24 and 8-29 from the Toxicity Technical Advisory Committee and the substantiation for Comment 8-26, the reference to NFPA 13 is necessary as part of the requirements of this section. The panel agrees that the use of a Fine Print Note reference to NFPA 13 is not appropriate because a FPN is not enforceable. The panel understands that the reference to NFPA 13 in the text of the requirement does not comply with Section 4.2 of the NEC Style Manual, but in lieu of extracting the applicable sections of NFPA 13 into the NEC, the action is justified and the panel requests that the Technical Correlating Committee permit this action to stand.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:

AFFIRMATIVE: 13

NEGATIVE: 1

EXPLANATION OF NEGATIVE:

LOYD: The TTAC substantiation does not support their recommendation nor the technical committee's action. Two major items cause me to find this insufficient for approving removal of the thermal barrier. The TAC decision was determined primarily on toxicity alone, using death as the endpoint.

1. Current international work is examining the role of toxic combustion gases in incapacitation of fire victims to the extent their escape is inhibited. (Work at ISO and the NFPA Research Foundation.) The jury is not in on this matter and we should not load our concealed building spaces with combustible materials until we have the answers to the questions being raised. It is important to remember that HCL, an extremely irritant gas from PVC, has a strong effect on the eyes, nose, and respiratory system and could be very incapacitating. In addition, however, PVC produces prolific carbon monoxide, the primary killer in fires. The TAC has not convinced me that they fully evaluated a fire originating in concealed spaces, especially in suspended ceilings. This is where I see use of ENT increasing the most because currently ceiling tiles with a finish rating are limited. If no finish rating is required, it is possible the NET will be installed behind non-fire rated tiles. This would be even more apt to occur in hi-rise buildings where this grid ceiling is used purely for esthetics and service concealment and the floor above it is the fire barrier. The TAC has focused more on the contribution of ENT in the event a fire originates in a room, and thus is incomplete. Looking at overall risk assessment of ENT permitted without the currently required thermal barrier I find there is a foreseeable hazard involved and do not believe it is justified. The courts are looking seriously at codes and standards that ignore these foreseeable hazards.

2. The trend of trading of important safety issues and depending strictly on sprinklers for fire protection is of concern. Everyone is aware that when some of the more serious fires have occurred the sprinkler system (failed) did not perform properly or the sprinkler system was down for repairs. There is no question sprinklers are very valuable for controlling fire spread until the fire department arrives but there is still a lot of smoke. Also, the building codes have already permitted numerous trade-offs, such as reducing the fire rating required for some assemblies to as little as 1/2 hour. Protection of corridors has been reduced or eliminated. Permitting this unrestricted use of a nonmetallic wiring method throughout buildings where combustibles have long been regulated opens the door for even more combustibles and further reduction in safety. Redundant fire protection is fast disappearing and I do not believe the NEC should be part of this deterioration.

The committee agrees that any building above three stories using ENT without the thermal barrier must be protected with a fire sprinkler system installed in accordance with NFPA 13. This was intended to assure that the building was protected with a minimum level of safety, and verifies that the ENT could be a safety hazard. I believe this is sufficient reason to provide the extra safety measure of a thermal barrier.

NFPA has repeatedly marketed the NEC as in international document. This requirement may not be know or used in some countries where the NEC is adopted and used. I would urge the committee to vote "negative" on the written ballot on comments 8-20, 8-21, 8-22, 8-25, 8-26 and 8-27 to accept the concept at this time.

COMMENT ON AFFIRMATIVE:

DAUBERGER: NEMA recognizes that the mandatory reference to NFPA 13 is in violation of the NFPA NEC Style Manual, and makes the following recommendations:

Revise 331-10(5) of the 2002 NEC Draft to read:

(5) Above suspended ceilings where the suspended ceilings provide a thermal barrier of material that has at least a 15-minute finish rating as identified in listings of fire-rated assemblies, except as permitted in Section 331-10(1)(a).

Exception: When an approved fire sprinkler system(s) is installed on all floors as a complete system, ENT shall be permitted to be used above suspended ceilings without a 15-minute finish rated thermal barrier material.

FPN: For further information on fire sprinkler system(s), see standard NFPA 13, Installation of Sprinkler Systems.

KENDALL: I agree with George Dauberger and the NEMA affirmative statement on Comment 8-26. An approved sprinkler system installed completely on all floors is an acceptable practice and is in compliance with local codes.

(Log #2420)

8- 27 - (331-3(5)): Reject

SUBMITTER: Tim Andrassy, Steel Tube Inst.

COMMENT ON PROPOSAL NO: 8-66

RECOMMENDATION: This proposal should continue to be rejected.

SUBSTANTIATION: See our Comments on Proposal 8-65.

PANEL ACTION: Reject.

PANEL STATEMENT: See panel action and statement on Comment 8-26.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:

AFFIRMATIVE: 13

NEGATIVE: 1

EXPLANATION OF NEGATIVE:

LOYD: See my Explanation of Negative on Comment 8-26.

(Log #90)

8- 28 - (331-3(5), Exception (New)): Accept

SUBMITTER: Technical Correlating Committee National Electrical Code

COMMENT ON PROPOSAL NO: 8-66

RECOMMENDATION: The Technical Correlating Committee directs that this Proposal be referred to the NFPA Toxicity Advisory Committee for comment on the toxicity issues relative to the use of ENT in buildings over three stories. The Technical Correlating Committee directs that Code-Making Panel 8 act on the technical merits of the proposal outside of presumed toxicity issues.

SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.

PANEL ACTION: Accept.

PANEL STATEMENT: See panel action and statement on Comment 8-26.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:

AFFIRMATIVE: 14

(Log #2378)

8- 29 - (331-3(5), Exception (New)): Accept

SUBMITTER: Toxicity Technical Advisory Committee

COMMENT ON PROPOSAL NO: 8-66

RECOMMENDATION: As with proposal 8-65, the TTAC finds that this is an issue of fire hazard analysis and less one of toxic hazard.

SUBSTANTIATION: Summary of Proposal: The use of ENT would be expanded to permit installation above suspended ceilings on all floors without a 15-minute finish rated barrier when the building is sprinklered in accordance with NFPA 13.

Toxicity Issues: The TTAC comments on proposal 8-65 on fuel contribution and toxic potency apply here as well. The issue here is the relative effectiveness of the 15-minute finish rating and the sprinkler system in preventing communication of fire between the room and the ENT.

General Statements: Please also see general statements in the substantiation submitted with Comment on Proposal 8-65 (Log #2377).
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #514)

8- 30 - (331-12 and Exception): Hold
SUBMITTER: James M. Daly, BICC General
COMMENT ON PROPOSAL NO: 8-57
RECOMMENDATION: The proposal should continue to be accepted in principle with the following revisions.
331-12 Revise as follows:
ENT shall not be used ~~in the following:~~
Add the following exception to 331-12(4):
Exception: Insulated conductors or multiconductor cables rated at a higher temperature than the ENT listed temperature rating shall be permitted to be installed in ENT provided they are not operated at a temperature higher than the ENT listed temperature rating.
SUBSTANTIATION: Deletion of the phrase "in the following" makes the list read better as complete sentences.
The exception will resolve a conflict within the code.
There are numerous wire and cable products in the code that are rated higher than the ENT temperature rating.
The exception will permit higher rated conductors or cables to be installed in ENT provided they are not operated at a temperature higher than the ENT temperature rating.
The temperature rating of the ENT will not be exceeded, equivalent safety will be provided, and other products will not be prohibited from being used in ENT.
PANEL ACTION: Hold.
PANEL STATEMENT: In accordance with Section 4-4.6.2.2(a) of the NFPA Regulations Governing Committee Projects this comment is held as the proposed exception introduces new material that has not had public review.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #790)

8- 31 - (331-22): Accept
SUBMITTER: David H. Kendall, Carlon
COMMENT ON PROPOSAL NO: 8-57
RECOMMENDATION: New paragraph in proposed Section 331.22:
Cables shall be permitted to be installed where such use is permitted by the respective cable articles. The number of cables shall not exceed the allowable percentage fill specified in Table 1, Chapter 9.
SUBSTANTIATION: This proposed text is to harmonize with the other raceway articles and allows cables to be installed in the raceway as long as the respective cable article permits it.
PANEL ACTION: Accept.
PANEL STATEMENT: The panel directs that the paragraph be arranged as a second paragraph to correlate with the same section in other articles.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #429)

8- 32 - (331-30, Exception): Hold
SUBMITTER: Dan Leaf, Palmdale, CA
COMMENT ON PROPOSAL NO: 8-57
RECOMMENDATION: Accept in principle revised as follow:
Delete present exception and substitute:
Exception No. 1: The intervals for fastening and support from luminaires and equipment in or on suspended ceilings shall be permitted to be increased where: (1) structural members (including support wires or rods and ceiling grid members) where permitted to be used, do not readily permit support intervals required by this section; (2) the nearest readily available support member is used; (3) the fastening and support intervals do not exceed 1.8 m (6 ft); and (4) the ENT is above the suspended ceiling.
Exception No. 2: Fastening shall not be required where an unbroken length of ENT is fished between access points in finished buildings or structures.
SUBSTANTIATION: I believe the original concept of allowing unsupported lengths was to apply to the space above suspended ceilings. Present wording permits a carte blanche use for all installations and negates the general rule. Where structural support above a suspended ceiling is less than 6 ft above the ceiling or where support wires or ceiling grids not prohibited from support are available at less than 6 ft there is no reason such members can't be used. Similar exceptions for other wiring methods include connection to equipment and permit fishing.
PANEL ACTION: Hold.
PANEL STATEMENT: In accordance with Section 4-4.6.2.2(a) of the NFPA Regulations Governing Committee Projects this comment is held as the proposed exception introduces new material that has not had public review. There were no technical changes to the support requirements in Proposal 8-57.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #958)

8- 33 - (331-30(a), Exception): Hold
SUBMITTER: Joseph A. Ross, Ross Electrical Assessments
COMMENT ON PROPOSAL NO: 8-57
RECOMMENDATION: Revise the Exception as follows:
Exception: Lengths not exceeding 6-feet (1.83m) from an outlet for connection within an accessible ceiling to lighting fixtures or equipment.
SUBSTANTIATION: This revised exception is not to be considered new material. Note: The proper text presently appears in Sections 333-7(b)(3), 334-10(b), and 336-18 Exception No. 2. This Comment corrects an omission. It is to be noted that ENT is intended to be permitted as a "whip." The text of the present Exception stops short of referencing Section 410-67(c), but uses the text from Section 410-67(c) and ENT is not permitted for that use (to contain hi-temp conductors). See companion Comments for Sections 350-30 and 3XX-30(a) Exception.
The omission must be corrected as 6-foot lengths (whips) are presently manufactured and listed and in common use today. Some inspectors have rejected their use.
The term "whip" is not defined in the NEC, but everyone knows what a "whip" is and takes for granted that flexible raceways and cables are permitted for this use. However, many misinterpret that Section 410-67(c) addresses "whips" and believe the method is covered. It is not.
Section 410-67(c) was introduced into the NEC to permit a transition from the hi-temp fixture wires of a recessed incandescent fixture to lo-temp branch-circuit wires. That is, a recessed incandescent fixture was provided with a 6 foot "tail" of flexible metal raceway or metal-sheathed cable containing hi-temp fixture wire for connection, within a field installed junction box, to lo-temp branch-circuit wiring. The 6 foot "tail" assured that the heat of the fixture would not be transmitted to the branch-circuit wiring.
This method provided for the fixture to be installed in a plastered or sheetrock (nonaccessible) ceiling cavity and the junction box being "placed" rather than rigidly supported and fastened. The unsupported "tail" and branch-circuit wiring assures that the box is accessible and may be retrieved (for any reason) through the fixture trim opening by removing the fixture.
A "whip" application is quite different, i.e., a "whip" is permitted to be unsupported, not more than 6 feet in length, and run from an accessible and rigidly supported and fastened outlet box for connection within an accessible ceiling to lighting fixtures or equipment.
PANEL ACTION: Hold.
PANEL STATEMENT: In accordance with Section 4-4.6.2.2(a) of the NFPA Regulations Governing Committee Projects this comment is held as the proposed exception introduces new material that has not had public review. There were no technical changes to the support requirements in Proposal 8-57.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

ARTICLE 333 — ARMORED CABLE

(Log #1825)

7- 16 - (333-3 and 333-4): Accept
SUBMITTER: Marshall A. Klein, Marshall A. Klein & Assoc., Inc.
COMMENT ON PROPOSAL NO: 7-96
RECOMMENDATION: We support the Panel's rejection based on the supporting documentation in the original proposal. The

submitted report, NBSIR 78-1415, "Fire Endurance Tests of Residential Walls Containing Branch Circuit Wiring-Preliminary Findings," substantiates that there is no significant difference in the performance of different cable types. The two cable types used in this study were Type NM and Type AC.
SUBSTANTIATION: As submitter of the original proposal, I support the Panel's rejection of my proposal based on the documentation submitted that clearly shows that AC, as well as NM Cable "...has not documented any problems resulting from the current permitted uses for Type AC Cable that would support the proposed restrictions on those uses." It was clear from the Panel's Statement that AC Cable is a safe wiring system. Since the NBS Report submitted with this proposal compared AC Cable with NM Cable, it is clear that Panel 7, by default should agree that the installation of NM Cable in a one hour fire rated wall assembly would be expected to perform the same. There is an inconsistent treatment between these two wiring methods under the NEC Code, as well as vs. the unrestricted use of ENT above three stories. Panel 8's continued resistance to restrict the use of ENT to 3 story buildings (See Code Proposal 8-64-(331-3 and 331-4)), when Panel 7 has continued to restrict the use of NM Cable above three stories based on the same documentation and NFPA Fire Data showing no major fire problem in the US with fixed wring in Apartment Buildings (See Code Proposal 7-145-(336-5)), will require the NEC Technical Correlating Committee and/or the NFPA Standards Council to resolve. We are only attempting to gain consistency in the NEC, and between Panel Committees, on electrical wiring methods.

In further support, the NEC NM Task Group at its August 27-30, 2000 meeting, confirmed with ULs representative on the Task Group, Mr. Tom Guida, that wiring installed within a fire-rated wall or ceiling does not have any impact on the integrity of the fire rating of the wall or ceiling (Enclosure 4 of the August 2000 Meeting Minutes, Question #11 and Answer). As also noted in the minutes of this Task Group, under Item 00-8-4c, "Review of UL Information", Chairman Traniner had a phone conversation with Mr. Walke of UL that confirmed Mr. Guida's answer on this issue.
PANEL ACTION: Accept.
PANEL STATEMENT: The panel concurs with submitter's recommendation that is in agreement with the panel's action to reject Proposal 7-96. The panel does not agree with the inference made by the submitter, in the substantiation provided with this comment, that Type AC Cable should be treated the same as Type NM Cable because in some specific test no difference was observed in the performance of the two wiring methods.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #CC702)

7- 16a - (333-17): Accept
SUBMITTER: CMP 7
COMMENT ON PROPOSAL NO: 7-89a
RECOMMENDATION: Revise 333-17 to read:
333-17. Through or Parallel to Framing Members. Type AC cable shall be protected in accordance with
300-4 where installed through or parallel to framing members.
SUBSTANTIATION: The panel has revised this section to be consistent with corresponding sections in Articles 330, 334 and 336.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #CC705)

7- 16b - (330-30): Accept
SUBMITTER: CMP 7
COMMENT ON PROPOSAL NO: 7-69a
RECOMMENDATION: Revise 330-30 to read:
330-30. Securing and Supporting. Type MI cable shall be supported securely at intervals not exceeding 1.8 m (6 ft) by straps, staples, hangers, or similar fittings designed and installed so as not to damage the cable.
(A) Horizontal Runs Through Holes and Notches. In other than vertical runs, cables installed in accordance with 300-4 shall be considered supported and secured where such support does not exceed 1.8 m (6 ft) intervals.
(B) Unsupported Cables. Type MI cable shall be permitted to be unsupported where the cable is fished.
(C) Cable Trays. Type MI cable installed in cable trays shall comply with 318.8(B).
SUBSTANTIATION: The panel has revised this section to be consistent with corresponding sections in Articles 333, 334 and 336.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #CC706)

7- 16c - (333-30): Accept
SUBMITTER: CMP 7
COMMENT ON PROPOSAL NO: 7-89a
RECOMMENDATION: Revise 333-30 to read:
333-30. Securing and Supporting. Type AC cable shall be secured by staples, cable ties, straps, hangers, or similar fittings designed and installed so as not to damage the cable at intervals not exceeding 1.4m (4 1/2 ft) and within 300 mm (12 in.) of every outlet box, junction box, cabinet, or fitting.
(A) Horizontal Runs Through Holes and Notches. In other than vertical runs, cables installed in accordance with 300-4 shall be considered supported and secured where such support does not exceed 1.4 m (4 1/2 ft) intervals and the armored cable is securely fastened in place by an approved means within 300 mm (12 in.) of each box, cabinet, conduit body, or other armored cable termination.
(B) Unsupported Cables. Type AC cable shall be permitted to be unsupported where the cable is
(1) Fished between access points, where concealed in finished buildings or structures and supporting is impracticable; or
(2) Not more than 600 mm (2 ft) in length at terminals were flexibility is necessary; or
(3) Not more than 1.8 m (6 ft) from the last point of support for connections within an accessible ceiling to luminaire(s) [lighting fixture(s)] or equipment.
(C) Cable Trays. Type AC cable installed in cable trays shall comply with 318.8(B).
SUBSTANTIATION: The panel has revised this section to be consistent with corresponding sections in Articles 330, 334 and 336. This satisfies Comment 7-94 on Proposal 7- 101 and addresses comment by Mr. Trainor with his vote on Proposal 7-102.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

ARTICLE 334 — METAL-CLAD CABLE

(Log #2099)

7- 17 - (334-3(12)c): Reject
SUBMITTER: George W. Flach, Nat'l Armored Cable Mfrs' Assn. (NACMA)
COMMENT ON PROPOSAL NO: 7-114
RECOMMENDATION: Accept the proposal.
SUBSTANTIATION: The technical substantiation requested by the panel is that the interlocked armor of Type MC is not impervious to water and while the conductors within the cable are rated for wet locations, water that enters the cable core through the armor will migrate to terminations creating a hazardous condition. Major manufacturers of MC cable do not offer unjacketed MC for wet locations. The Code should reflect this higher level of safety.
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter has not provided additional technical substantiation to convince the panel to change its position on Proposal 7-114.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #79)

7- 18 - (334-10(a)(2), (e)): Accept in Principle
Note: The Technical Correlating Committee understands that the Panel Action on Comment 7-22b is the final action on this section and the issue of support at terminations will now be covered in 334.30(C).
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 7-121
RECOMMENDATION: The Technical Correlating Committee understands that the action deletes 334-30(a)(2) in Proposal 7-107a. In addition, the Technical Correlating Committee directs the Panel to address the Style Manual issues as they relate to the rewrite of 334-30. This action will be considered by the Panel as a Public Comment.

SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept in Principle.
Section 334-30(a)(2) should become 334.30(A)(2) and read as follows:
At Terminations. Cables containing four or fewer conductors, sized not larger than 10 AWG shall be secured within 300 mm (12 in.) of every box, cabinet, fitting, or other cable termination.
PANEL STATEMENT: The panel recognizes that their action on Proposal 7-121 deletes 334-30(a)(2) in Proposal 7-107a. The panel has reconsidered this action and reverses its action. The 1999 NEC contained identical support requirements in Sections 334-30(a) and 334-30(a)(2). The panel only intended to delete one of these requirements.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #2150)

7- 19 - (334-13): Reject
SUBMITTER: Robert Konnik, Rockbestos-Suprenant Cable Corp.
COMMENT ON PROPOSAL NO: 7-125
RECOMMENDATION: Delete "As Required by 334-14 (New)" and add:
Where single conductor Type MC conductors are installed as open runs with a maintained free air space of not less that 2.15 times each conductor diameter in the circuit and with a maintained free air space of not less than 2.15 times one conductor of the largest conductor in the circuit and adjacent conductor configurations or cables the ampacity of the conductors shall not exceed the allowable ampacity of Tables 310-17 or 310-19 for conductors rated 0 through 2000 volts.
SUBSTANTIATION: See companion proposal for substantiation of deleting 334-14 (new). The additional wording is for completeness to cover the case of spaced conductors. Note, for conductors rated over 2000 volt, there are no ampacity tables covering single conductors.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel rejects the recommendation as the text in Section 334-14 is necessary. See panel actions on Comment 7-19a and Comment 7-25.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #80)

7- 20 - (334-14 (New)): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 7-126
RECOMMENDATION: The Technical Correlating Committee directs the Panel to clarify the Panel Action relative to the location and title of the proposed language in Proposal 7-107a. This action will be considered by the Panel as a Public Comment.
The Technical Correlating Committee refers this Proposal to Code-Making Panel 3 for information.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
PANEL STATEMENT: The panel's action on Comment 7-21 addresses the concerns expressed in the comment.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #CC700)

7- 19a - (334-14): Accept
SUBMITTER: CMP 7
COMMENT ON PROPOSAL NO: 7-126
RECOMMENDATION: Revise and renumber the text of proposed Section 334-14 to read:
334-31. Single Conductors. Where single-conductor cables with a nonferrous armor or sheath are used, the installation shall comply with 300-20.
SUBSTANTIATION: The revised wording provides a reference to Section 300-20 for single-conductor Type MC cables. This action modifies the text in Comment 7-21.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #1329)

7- 21 - (334-14 (New)):
Note: The Technical Correlating Committee directs that this Comment be reported as "Accept in Principle" and is superceded by the wording in Comment 7-19a.
SUBMITTER: James M. Daly, BICC General
COMMENT ON PROPOSAL NO: 7-126
RECOMMENDATION: This proposal should continue to be accepted.
The text should be included as 334-31 in the rewrite of Article 334 accepted under Proposal 7-107a. The new section would read as follows:
334-31 Grouping of Single Conductors. Where single-conductor cables are used, all phase conductors and, where used, the neutral conductor shall be grouped together to minimize induced voltage on the sheath.
SUBSTANTIATION: Location of the text as indicated above will address the Technical Correlating Committee Comment relative to the location and title of the proposed language and will also be consistent with the direction provided by the Technical Correlating Committee Comment on Proposal 7-69a.
Location of the text in a new Section 334-31 will provide consistency with a Comment to locate similar text in 330-31; see my Comment on Proposal 7-69a.
The numbering of this section will also coordinate with the section renumbering of Chapter 3 and XXX-31 should be added to the renumbering list and reserved for this specific requirement.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
STEWART: As written, the new section 334-31 limits the use of single conductor Type MC cable to bundled configuration. This is excessively restrictive as there are many installations of single conductor MC cable with spaced conductors.
This should be revised to allow both spaced and bundled installations.
The suggested revision should be as given below:
"334-31 - Grouping of single conductor:
Where single conductor cables are used, they may be bundled or spaced.
Where all phase conductors and, where used, the neutral conductor are grouped together, the induced voltage in the sheath will be minimized.
Where phase conductors and, where used, the neutral conductor are spaced, the armor should be grounded at one point only to avoid circulating current in the armor."
The above revision would allow for installation of both spaced and bundled conductors and the user can choose which method best fits their needs.

(Log #2151)

7- 22 - (334-14 (New)): Reject
SUBMITTER: Robert Konnik, Rockbestos-Suprenant Cable Corp.
COMMENT ON PROPOSAL NO: 7-126
RECOMMENDATION: Reject new text 334-14.
SUBSTANTIATION: Cables in Table 310-13 (RHW, XHHW, THHN, etc.) are used as single conductors that are not required to be grouped. The same is true for shielded and nonshielded medium voltage cable. One application is shown in detail 9 of Appendix B of the NEC, and in detail 9 of 310-60. The NEC should not limit a single conductor MC cable to be bundled, when it may be properly designed and installed in a maintained space configuration. This configuration may be used to increase ampacity to allow the use of Table 310-17 ampacity when properly designed.
PANEL ACTION: Reject.

PANEL STATEMENT: The panel does not concur with the substantiation provided in this comment that single conductors do not have to be grouped. See panel action on Comment 7-19a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #CC703)

7- 22a - (334-17): Accept
SUBMITTER: CMP 7
COMMENT ON PROPOSAL NO: 7-107a
RECOMMENDATION: Revise 334-17 to read:
334-17. Through or Parallel to Framing Members. Type MC cable shall be protected in accordance with 300-4 where installed through or parallel to framing members.
SUBSTANTIATION: The panel has revised this section to be consistent with corresponding sections in Articles 330, 333 and 336.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #CC707)

7- 22b - (334-30): Accept
SUBMITTER: CMP 7
COMMENT ON PROPOSAL NO: 7-107a
RECOMMENDATION: Revise 334-30 to read:
334-30. Securing and Supporting. Type MC cable shall be supported and secured at intervals not exceeding 1.8 m (6 ft).
(A) Horizontal Runs Through Holes and Notches. In other than vertical runs, cables installed in accordance with 300-4 shall be considered supported and secured where such support does not exceed 1.8 m (6 ft) intervals.
(B) Unsupported Cables. Type MC cable shall be permitted to be unsupported where the cable is
(1) Fished between access points, where concealed in finished buildings or structures and supporting is impracticable; or
(2) Not more than 1.8 m (6 ft) from the last point of support for connections within an accessible ceiling to luminaire(s) [lighting fixture(s)] or equipment.
(C) At Terminations. Cables containing four or fewer conductors, sized no larger than 10 AWG shall be secured within 300 mm (12 in.) of every box, cabinet, fitting, or other cable termination.
SUBSTANTIATION: The panel has revised this section to be consistent with corresponding sections in Articles 330, 333 and 336.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #385)

7- 23 - (334-30(b)): Accept in Principle
SUBMITTER: Dan Leaf, Palmdale, CA
COMMENT ON PROPOSAL NO: 7-107(a)
RECOMMENDATION: Accept in principle revised: 334-30(b) UNSUPPORTED CABLES. (1) WHERE FISHED. Type MC cable shall not be required to be supported and secured where the cable is fished between access points where concealed in finished buildings or structures. ~~and supporting is impractical, or where used in lengths not more than 1.8m (6 ft.) from an outlet for connections within an accessible ceiling to lighting fixtures or equipment.~~ (2) ACCESSIBLE CEILINGS. The support interval from terminations at luminaires or equipment in or on suspended ceilings shall be permitted to be increased where all the following conditions are met: (a) structural members (including support wires or rods and ceiling grid members, where permitted to be used) do not permit the support interval required by (a)(2); (b) the nearest readily available support member is used; (c) the support interval does not exceed 1.8m (6 ft); and (d) the cable is above the suspended ceiling.
SUBSTANTIATION: The phrase "and supporting is impracticable" is superfluous. Present requirement "from an outlet" infers the length must originate from a box or conduit body and cannot be a longer continuous length from a panelboard.
The broad exemption of support within 12 in. is not warranted where structural support above a suspended ceiling is less than 6 ft or where support wires or rods and ceiling grid members are available at less than 6 ft. The 6 ft maximum should apply only where no closer support is available. Since this section only affects (a)(2) that section is noted.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action on Comment 7-22b.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #2041)

7- 24 - (334-70): Accept in Principle
SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc.
COMMENT ON PROPOSAL NO: 7-126
RECOMMENDATION: Locate this material as 334.70, to correlate with a companion comment for Article 330 suggesting a uniform placement in the cable articles for single conductor requirements.
SUBSTANTIATION: None given.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action on Comment 7-21.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #1560)

7- 25 - (334-80): Accept in Principle
SUBMITTER: Ravindra H. Ganatra, Alcan Cable
COMMENT ON PROPOSAL NO: 7-125
RECOMMENDATION: Revise text as follows:
334.80. Ampacity.
(A) General. The ampacity of Type MC cable shall be determined in accordance with 310.15 or 310.60 for 14 AWG and larger conductors and in accordance with Table 402.5 for 18-16 AWG conductors. The installation shall comply with temperature ratings of termination and equipment.
(B) Type MC Cable Installed in Cable Tray. The ampacities for Type MC cable installed in cable tray shall be determined in accordance with 318.11 and 318.13 and the installation shall comply with temperature ratings of termination and equipment.
(C) Single Type MI Conductors Grouped Together. Where single Type MC conductors are grouped together in a triangular or square configuration, as required by 334.14, and installed on a messenger or as open runs with a maintained free air space of not less than 2.15 times one conductor diameter (2.15 x O.D.) of the largest conductor contained within the configuration and adjacent conductor configurations or cables, the ampacity of the conductors shall not exceed the allowable ampacities of:
(1) Table ~~310.20~~310.17 for conductors rated 0 through 2000 volts
(2) Tables 310.67 and 310.68 for conductors rated over 2000 volts
The installation shall comply with temperature ratings of termination and equipment.
SUBSTANTIATION: Recommended changes regarding compliance with temperature ratings of termination and equipment are similar to those recommended in a separate comment on Proposal 7-88 for 330.80. Please see that comment.
In Item (C) above, the Table reference should be 310.17 instead of 310.20.
PANEL ACTION: Accept in Principle.
Revise text to read:
334.80 Ampacity. The ampacity of Type MC cable shall be determined in accordance with 310.15 or 310.60 for 14 AWG and larger conductors and in accordance with Table 402.5 for 18-16 AWG conductors. The installation shall not exceed the temperature ratings of terminations and equipment.
(A) Type MC Cable Installed in Cable Tray. The ampacities for Type MC cable installed in cable tray shall be determined in accordance with 318.11 and 318.13.
(B) Single Type MC Conductors Grouped Together. Where single Type MC conductors are grouped together in a triangular or square configuration and installed on a messenger or as open runs with a maintained free air space of not less than 2.15 times one

conductor diameter (2.15 x O.D.) of the largest conductor contained within the configuration and adjacent conductor configurations or cables, the ampacity of the conductors shall not exceed the allowable ampacities of:
(1) Table 310.20 for conductors rated 0 through 2000 volts
(2) Tables 310.67 and 310.68 for conductors rated over 2000 volts.
PANEL STATEMENT: The submitter's text has been incorporated into revisions made to be consistent in style with the text in Section 330-80. See panel action on Comment 7-15 relating to the change from Table 310-17 to Table 310-20.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
STEWART: This proposal would allow Type AC cable to be used as a general wiring method on cranes and hoists. Type AC cable is not suitable for the flexing conditions normally associated with this application due to armor separation. AC cable should be limited to fixed installations only.
The flexibility test for Type AC cable is a single bend of one turn around a fixed cylinder. This is not sufficient to qualify this construction for a flexing application.
COMMENT ON AFFIRMATIVE:
TEMBLADOR: Add "in accordance with 110-14(C)" as shown below. See our Explanation of Negative vote on Comment 7-15 for details.
334.80 Ampacity. The ampacity of Type MC cable shall be determined in accordance with 310.15 or 310.60 for 14 AWG and larger conductors and in accordance with Table 402.5 for 18-16 AWG conductors. The installation shall not exceed the temperature ratings of terminations and equipment in accordance with 110-14(c).
No change in the remaining text per Panel Action.

ARTICLE 336 — Nonmetallic-Sheathed Cable

(Log #81)

7- 26 - (336): Reject
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 7-128a
RECOMMENDATION: The Technical Correlating Committee advises that Article Scope statements are the responsibility of the Technical Correlating Committee and the Technical Correlating Committee accepts the Panel Action.
Further, the Technical Correlating Committee directs that the definition in 336-12(a)(1) be moved to 336-2 Definitions to comply with the NEC Style Manual. This action will be considered by the Panel as a Public Comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Reject.
PANEL STATEMENT: The location of the text is appropriate and enhances the understanding of this particular requirement.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #634)

7- 27 - (336): Accept
SUBMITTER: James M. Daly, BICC General
COMMENT ON PROPOSAL NO: 7-130
RECOMMENDATION: Continue to reject this proposal.
SUBSTANTIATION: This proposal should continue to be rejected as supported by the panel statement. Refer to my comment on Proposal 7-145.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NEGATIVE: 2
EXPLANATION OF NEGATIVE:
NUTT: It has not been technically substantiated that there is a need for the three-floor restriction on the use of Type NM cable. Properly installed type NM wiring systems are safe to operate and safe to use regardless of the building's height or number of floors. There are two states (Massachusetts and Michigan) that take exception to the restricted use of NM, NMC, and NMS and have positive experience in using these cables in those areas. These cables have thus far stood the test of time and we should be cautious about restricting the use of these cables.
Additional statistical NFPA data has been supplied to the Code Making Panel that shows an excellent track record for NM type cable systems. Also, the Toxicity Advisory Committee comments on NM type cables did not indicate that toxicity was not a reason to restrict the use of NM cable.
PROPST: While I do not necessarily support the concept presented by this proposal, I also do not support the reasoning used by Code-Making Panel 7 in rejecting the variety of different proposals related to the application of NM cable to multifamily dwellings. My reasoning for disagreeing with the direction of the panel is further discussed under Comment 7-52.

(Log #1814)

7- 28 - (336): Accept
SUBMITTER: Tim Andrassy, Steel Tube Inst.
COMMENT ON PROPOSAL NO: 7-130
RECOMMENDATION: This proposal should continue to be rejected.
SUBSTANTIATION: Since this proposal was submitted we have realized that the NEC should be a stand alone document. Building codes are not in the same code change cycle and their requirements differ in various jurisdictions, both domestic and foreign. Any requirements for mitigation of, or protection from, the fire hazards of N/M cable should be self-contained in the NEC. Additionally, further fire characteristic information has been developed in a cohesive fashion. Information is available that N/M cable can be a source of ignition even in a code compliant installation, due to undetected damage at the time of installation. Many trade-offs are occurring in exchange for sprinklers, including the fact that some assemblies that are tenant separations and guest room separations may now only be 1/2 hour. The NFPA Task Group on the three story rule has examined documentation in support of expanded use of N/M Cable in detail and does not recommend expansion at this time. SEE ALSO FULL COMMENTS MADE TO PROPOSAL 7-145
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NEGATIVE: 2
EXPLANATION OF NEGATIVE:
NUTT: See my explanation of negavite vote on Comment 7-27.
PROPST: While I disagree with portions of the substantiation provided with Comment 7-28, I also do not agree with the approach taken by Code-Making Panel 7 in rejecting NM cable for use on multifamily dwellings in general and specifically to Comment 7-52.

(Log #1833)

7- 29 - (336): Accept
Note: The Technical Correlating Committee notes that the Comment is on Proposal 7-128a and not 7-129a.
SUBMITTER: Patricia Horton, Elaine Thompson, Allied Tube & Conduit
COMMENT ON PROPOSAL NO: 7-129a
RECOMMENDATION: In 336-10(2) change the reference from "336-5" to "336-12."
In 336-23 change reference from "333-12" to 333-23."
SUBSTANTIATION: Editorial.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15
COMMENT ON AFFIRMATIVE:
STRANIERO: This comment is on Proposal 7-128a, not 7-129a as indicated.

(Log #635)

7- 30 - (336-4 and 336-5): Accept
SUBMITTER: James M. Daly, BICC General
COMMENT ON PROPOSAL NO: 7-135
RECOMMENDATION: Continue to reject this proposal.

SUBSTANTIATION: This proposal should continue to be rejected as supported by the panel statement. Refer to my comment on Proposal 7-145. Although the proposal was developed by the Technical Correlating Committee Task Group on Type NM cable, the Technical Correlating Committee elected not to submit the proposal as a Technical Correlating Committee proposal, since there was not a consensus among the Task Group.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NEGATIVE: 3
EXPLANATION OF NEGATIVE:
NICKSON: Comment should be rejected. ROP 7-135 should be Accepted in Principle. See NMHC Explanation of Negative vote on Comment 7-52.
NUTT: See my explanation of negavite vote on Comment 7-27.
PROPST: See my explanation of negative vote on Comment 7-27.

(Log #636)

7- 31 - (336-4 and 336-5): Accept
SUBMITTER: James M. Daly, BICC General
COMMENT ON PROPOSAL NO: 7-137
RECOMMENDATION: Continue to reject this proposal.
SUBSTANTIATION: This proposal should continue to be rejected as supported by the panel statement. Refer to my comment on Proposal 7-145. Item 3, regarding electromagnetic interference in the panel statement is beyond the scope of the NEC. In the panel statement, the panel noted that the task Group on NM Cable disagreed on the extent to which nonmetallic sheathed cable becomes an ignition source under these conditions. Evaluation of Type NM cable under overload conditions should be provided in any Fact Finding Report. It should be noted that the Task Group Report included as an attachment to Proposal 7-137 did not receive consensus support from the Task Group.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NEGATIVE: 3
EXPLANATION OF NEGATIVE:
NICKSON: Comment should be rejected. ROP 7-137 should be Accepted in Principle. See NMHC Explanation of Negative vote on Comment 7-52.
NUTT: See my explanation of negavite vote on Comment 7-27.
PROPST: See my explanation of negative vote on Comment 7-27.

(Log #637)

7- 32 - (336-4 and 336-5): Accept
SUBMITTER: James M. Daly, BICC General
COMMENT ON PROPOSAL NO: 7-138
RECOMMENDATION: Continue to reject this proposal.
SUBSTANTIATION: The panel statement is incorrect since it states that the proposal introduces additional restrictions on Type NM cable while it appears that the intent of the proposal is to expand the use of Type NM cable, rather than a restriction. Refer to my comments on Proposals 7-137 and 7-145.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NEGATIVE: 2
EXPLANATION OF NEGATIVE:
NUTT: See my explanation of negavite vote on Comment 7-27.
PROPST: See my explanation of negative vote on Comment 7-27.

(Log #638)

7- 33 - (336-4 and 336-5): Accept
SUBMITTER: James M. Daly, BICC General
COMMENT ON PROPOSAL NO: 7-139
RECOMMENDATION: Continue to reject this proposal.
SUBSTANTIATION: This proposal should continue to be rejected as supported by the panel statement. Refer to my comments on Proposals 7-137 and 7-145. It should be noted that ENT is a raceway and Type NM cable is a cable and that they have different physical and fire characteristics.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NEGATIVE: 3
EXPLANATION OF NEGATIVE:
NICKSON: Comment should be rejected. ROP 7-139 should be Accepted in Principle. See NMHC Explanation of Negative vote on Comment 7-52.
NUTT: See my explanation of negavite vote on Comment 7-27.
PROPST: See my explanation of negative vote on Comment 7-27.

(Log #1810)

7- 34 - (336-4, 336-5): Accept
SUBMITTER: Tim Andrassy, Steel Tube Inst.
COMMENT ON PROPOSAL NO: 7-138
RECOMMENDATION: This proposal should continue to be rejected.
SUBSTANTIATION: This proposal has wrong references and wrong numbers. Primarily it would limit use of N/M cable to one-and-two family dwellings if accepted as written. While we agree that would be the most appropriate use, and local jurisdictions frequently amend to do just that, we do not believe that is the submitter's intent. In response to Mr. Nixon's negative, we do not believe he recognizes the one-and-two family limitation this proposal would result in.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NEGATIVE: 2
EXPLANATION OF NEGATIVE:
NUTT: See my explanation of negavite vote on Comment 7-27.
PROPST: See my explanation of negative vote on Comment 7-27.

(Log #1815)

7- 35 - (336-4, 336-5): Accept
SUBMITTER: Tim Andrassy, Steel Tube Inst.
COMMENT ON PROPOSAL NO: 7-135
RECOMMENDATION: Continue to reject this proposal.
SUBSTANTIATION: Particular attention is called to 336-4 (2). This proposal permits use in multifamily dwellings in Types III, IV and V construction. Even if it were to be accepted, it should read Multifamily Dwelling Units. As defined in the NEC, multifamily dwellings could be any building that contains three or more dwelling units, regardless of what other occupancies are in the building. This proposal was originally developed by the 3-story Task Group, but was not accepted by them. Further review by the Task Group found this not to be acceptable expanded use for the product as currently produced. Even with a thermal barrier, ENT has been limited in its use by the building codes. There is information available that even ENT in 1-hour rated assemblies can reduce the rating unless it is wrapped in specific environmental insulation. Some of the assembly ratings in the proposed construction could now be 1/2 hour rated. Testing similar to that performed on ENT is needed to assure the assembly rating will not be compromised. The NIBS report submitted by the proponents does not provide the necessary information and primarily evaluated openings in assemblies. In addition, the impact of the insulation on the ampacity of the N/M Cable should be evaluated as the wrap dramatically increases the temperature of the ENT. SEE ADDITIONAL INFORMATION IN COMMENT TO 7-145.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NEGATIVE: 3
EXPLANATION OF NEGATIVE:
NICKSON: Comment should be rejected. ROP 7-135 should be Accepted in Principle. See NMHC Explanation of Negative vote on Comment 7-52.
NUTT: See my explanation of negavite vote on Comment 7-27.
PROPST: See my explanation of negative vote on Comment 7-27.

(Log #1816)

7- 36 - (336-4 and 336-5): Accept
SUBMITTER: Tim Andrassy, Steel Tube Inst.
COMMENT ON PROPOSAL NO: 7-139
RECOMMENDATION: This proposal should continue to be rejected.
SUBSTANTIATION: See SUBSTANTIATION AS PROVIDED FOR 7-145. We have used 7-145 to save space as that was the basic comment of the 3-story Task Group. Our comment on 7-135 also applies.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NEGATIVE: 3
EXPLANATION OF NEGATIVE:
NICKSON: Comment should be rejected. ROP 7-139 should be Accepted in Principle. See NMHC Explanation of Negative vote on Comment 7-52.
NUTT: See my explanation of negavite vote on Comment 7-27.
PROPST: See my explanation of negative vote on Comment 7-27.

(Log #1954)

7- 37 - (336-4 and 336-5): Accept
SUBMITTER: Phil Simmons, Simmons Electrical Services
COMMENT ON PROPOSAL NO: 7-147
RECOMMENDATION: Continue to reject the proposal.
SUBSTANTIATION: See my comment on Proposals 7-135 and 7-145.
Also, we agree with the panel's statement that the proposal was not properly substantiated.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NEGATIVE: 3
EXPLANATION OF NEGATIVE:
NICKSON: Comment should be rejected. ROP 7-147 should be Accepted in Principle. See NMHC Explanation of Negative vote on Comment 7-52.
NUTT: See my explanation of negavite vote on Comment 7-27.
PROPST: See my explanation of negative vote on Comment 7-27.

(Log #1969)

7- 38 - (336-4 and 336-5): Accept
SUBMITTER: Phil Simmons, Simmons Electrical Services
COMMENT ON PROPOSAL NO: 7-139
RECOMMENDATION: Continue to reject the proposal.
SUBSTANTIATION: See my comments on Proposals 7-135 and 7-145.
Also, we agree with the Panel's Statement that the proposal was not properly substantiated.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NEGATIVE: 3
EXPLANATION OF NEGATIVE:
NICKSON: Comment should be rejected. ROP 7-139 should be Accepted in Principle. See NMHC Explanation of Negative vote on Comment 7-52.
NUTT: See my explanation of negavite vote on Comment 7-27.
PROPST: See my explanation of negative vote on Comment 7-27.

(Log #1970)

7- 39 - (336-4 and 336-5): Accept
SUBMITTER: Phil Simmons, Simmons Electrical Services
COMMENT ON PROPOSAL NO: 7-138
RECOMMENDATION: Continue to reject the proposal.
SUBSTANTIATION: See my comments on Proposals 7-135 and 7-145.
Also, we agree with the Panel's Statement that the proposal was not properly substantiated.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NEGATIVE: 2
EXPLANATION OF NEGATIVE:
NUTT: See my explanation of negavite vote on Comment 7-27.
PROPST: See my explanation of negative vote on Comment 7-27.

(Log #1971)

7- 40 - (336-4 and 336-5): Accept
SUBMITTER: Phil Simmons, Simmons Electrical Services
COMMENT ON PROPOSAL NO: 7-135
RECOMMENDATION: Continue to reject the proposal.
SUBSTANTIATION: While it is true that all wiring methods can be improperly installed and abused, they are not equally susceptible to such treatment. That is because not all wiring methods are equally constructed to withstand improper installation or abuse. The hazards presented by improper installation and abuse also are not equal. Type NM cable by its very nature invites abuse and non-code compliance by the ease with which it can be spliced, tapped, nicked, and overloaded. Recent fire reports indicate that a single staple that is driven too tightly (used to secure type NM cable) can be the source of fire ignition.
Type NM cable products are not as safe from physical damage as armored cable projects are. Type NM cables, having a nonmetallic overall outer jacket, are much more susceptible to damage from nails and screws during building construction and during later remodeling projects. Type NM cable products cannot compete with armored cable products when it comes to protection from physical damage. I have personally been called out to job sites to try to locate and repair damage done to type NM cables by other building trades. Homeowners and other building occupants have damaged Type NM cables by installing photographs or other objects on the wall.
Type NM cable does not fit well with the types of construction used for high-rise buildings. It is much more likely to be damaged by sharp edges of framing materials during construction as well as during remodeling. More stringent construction requirements are imposed on high-rise construction due to concern for smoke propagation and exiting requirements. Type NM cables should not be permitted in these structures.
See also my comment on Proposal 7-145.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NEGATIVE: 3
EXPLANATION OF NEGATIVE:
NICKSON: Comment should be rejected. ROP 7-135 should be Accepted in Principle. See NMHC Explanation of Negative vote on Comment 7-52.
NUTT: See my explanation of negavite vote on Comment 7-27.
PROPST: See my explanation of negative vote on Comment 7-27.

(Log #1972)

7- 41 - (336-4 and 336-5): Accept
SUBMITTER: Phil Simmons, Simmons Electrical Services
COMMENT ON PROPOSAL NO: 7-137
RECOMMENDATION: Continue to reject the proposal.
SUBSTANTIATION: See my comments on Proposals 7-135 and 7-145.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NEGATIVE: 3
EXPLANATION OF NEGATIVE:
NICKSON: Comment should be rejected. ROP 7-137 should be Accepted in Principle. See NMHC Explanation of Negative vote on Comment 7-52.
NUTT: See my explanation of negavite vote on Comment 7-27.
PROPST: See my explanation of negative vote on Comment 7-27.

(Log #2266)

7- 42 - (336-4 & 336-5): Reject
SUBMITTER: Lawrence Brown, National Association of Home Builders (NAHB)
COMMENT ON PROPOSAL NO: 7-138
RECOMMENDATION: Accept the proposal as submitted.
SUBSTANTIATION: The panel statement did not address the basic intent of the proposal. No credible reason or documentation was included in the statement that would preclude the "reject" of the proposal. The panel should be required to provide reliable and credible substantiation to back-up the rejection.
PANEL ACTION: Reject.
PANEL STATEMENT: The comment has not addressed the concerns expressed in the panel's statement on Proposal 7-138.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
PROPST: See my explanation of negative vote on Comment 7-27.

(Log #2297)

7- 43 - (336-4 and 336-5): Hold
SUBMITTER: C. David Mercier, Southwire Co.
COMMENT ON PROPOSAL NO: 7-139
RECOMMENDATION: Revise text to read as follows:
336.4(2) Multifamily dwellings and other structures, except as prohibited in Section 336-5 In multifamily dwellings exceeding three floors above grade, Type NM cable shall be concealed within walls, floors, and ceilings where the walls, floors, and ceilings provide a thermal barrier of material that has at least a 15-minute finish rating as identified in listings of fire-rated assemblies. The 15-minute finish rated thermal barrier shall be permitted to be used for combustible walls, floors, and ceilings. Type NM shall be identified as meeting the following requirements when used in multifamily dwellings exceeding three floors above grade:
a. Use in cable trays.
b. Limited smoke.
c. Crush and impact of Type MC cable.
FPN: A finish rating is established for assemblies containing combustible (wood) supports. The finish rating is defined as the time at which the wood stud or wood joist reaches an average temperature rise of 121°C (250°F) or an individual temperature of 163°C (325°F) as measured on the plane of the wood nearest the fire. A finish rating is not intended to represent a rating for a membrane ceiling.
336-5(a)(1) In any ~~multifamily dwelling or other structure~~ structure, other than dwellings, exceeding three floors above grade.
SUBSTANTIATION: Additional performance requirements for Type NM cables used in multifamily dwellings above three floors above grade address concerns over removing building height restrictions. The additional requirements for NM cables address the concerns relating to flame spread, smoke and mechanical damage. These restrictions provide increased flame resistance by requiring the cable to pass the vertical-flame test that limits the flame spread in vertical cable runs, the limited smoke test which limits the amount of smoke produced in a fire, and the crush and impact test for Type MC cables to increase the cables resistance to mechanical damage. Presently, NM cable can be marked for cable tray use and limited smoke if it meets the requirements of the UL Standard. The crush and impact test for type MC cable is presently used with Type TC cable for open wiring applications.
The proposed NM construction is equivalent to currently accepted wiring methods used in buildings without height restrictions. This comment uses the same language used to recognize the use of Electrical Nonmetallic Tubing above three floors with the additional restriction of limiting installations to multifamily dwellings. Type MC cables with a nonmetallic jacket can be used in dwellings without meeting the requirements of the vertical-flame test and limited smoke test. The proposed NM cable's flame and smoke tests exceed the requirements for Type MC. The proposed NM cable's crush and impact test is the same as Type MC. The expanded use of NM should be accepted based on increased performance requirements that meet accepted wiring methods above three floors while limiting installations to concealed areas behind a 15-minute finish rated thermal barrier in multifamily dwellings.
PANEL ACTION: Hold.
PANEL STATEMENT: The material submitted is considered to be new. There were no proposals that provided for different construction requirements for Type NM cable where it is installed in buildings that exceed three floors above grade. A fact finding report is necessary and this comment should be considered in the development of that report.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
NICKSON: Comment should be rejected. ROP 7-139 should be Accepted in Principle. See NMHC Explanation of Negative vote on Comment 7-52.
COMMENT ON AFFIRMATIVE:
TEMBLADOR: We support the Panel Action on this comment to "Hold for Further Study" provided, a thorough fact-finding report that evaluates a nonmetallic sheathed product's construction, performance, and identifies relevant installation criteria for intended applications is submitted to Panel 7. We believe that the contents of the presentation, made at the ROC meeting by the submitter, do not constitute a fact-finding report. Without a fact-finding report, the recommendation made by this comment should be rejected.

(Log #2373)

7- 44 - (336-4, 336-5): Reject
SUBMITTER: Joseph A. Hertel, Safety and Buildings Div., State of Wisconsin
COMMENT ON PROPOSAL NO: 7-139, 7-137
RECOMMENDATION: Revise as follows:
336-4 Uses Permitted. Type NM, Type NMC and Type NMS cables shall be permitted to be used in the following:
(1) One- and two-family dwellings
(2) In any building exceeding three floors above grade, nonmetallic-sheathed cables shall be concealed within walls, floors, and ceilings where the walls, floors and ceilings provide a thermal barrier of material that has at least a 15-minute finish rating as identified in listings of fire-rated assemblies. The 15-minute finish rated thermal barrier shall be permitted to be used for combustible walls, floors and ceilings.
336-5(1) Delete this section of uses not permitted.
SUBSTANTIATION: While there may be a lack of substantiation to justify this proposed change in the use of NM cable, there is no substantiation to not support this change. The greatest deterrent to this change seems to be a metal image that at one time was the scourge of the plumbing industry. The panel has stated that there is a lack of substantiation, while the Technical Correlating Committee directs the proposal to the NFPA Toxicity Advisory Committee and the NM Cable Task Group. Rejecting proposals due to a lack of substantiation is relatively easy and in doing so the panel has failed to provide an answer as to what problems may be encountered with the expanded use of NM cable.
The panel addresses potential hazards raised by the Task Group, with the expanded use of NM cable but does not provide any substantiation of the hazards. I can agree with portions of the panel Statement in Proposal 7-137 in that as an electrical inspector or installer, I am not intimately familiar with the types of construction in building codes and do not wish to be. I would like to address the numbered responses to this proposal.
(1) The compatibility of NM cable with modern building code requirements and construction methods and materials other than wood frame construction. Steel studs and as you say "modern building methods" are used in one- and two-family dwellings as well as commercial buildings of three floors or less. I am not aware of problems with NM in these installations. NM cable can be and is used in shopping malls and many buildings of less than three floors with the exception of Places of Assembly as covered in Article 518. The use of NM cable and steel studs is a common application.
(2) The NFPA Research Foundation's study of Incapacitation and the possible contribution of PVC to this issue. It appears to be a toxicity concern yet we are discussing commercial buildings while the NFPA indicates most fire deaths are in dwellings. The amount of PVC in NM cable seems significant when compared to the plastic content of carpeting, furnishings and plumbing piping.
(3) The potential contribution of Electromagnetic Interference which is of particular concern in commercial and industrial installations. I assume from your statement the ENT, nonmetallic raceways or other wiring methods magically prevent electromagnetic interference while NM does not have the

capability, perhaps this should be discussed with the manufacturers. This is a design issue and commercial and industrial installations are free to use any appropriate method. Most industrial buildings do not exceed three floors and the use of NM cables is limited more by the installation requirements than the potential for EMI. National studies on the effects of magnetic fields do not appear to substantiate a health risk, but the owner is free to specify any acceptable wiring method.

"Of ongoing concern is the behavior of Nonmetallic-sheathed cable under fault or overload conditions." While concerns with fault or overload are addressed for all conductors in Article 240, I must assume from the statement that metal cables and raceway methods do not have this potential problem.

Again, since this wiring method appears to have so many inherent dangers, perhaps the panel should reconsider its allowed usage in one- and two-family dwellings given their higher statistics for fire related injuries and death.

I would recommend that the panel support Proposal 7-139 as a logical extension to the use of nonmetallic wiring methods.

PANEL ACTION: Reject.

PANEL STATEMENT: The submitter has not provided any new substantiation. See the panel action and statement on Comment 7-48.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:

AFFIRMATIVE: 13

NEGATIVE: 2

EXPLANATION OF NEGATIVE:

NICKSON: Comment should be rejected. ROP 7-137 and 139 should be Accepted in Principle. See NMHC Explanation of Negative vote on Comment 7-52.

NUTT: See my explanation of negavite vote on Comment 7-27.

(Log #2379)

7- 45 - (336-4 and 336-5): Accept

SUBMITTER: Toxicity Technical Advisory Committee

COMMENT ON PROPOSAL NO: 7-135 & 7-137

RECOMMENDATION: The TTAC finds that this is an issue of fire hazard analysis and less one of toxic hazard.

SUBSTANTIATION: Summary of Proposal: In these two identical proposals the use of NM cable would be expanded to permit installation (a) behind a 15-minute finish rated barrier on all floors of multifamily dwellings and (b) with no protection in nonresidential construction.

Toxicity Issues: The TTAC comments on proposal 8-65 on fuel contribution apply here as well. The toxic potency associated with the smoke from NM cable varies with the polymeric composition of the insulation and the jacket. The smoke from flaming combustion of a cable with fire-retarded ethylene vinyl acetate insulation and a chlorosulfonated polyethylene jacket had a lethal toxic potency of about 30 g/m^3 (NIST Cup Furnace).[6] Cup Furnace data for a plasticized PVC wall covering indicate a slightly lower lethality than for an unplasticized conduit product.[2] Thus, the toxic potencies of smoke from well-ventilated burning of cable materials do not appear to differ greatly from the potency of normal contents of buildings. The irritancy of the smoke from those combustibles in uncontrolled, making it difficult to analyze the contribution of smoke from NM cable. However, the combustible mass of NM cable in a structure is a small fraction of the combustibles present in buildings. As such, NM cable is not likely to add significantly to the toxic hazard posed by the normal, unregulated combustibles present in buildings that conform to modern building codes. In a case where the NM cable is the initial and dominant fuel, a fire hazard analysis is needed. The irritancy of the smoke will impact an occupant's ability to escape, but this effect would need to be compared to the smoke effects from any other fire for which the safety features of the building have been designed.

The contribution to fire hazard of building contents in general, and NM cable in particular, is not a direct function of the building height or the floor on which the combustibles are located. As the mitigating features of buildings through active and passive means are increased with height, it follows that both the hazards of ordinary building contents and NM cable would be mitigated in a similar manner. Thus, there is no basis for differentiating the toxic hazard of NM cable on the basis of building height.

Committee members did, however, identify fire scenarios where the irritation properties of smoke may exceed that experienced without NM cable. When protected with a 15 minute thermal barrier, the toxicity of NM cable is not expected to be materially different from that already permitted by code for ENT.

General Statements: This comment was developed by the NFPA Toxicity Technical Adviosry Committee. Members of this committee are as follows: Richard G. Gann, Ph.D., Chair; Craig Beyler, Ph.D; Edward V. Clougherty, Ph.D; Christopher Laux, AIA, CBO; James P. Lyon, Ph.D; and Richard Pehrson, Ph.D.

The 12 proposals for the 2002 NEC that were forwarded to the Toxicitiy Technical Advisory Committee (TTAC) on May 26, 2000 for comment all involve potential changes in the mass and location of combustible or degradable (C/D) materials within a building. Such changes might affect the fire's rate of heat release, the single most important variable affecting hazard to people since it is the driving force leading to the spread of fire and products of combustion. Having been advised that the NEC task groups contain the necessary expertise to address fire growth and overall fire hazard, the TTAC is only submitting comments on the impacts of the proposed changes on smoke toxicity and toxic hazard.

In the following comments, references to "occupants" are meant to include firefighters operating in accordance with NFPA 1500.

The composition of the C/D products, and thus the smoke generated in a fire, may evolve over time. Thus, the TTAC comments apply to general changes in the mass and location of C/D products and are not limited to the current formulation of such products.

Section 331-1 of the NEC requires that the toxicity characteristics of NMT be no worse than those of unplasticized PVC, but does not name those characteristics nor cite a test method for measuring them. NFPA 269 was developed for such purposes. It can be used to provide (a) data on the lethal toxic potency of smoke and (b) gas yields of key toxicants for use in fire hazard modeling. Section 331-1 should be modified to note both the method to be used and that these are the data to be provided. A prescriptive (e.g., LC_{50}) comparison with unplasticized PVC should be replaced by a comparison of Toxic hazard of the proposed product and unplasticized PVC.

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1 Babrauskas, V., Harris, Jr., R.H., Braun, E., Levin, B.C., Paabo, M., and Gann, R.G., The Role of Bench-Scale Test Data in Asssessing Real-Scale Fire Toxicity, NIST Tech Note 1284, National Institute of Standards and Technology, 1991.

2 Peacock, R.D., Jones, W.W., Bukowski, R.W., and Forney, C.L., "Technical Reference Guide for the HAZARD I Fire Hazard Assessment Method," NIST Handbook 146, National Institute of Standards and Technology, Gaithersburg, MD, 1991.

3 Data from reference 1, with estimated correction for loss of HCI; personal communication from R. Gann.

4 Huggett, C., and Levin, B.C., "Toxicity of the Pyrolysis and Combustion Products of Poly (Vinyl Chlorides): A Literature Assessment," Fire and mateirals 11, 131-142 (1987).

5 From ISO TC92 (Committee on Fire Safety) SC3 (Fire Threat to People and the Environment), personal communication from R. Gann.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:

AFFIRMATIVE: 14

NEGATIVE: 1

EXPLANATION OF NEGATIVE:

SCHUMACHER: The Toxicity Committee's recommendation that NM Cable is a fire hazard, and not a toxicity hazard does not lessen the fact that a person who dies of toxic smoke poisoning, or fire is any less dead. The fact of the matter is that NM Cable, used improperly can cause fires, and even though the Toxicity Committee has determined that toxic products of smoke are not a major problem to occupants, the fire that causes them can have significant effects on persons and property.

(Log #2380)

7- 46 - (336-4 and 336-5): Accept

SUBMITTER: Toxicity Technical Advisory Committee

COMMENT ON PROPOSAL NO: 7-138

RECOMMENDATION: The TTAC finds that this change would not significantly increase toxic hazard to occupants.

SUBSTANTIATION: Summary of Proposal: The use of NM cable would be expanded to permit the concealed and exposed installation with no fire barrier or other protection in buildings over three stories in height.

Toxicity Issues: The expanded use of exposed NM cable in code-compliant buildings over three stories is not likely to decrease appreciably the time to the incapacitation of the occupants or slow

their rates of egress any more or less than it would in code-compliant buildings of fewer stories.

The toxic potency of the smoke from the NM cable is not a primary issue. As noted in the TTAC comments on Proposals 7-135 and 7-137, the toxic potencies of smoke from well-ventilated burning of cable materials do not appear to differ greatly from the potency of normal contents of buildings. Similar to the TTAC comments on ENT in 86-5, it is not possible to estimate whether there is a significant and different toxic impact of the increased presence of NM cable, given the presence of a large, unregulated mass of other combustibles. The TTAC did not expect that the expanded use of NM cable would result in a meaningful change in smoke density and thus, e.g., in the ability to view exit signs or doors.

There is the potential for unprotected C/D cable to become involved in a fire earlier than cable installed behind a fire barrier. As addressed in the comments on Proposals 7-135 and 7-137, these are issues of general fire hazard, not toxic hazard in particular.

General Statements: Please also see general statements of the substantiation submitted with Comment 7-45 (Log #2379).

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:

AFFIRMATIVE: 14

NEGATIVE: 1

EXPLANATION OF NEGATIVE:

SCHUMACHER: See my explanation of negative vote on Comment 7-45.

(Log #2381)

7- 47 - (336-4 and 336-5): Accept

SUBMITTER: Toxicity Technical Advisory Committee

COMMENT ON PROPOSAL NO: 7-139

RECOMMENDATION: The TTAC finds that this is an issue of fire hazard analysis and less one of toxic hazard.

SUBSTANTIATION: Summary of Proposal: The use of NM cable would be expanded to buildings taller than three stories if installed behind a 15-minute finish rated barrier.

Toxicity Issues: As noted in the TTAC Comments on Proposals 7-135 and 7-137, the amount of NM cable in relation to the other unregulated combustibles present, particularly contents, was small and the characteristics of the smoke produced by burning NM cable did not differ substantially from the smoke produced by a fire serious enough to involve the cable.

General Statements: Please also see general statements of the substantiation submitted with Comment 7-45 (Log #2379).

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:

AFFIRMATIVE: 14

NEGATIVE: 1

EXPLANATION OF NEGATIVE:

SCHUMACHER: See my explanation of negative vote on Comment 7-45.

(Log #639)

7- 48 - (336-5): Accept

SUBMITTER: James M. Daly, BICC General

COMMENT ON PROPOSAL NO: 7-145

RECOMMENDATION: This proposal should continue to be rejected.

SUBSTANTIATION: 1. While the fire loss data from the U.S. Fire Administration's National Fire Incident Reporting System (NFIRS) is factual, it is not definitive regarding Type NM Cable. Different conclusions can be drawn from the data, e.g., will the incidence rate increase if the expanded use of Type NM cable is authorized? There is no evidence regarding how much Type NM cable has actually been used in buildings either under or over three floors. Not all of the states report and there is no data supplied as to how many cities within a state report.

The State of Michigan has deleted the three-floor limitation since 1978. However, the state code only became mandatory for the entire state in late 1999. In Massachusetts, which also permits Type NM cable above three floors, the cable is not permitted to leave the floor or the dwelling in which its originates. The code proposal does not include such a restriction. Also, there is no data on the extent of the use of Type NM Cable over three floors in Massachusetts.

2. The National Bureau of Standards Report on fire Endurance Tests of Residential Walls Containing Branch Circuit Wiring stipulates that the differences in the fire performance between not more than two Type NM and Type AC branch circuit cables is not appreciable within a gypsum board and wood stud constructed, one-hour fire-rated wall.

However, the report specifically states that "(T)these conclusion apply only to a single cable or at most two single cables penetrating a stud space under the conditions of the test. They may not apply to bundles of cables or to many cables passing through a stud space." Cable bundling or multiple cable runs in close proximity are common practices and the wording of the proposed exception does not limit the cable installation in a manner consistent with the report findings.

In addition, the report limits the scope of the performance tests to gypsum board and wood stud constructed one-hour fire-rated walls. The report further stipulates that "no conclusion can be made on the integrity of other types of wall construction." Ceiling voids are not addressed in the report. These findings are not reflected in the proposed wording of the exception because there are no provisions to limit installation in other types of wall construction or in ceiling voids.

3. NFPA 921: Fire and Explosion Investigations is relevant to Proposal 7-145 because it provides information on Type NM cable as a source of ignition and was submitted in response to one of the concerns expressed by the Task Group on Type NM Cable established by the NEC Technical Correlating Committee. NFPA 921 does not in and of itself support the conclusion that Type NM cable cannot be a source of ignition. The experience of some installers on the Task Group also does not support such a conclusion.

4. The Type NM Cable Fire Hazard Analysis, prepared by the Sullivan Code Group, contains two sets of conclusions.

The first set of conclusions stated that "The results of this analysis were as follows:

1. In a nonsprinklered area, for all fire scenarios evaluated, untenable conditions within the room of fire origin will be reached due to the products of combustion well before any toxic products are generated from the thermal decomposition of Type NM Cable.
2. In an area protected by residential sprinklers, for all fire scenarios evaluated, the calculated sprinkler activation time is well before the time that the Type NM cable is exposed to temperatures which would cause thermal decomposition of the cable.
3. Tests conducted using a Cone Calorimeter in accordance with NFPA 271 provided evidence that the minimum exposure necessary to cause decomposition of Type NM cable was equivalent to ENMT."

It should be noted that the fire scenarios utilized to reach conclusions 1 and 2 above were limited to a fire originating in a room and the effect this fire would be expected to have on the Type NM cable or ENMT inside a wall or in a ceiling cavity (void space). Type NM cable and ENMT exposed in the room of fire origin, or fires originating in the wall or ceiling void space were not evaluated.

The Cone Calorimeter test data in conclusion 3, above did not provide evidence that the minimum exposure necessary to cause decomposition of Type NM cable was equivalent to ENMT. However, for the particular fire scenario tested, the Report does support the contention that neither ENT nor Type NM cable will decompose within the temperature limitations of the test (194°F/90°C). A subsequent letter from Mr. Paul Sullivan dated August 22, 2000, clarified that the minimum measured surface temperature required to cause decomposition of Type NM and ENMT (ENT) is 347°F.

The second set of conclusions stated "Therefore, for the conditions evaluated in this report, it is our professional opinion that:

1. Type NM cable will not decrease the level of life safety within a building of any height when located in ceiling and wall spaces separated from the interior of the building by a 15 minute finish rating (i.e., 1/2 in. thick gypsum wall board), and on this basis should not arbitrarily be limited to 3 stories in height.
2. In terms of building fire safety, these results indicate that Type NM Cable, like ENMT (which is not limited to 3 stories by the National Electrical Code), will not contribute to the hazard of a fire when the cable is separated from the interior of the building by a 15 minute finish rating (NFPA 70, Section 331-3(2)).
3. We believe that this fire hazard analysis report provides reasonable and adequate documentation for approval of this appeal under the City of Rockville Building and Buildings Regulations Section 5-12(a)(3), "Grounds for appeals" which states: "An appeal may be taken when it is claimed that an equally good or better form of construction can be used.""

The Report does not adequately support the broad statements made in conclusions 1. and 2. above. These conclusions in the Report must be limited to the specific fire scenario where the fire originates in the room under specific test conditions and may not be applicable to all fire conditions for which Type NM Cable may be subjected in any expanded use. For example, fires originating in ceiling void spaces and inside walls are not addressed by this Report.

The material in conclusion 3 above is not relevant to an NEC proposal.

4. It is noted that, at the request of the NFPA Standards Council (Council Agenda Item 98-60, April 28, 2000 decision), the NEC Technical Correlating Committee has referred the concerns about toxicity of the products of combustion of NM cable, if expanded use of Type NM Cable is permitted, to the Toxicity Technical Advisory Committee. Comments provided by the Toxicity Technical Advisory Committee should also be considered in addition to this comment.

5. A review of the UL test methods for various wiring methods indicted that there are differences in testing Type NM cable and other wiring methods currently permitted above three stories. A Fact Finding Report should be submitted that provides test data from a qualified testing laboratory showing that the performance characteristics of Type NM cable, a modified Type NM cable, or another product are equal to, or better than, those of one or more of the currently permitted wiring methods. Specifically, the report should discern what are appropriate or acceptable differences in terms of the mechanical, electrical, flame propagation, and smoke generation properties between the wiring methods and what, if any, significance that makes for the intended expanded use of Type NM cable.

6. It should be noted that the Task Group Report included as an attachment to Proposal 7-137 did not receive consensus support from the Task Group.

PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NEGATIVE: 3
EXPLANATION OF NEGATIVE:
NICKSON: Comment should be rejected. ROP 7-145 should be accepted as modified in Comment 7-52. See NMHC Explanation of Negative vote on Comment 7-52.
NUTT: See my explanation of negavite vote on Comment 7-27.
PROPST: See my explanation of negative vote on Comment 7-27.

(Log #640)

7- 49 - (336-5): Accept
SUBMITTER: James M. Daly, BICC General
COMMENT ON PROPOSAL NO: 7-146
RECOMMENDATION: Continue to reject this proposal.
SUBSTANTIATION: This proposal should continue to be rejected as supported by the Panel Statement.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NEGATIVE: 3
EXPLANATION OF NEGATIVE:
NICKSON: Comment should be rejected. ROP 7-146 should be accepted as modified in Comment 7-52. See NMHC Explanation of Negative vote on Comment 7-52.
NUTT: See my explanation of negavite vote on Comment 7-27.
PROPST: See my explanation of negative vote on Comment 7-27.

(Log #1356)

7- 50 - (336-5): Reject
SUBMITTER: David P. Brown, Baltimore Gas and Electric Co/EEI
COMMENT ON PROPOSAL NO: 7-147
RECOMMENDATION: This Proposal should be accepted.
SUBSTANTIATION: EEI believes that the technical substantiation submitted by the National Multi Family Council in support of Proposal 7-145 clearly indicates that there are no valid safety reasons for continuing to maintain the existing three-floor limit on the use of Type NM cable in commercial and all non-single family residential construction. Our Proposal 7-147 to remove the restriction should be accepted.

EEI continues to maintain that the three-floor restriction on the use of Type NM Cable is not now, and never has been technically substantiated. We recognize that this is not a black and white issue, and that there are many factors that must be considered. We are also aware of the considerable amount of effort and work performed trying to resolve this issue by the "NM Cable Task Group to the NEC", appointed at the direction of the Standards Council (Tom Trainor as chairman). But even with all their work (and it was considerable), the Task Group was not able to reach a unanimous consensus on their conclusions and recommendations. We understand that they spent a lot of time trying to create valid technical substantiation that would justify the initial restriction in the 1974 Code, and the continued restriction in the 2002 Code. In our opinion, that would have been the preferred solution. Had they been able to reach unanimous agreement on the technical justification for instituting and retaining the restriction, the controversial issue would have been resolved and there would be no more problems. Maybe they were not successful because valid technical substantiation for the three-floor limitation of Type NM cable simply does not exist. If it did exist, then in our opinion, the Task Group would not have found it that difficult to technically justify a Code requirement that has been in place for 25+ years.

Failing to reach unanimous agreement, the Task Group put the ball in the opposition's court by requiring the opposition to prove that the restriction was not presently justified and should be removed or modified. As active participants in the Code making process, the EEI EL&P TF members know that it is the responsibility of the submitter of a Proposal or Public Comment to provide technical substantiation for making the requested Code change. We totally agree with that concept. And we agree that the proponents of removing the three-floor restriction on the use of Type NM cable should provide technical substantiation for making the change. But we also know that for the last 25+ years, no opponent has ever been able to provide technical substantiation that Code-Making Panel 7 considered adequate for removing the restriction. It's difficult to develop suitable technical substantiation to remove a Code requirement that has no technical substantiation for being there in the first place. What was broken and must be fixed? Why can Type NM be used safely in up to three floors, but not four or more? If we knew those answers, then we would know how to fix the problem. In our opinion, the only reason this limit made it into the 1974 NEC was because certain members of Code-Making Panel 7 wanted it to be there, and they had the voting strength to make it happen. The way it appears to us, that is still the case today.

The electric utilities have energized millions of electrical wiring systems using Type NM cable. This includes services to residential, commercial, industrial, and institutional facilities and installations above and below three floors. If there was or is a major safety concern with Type NM installations, we would know about it. Regardless of the cause, as the electric energy supplier, we generally get involved with most property damage or personal injury claims attributed to the use or misuse of electricity. For that reason, we have a vested interest in the electrical safety of all of our customers' wiring systems. And that is one of the reasons that we have Utility representation on all 20 Code-Making Panel. While we don't have detailed records, our experience does not indicate that Type NM installations are any better or any worse than any of the other approved wiring systems. If it could be technically documented that Type NM cable is unsafe when used in installations above three floors, then that may give us some reason to be concerned about all Type NM installations, regardless of building height.

In its July 7, 1998 decision, the Standards Council directed the NM Cable Task Group to the NEC "to do an in-depth review of the Proposals at issue (processed in the 1999 edition of the NEC) with consideration as to whether any one or a combination of these Proposals could be approved and the basis for such approval". We are not sure if this directive was met. In item one of their final report addressing Proposal 7-145 for the 2002 NEC, the Task Group states, "In Massachusetts, which also permits Type NM above three floors, the cable is not permitted to leave the floor or the dwelling in which it originates. The Code Proposal does not include such a restriction". Does that imply that if the Proposal did include the restriction, that it may be more acceptable? If so, then why wasn't it combined with Proposal 7-77 for the 1999 NEC, which did include that restriction? Isn't that what the Standards Council asked them to do? For the record, Code-Making Panel 7 rejected Proposal 7-77 without addressing that or any of the recommendations contained in the proposal.

The Standards Council decision went on to say, "Further, if the Task Group believed that acceptance of any revision to the three floor limit could not be achieved based on the existing

substantiation, they should provide clear direction relative to what substantiation would be required before favorable consideration could be given to Proposals to eliminate or modify the three floor limit". When Code-Making Panel 7 was not able to successfully resolve the issue during the 2002 ROP meeting, the Standard's Council once again directed the Task Group "to provide clear explanation and direction along the lines set forth by the Council when the Task Group was formed".

In their final Task Group report, which the Technical Correlating Committee directed be submitted to Code-Making Panel 7 for information only, the Task Group did appear to address all of the issues as directed by the Standards Council's decisions of July 17, 1998 and April 28, 2000. But although they appeared to address the issues, in our opinion, they did not always provide the results requested by the Standards Council's directives. Specifically, in addition to the example discussed in the previous paragraph, the Task Group report does not provide clear direction relative to what substantiation would be required before favorable consideration could be given to Proposals to eliminate or modify the three floor limit. The key word here is "favorable". The Task Group Report does recommend the need for a detailed "Fact Finding Report" comparing the performance of Type NM cable to any of the presently permitted wiring systems under the same specified tests procedures. But the report does not indicate that if the Type NM performs as well as or better than the comparison wiring system, Type NM would then receive favorable consideration by either the Task Group or Code-Making Panel 7. When we we discussed this with some of the Task Group members, we were told that the Task Group would not make any assurances that positive results of a Fact-Finding Report would guarantee favorable consideration by anyone. In our opinion, that does not comply with the Standards Council's directive to provide clear direction resulting in "favorable" consideration by Code-Making Panel 7. Code-Making Panel 7 has a 25-year track record of considering change proposals to remove the three-floor limit, without ever making any substantial changes.

Based on Code-Making Panel 7's documented track record on this issue, the EEI EL&P TF members don't get any "warm and fuzzies" that a favorable Fact Finding Report developed by a NRTL will result in the removal of, or any acceptable modifications to the three floor limit. In our opinion, Code-Making Panel 7's past and present actions clearly indicate that for whatever their reasons, some of their members absolutely don't want to remove the restriction. And in our opinion, unless there is an attitude change by some of the Code-Making Panel 7 members or the organizations that they represent, then right or wrong, the three-floor limit on the use of Type NM cable will continue to be maintained.

PANEL ACTION: Reject.

PANEL STATEMENT: The submitter has not provided any new substatiation. See panel action and statement on Comment 7-48.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:

AFFIRMATIVE: 13

NEGATIVE: 2

EXPLANATION OF NEGATIVE:

NICKSON: Comment should be rejected. ROP 7-147 should be accepted as modified in Comment 7-52. See NMHC Explanation of Negative vote on Comment 7-52.

NUTT: See my explanation of negavite vote on Comment 7-27.

(Log #1819)

7- 51 - (336-5): Accept

SUBMITTER: Tim Andrassy, Steel Tube Inst.

COMMENT ON PROPOSAL NO: 7-145

RECOMMENDATION: This proposal should continue to be rejected and retain the permitted uses of the 1999 NEC.

SUBSTANTIATION: The language in the exception permits the use of N/M Cable in "Multifamily dwellings" exceeding three floors above grade. Although the substantiation indicates this would only be R2 occupancies (residential)the literal definition of "multifamily dwelling" in the NEC would permit more than that. A multifamily DWELLING is defined as any building or structure containing three or more multifamily DWELLING UNITS. This can literally be interpreted to mean any building containing three dwelling units, no matter what other occupancies may be in the building.

It is untrue that the 3-story limitation has never been substantiated. The proposal that initiated the 3-story rule was submitted by NEMA in response to complaints from inspectors, contractors, and fire officials that numerous hazards were occurring due to the use of N/M Cable. The proposal originally would have prohibited use in any building with a 3/4 hour fire rating. When it was discovered that HUD had some fire ratings on one-and-two family dwellings the 3-story rule was implemented in order not to be too restrictive. This decision was based on egress and rescue concerns in the event of fire. Those concerns have not changed today.

The fire loss data used as substantiation for this proposal is not sufficient to show that N/M cable is not a problem. It has been confirmed with NFPA that current statistics (which do not name the wiring method involved) are not suitable for determining product differences. In addition, although Michigan and Massachusetts have not had a 3-story limitation, there is nothing to indicate how many installations actually use N/M cable above 3 stories. Also, Massachusetts has additional requirements that are not contained in this proposal.

The paper I have provided by Frederick Franklin, P.E., forensic electrical engineer, provides evidence that fires in N/M cable have occurred inside walls that have not been opened since the original installation. It also details how fires can occur in N/M cable due to carbon arc paths that develop over time. This is true even in an installation that was code-complying when installed. N/M is a recognized built-in source of ignition. Other proposals for this Code, both in Article 336 and in proposals for arc-fault interrupters also document N/M Cable fires.

We are not yet aware of what guidance the Toxicity Advisory Committee will provide. However, we do know they did not address smoke density and the effect smoke has on incapacitation and inhibiting escape. The Task Group also did not address smoke as they passed that to the Toxicity Advisory Committee. IT IS THEREFORE IMPORTANT THAT THIS CODE PANEL LOOK AT THE OVERALL FIRE HAZARD THEY FEEL N/M CABLE WOULD PRESENT. It appeared that the TAC considered toxicity only from the viewpoint of the added contribution it would make to a fire in a room. A CONCEALED SPACE FIRE - ESPECIALLY OVERHEAD - IS AN ENTIRELY DIFFERENT MATTER. We must not continue to take the attitude that if other things are burning, additional combustibles do not matter. If that is the case, the fire safety of our buildings overall will go down. The stated mission of the NEC, in 90-1(a), is: "The purpose of this Code is the practical safeguarding of persons and property from hazards arising from the use of electricity." The NFPA Board of Directors has made it clear many years ago that fires from electricity are hazards arising from its use, and that they are to be considered by the Code Panels.

In a letter to Mr. Casey Grant of NFPA, Mr. Jeffrey Shapiro, on page 6 states that his clients question whether the toxicity of insulation is within the purview of the NEC, or that Code Making Panel 7 has any right to discuss toxicity. In response to this we submit letter of November 8, 1991 from Mr. Arthur Cote of NFPA to one of our members. In the second paragraph Mr. Cote explicitly states: "first let me say that the scope of the National Electrical Code Committee certainly does include fire hazards." He further notes: "Since it is well recognized that smoke toxicity hazard analysis always should be conducted within the larger context of fire hazard it is admittedly difficult, if not impossible, to separate toxicity hazard analyses from hazard analysis." He further clarifies that the recommendations of the TAC are strictly advisory, and that the TAC is not a Code Making Panel. And finally, Mr. Cote makes the explicit statement: "There is no restriction against NEC Panel Members discussing toxicity or any other fire related matters regarding Proposals or Comments submitted to them on the National Electrical Code." We bring this to your attention because the chairman of the Toxicity Committee made it very clear that the only issue they would be addressing was toxic hazard, not overall fire hazard.

To that end (overall fire hazard) we submit the attached paper provided to the Toxicity Advisory Committee which was not considered. A few pertinent facts are detailed here for the edification of readers that do not have the full paper. (1) A single N/M Cable 18 inches long is tested with a 5-inch flame from a Bunsen burner for 1 min 15 sec at 1700 BTU. In addition it is permitted to flame for 60 seconds after the flame is removed. (2) In comparison, ten A/C or ten M/C Cables, eight feet long, are tested for 20 minutes. The test flame is a burner over 13 inches wide producing a heat of 70,000 BTU. (3)N/M Cable is a plasticized product, and ENT is not permitted to be plasticized. ENT can only flame for 15 seconds at the completion of the flame test. (4)In the attached modified E-84 test,24 foot lengths of N/M Cable were tested. Flame spread the full 24 feet in approximately 31/2 minutes, ENT took 13 minutes to reach the same endpoint. The base against which other products are measured on flame spread is red oak and it reached the 24 feet in about 6 minutes.

(5)In the same test, red oak reached a peak optical density of 0.06 in just over seven minutes. In comparison both ENT and N/M Cable went off the limit of the recording equipment; ENT in just over 5 minutes and N/M cable (2.0) in less than a minute. (6)In assessing the added hazard, remember that wood is controlled and it performed better than either of the two wiring methods did.

Note the section on concerns about coordination with the building codes. A couple of special points to note are that a 13R sprinkler system in particular states "Sprinklers shall not be required in attics, penthouse equipment rooms, crawl spaces, floor/ceiling spaces, elevator shafts, and storage." Also, Section 5-5 of NFPA 13d Exception 3 states: "Sprinklers are not required in attics, crawl spaces and other concealed spaces that are not intended for living purposes or storage." Even a full NFPA 13 does not require sprinklers where the exposed portions of the concealed space are constructed entirely of fire-retardant treated wood as defined by NFPA 703.

The NEC should be a stand-alone document due to the fact that building codes change in a different cycle and without correlation with the NEC. Also, the NEC is used in other countries where the building codes differ from the US. One cannot count on the building code requirements for protection. As an example, the Multi-family Housing Council, proponent of unlimited use of N/M Cable, has submitted a sprinkler trade-off proposal to the International Building Code that at this point has been accepted. Buildings of Type IIA, IIIA and VA currently are required to be of one-hour fire-resistive construction. This proposal (G107-00) would trade-off that requirement for the 13 R sprinkler system noted above with all the exceptions. Rick Thornberry, P.E. notes in a comment recommending disapproval of the proposal, "In those cases a concealed fire could grow to significant proportions before breaking out and activating the sprinklers in the occupied areas which by then may be too late to avoid significant fire damage to the building structure." There are other areas noted where fire-resistance of the assembly is lowered from 1 hour to 1/2 hour. The Sullivan report submitted to support use of the 15-minute finish rating for N/M Cable did not address fires originating in concealed spaces.

The effects of dense smoke, particularly when it is irritating such as with HCL from PVC, has not yet been clarified. Logic tells us, however, that when one is perhaps in a state of panic, can't see, finding it hard to breath, and has eyes that are tearing and shutting, that smoke cannot be ignored. The higher one goes in a building, the more difficult it is to escape.

N/M Cable is not equal to the wiring methods currently permitted over 3 stories and its overall fire hazard will decrease the safety of the occupants.

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

PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NEGATIVE: 3
EXPLANATION OF NEGATIVE:
NICKSON: Comment should be rejected. ROP 7-145 should be accepted as modified in Comment 7-52. See NMHC Explanation of Negative vote on Comment 7-52.
NUTT: See my explanation of negavite vote on Comment 7-27.
PROPST: See my explanation of negative vote on Comment 7-27.
COMMENT ON AFFIRMATIVE:
SCHUMACHER: This comment should be accepted. The Pace report data saying that 1/3 of short circuit arcing fires in structures occur in NM branch circuit cables, which is 7 percent of all structure fires. What would this percentage be if unlimited use of NM cable were allowed?

(Log #1823)

7- 52 - (336-5): Reject
SUBMITTER: Marshall A. Klein, Marshall A. Klein & Assoc., Inc.
COMMENT ON PROPOSAL NO: 7-145
RECOMMENDATION: Revise as follows:
335-6. Uses Not Permitted.
(a) Types NM, NMC, and NMS. Types NM, NMC, and NMS cables shall not be used in the following:
(1) In any multifamily dweling or other structure exceeding three floors above grade.
Exception: Type NM, NMC, and NMS cables shall be permitted in a multifamily dwelling building, in multifamily dwelling portions of a multiple occupancy building, and in common areas associated with a multifamily dwelling portion of a multiple occupancy building, exceeding three floors above grade where installed in accordance with all the following conditions:
(FPN): Multifamily Dwelling Building is defined under NEC Article 100 under "Dwelling."
1. The building shall be protected by a sprinkler system installed in accordance with the building code.
(FPN): Sprinkler systems are regulated by NFPA 13, Standard for Automatic Sprinkler Systems and NFPA 13R, Standard for Residential Occupancies up to and Including Four Stories in Height.
2. The cables shall be concealed within walls, floors and ceilings where the walls, floors and ceilings provide a thermal barrier that has a finish rating of not less than 15-minutes as identified in listings of fire rated assemblies.
3. Where installed in a concealed space above a suspended grid ceiling, the cables shall not be exposed to the concealed space.
4. In other than a multi-floor dwelling unit, the cable shall not leave the floor from which the cable originated.
5. The cables shall be protected from mechanical damage where pulled through trusses or metallic studs.
(FPN): See 300-4 for protection against mechanical damage.
6. The cable penetrations shall be protected in accordance with Section 300-21.
7. The cable shall be listed.
SUBSTANTIATION: BACKGROUND
Proposal 7-145 and the general concept of restricting NM cable based on building height have recently been through two comprehensive reviews, one by Panel 7 and one by the NM Cable Task Group appointed by the NEC Technical Correlating Committee. As a result of these reviews, all interested parties have been given an opportunity to air their views regarding removal of NM cable height restriction, and objections that were voiced in both forums have been documented. Panel 7's objections were spelled out in detain in the Panel's reasons for rejecting Proposal 7-145, as originally submitted, and the NM Cable Task Group's issues were spelled out in detail in the Task Group's report.

It is the intent of this comment to address all of these objections so that there will no longer be any basis of argument for retaining the three-story limit on the use of NM cable in residential uses. Code text proposed in this comment and the comment's supporting statement respond to every objection raised by Panel 7 in the Panel's reason for rejecting Proposal 7-145, and every substantive issue identified by the NM Cable Task Group.

So that there is no misunderstanding, our intent is to show that NM cable is no more hazardous that other wiring methods currently allowed by the NEC that are not restricted with respect to the height of buildings in which they are used. It is not our intent to claim that NM cable is equivalent to each and every other wiring method permitted by the NEC to be used above the third story. Such a demonstration is not necessary to make our case. NM cable need only demonstrate parity with a single wiring method that is not restricted with respect to height to substantiate removing the 3-story limit on NM cable.

There is no debate that the flamespread and ignitibility characteristics of wire in steel conduit or AC cable may exceed those of NM cable; however, there is no reason that NM cable must demonstrate equivalent performance to these other wiring methods. Because the NEC permits the use of wire in electrical nonmetallic tubing (ENT)without regard to building height, it would be clearly unfair to restrict the use of NM cable with respect to building height once it has been demonstrated that the safety-related performance of NM cable is satisfactorily equivalent to ENT.

RESPONSE TO NM CABLE TASK GROUP ISSUES:

Code text proposed by this comment modifies the original proposal to address issues identified by the NM Task Group. A description of the reason for each modification follows:

1. Multiple occupancy building are now addressed in the exception. In multi-story, multiple occupancy buildings there may be floors or portions of floors with retail, offices, industrial, parking garages and residential uses. Only the floors, or portions of floors classified as multifamily dwelling occupancies, would be permitted to use this exception. This would include the common elements (corridors) and incidental uses (laundry room, lounge room, etc.) that serve a multifamily dwelling occupancy.

2. Condition 1 was added to enhance the fire protection/life safety of the building in which this exception is to be used. Given the lack of a demonstrated loss history associated with NM cable, the requirement to sprinkler buildings in order to get a relaxation of the three-story height limit could easily be argued as excessive.

However, the sprinkler condition is offered to ensure the success of this proposal, recognizing that the fire-safety record of sprinklered multi-family buildings is excellent and that many, if not most, such building are wired with Type NM cable.

3. Condition 2 was added to provide the 15-minute protection currently required for ENT when ENT is installed in buildings more than three-stories in height. This provides parity for the two wiring methods with respect to protection from an external fire exposure and negates the issue of cable protections. Since ENT, a plastic product, is acceptable above three stories when protected by a material with a 15-minute finish rating, it would be unfair to limit the use of NM cable with respect to building height based on cable protection when the cable is protected in an equivalent manner to that required for ENT.

4. Condition 3 was added to address the NM Cable Task Group's concern of using NM cable above suspended ceiling tiles that, over time, may be taken out and not properly replaced. The type of ceiling system of concern to the task group is referred to in the UL Fire Resistance Directory as a suspended "grid system," so that is the proposed terminology. NM cable installed above a monolithic ceiling membrane, such as drywall or plaster, would be acceptable.

5. Condition 4 was added to clarify that NM cable may not be used as a riser cable from floor to floor. NM cable will be limited to primarily horizontal runs on the residential floors. In multi-story dwelling units, NM cable will be permitted throughout the interior of a dwelling unit. This requirement basically incorporates the technical content of the Commonwealth of Massachusetts' Proposals 7-150 and 7-151 into Proposal 7-145 to address concerns of some NM Cable Task Group members about using Type NM cable as a floor to floor riser.

6. Condition 5 addresses a concern of the NM Cable Task Group regarding the susceptibility of NM cable to damage during installation. The added condition alerts the installer to follow NEC Section 300-4 for protection of NM cable against mechanical and physical damage. It should be noted that susceptibility to damage is not a valid reason to restrict the use of NM cable based on building height since susceptibility to damage is not a height sensitive issue.

7. Condition 6 addresses a concern expressed by the NM Cable Task Group that a fire involving NM Cable might be more likely to spread from floor to floor in concealed spaces than a fire involving another wiring method. This concern is already accommodated in large part of Condition 4, which prohibits use of NM cable as a riser in buildings exceeding three stories in height. Nevertheless, Condition 6 has been added to alert the user to the applicability of Section 300-21, which requires that openings around floor to floor penetrations be fire-stopped to prevent the spread of fire or products of combustion.

8. Condition 7 addresses a concern of some of the members of the NM Cable Task Group that all manufacturers of NM cable should list their product. It should be noted that the listing requirement would only apply to NM cable installed in multi-family dwelling buildings under this exception.

In summary, the revisions that have been made to Proposal 7-145 address all substantive concerns that were discussed at the NM Cable Task Group Meetings regarding the use of NM cable in multi-family buildings above three stories, with the exception of smoke toxicity, which has been determined by the Standards Council's special Toxicity Advisory Committee to be an invalid basis for restricting the use of NM cable.

RESPONSE TO PANEL 7 ISSUES"

The following comments provide and item-by-item rebuttal to reasons provided by Panel 7 to substantiate their rejection of Proposal 7-145. (NOTE: In the following text, Panels 7's statements from their reason for rejecting Proposal 7-145 are in quotes, and our responses are noted in the "Comment" under each quoted Panel 7 statement).

Panel 7: "There is concern that the requirements of the use of Type NM cable will now be dependent upon the use of building codes for proper interpretation types of construction."

Comment: This is not a valid basis for rejection for the proposal since it has nothing to do with technical merit. Nevertheless, the proposal does not rely on types of construction. It references only the installation of NM Cable in multi-family dwelling buildings, which are already defined in the NEC.

Panel 7: "The substantiation provided with this proposal does not provide a comparison with the wiring methods that are currently used in the applications for which the expanded use of Type NM cable is being proposed."

Comment: It is unnecessary to compare Type NM cable with every wiring method recognized by the NEC for use in buildings above three stories. NM cable need only judged to be equivalent to any single method recognized for use above three stories to justify acceptance. Substantiation for this proposal exceeds that level of justification by providing comparisons to both the AC and ENT wiring methods, both of which are permitted in buildings above three stories.

Furthermore, this revised proposal, in addition to requiring the 15-minute protection as required for ENT, includes other requirements addressing concerns of Panel 7 and the NM Cable Task Group.

It is unclear what additional information is deemed necessary by Panel 7 to favorably consider this proposal when the panel asks for a "comparison" with other wiring methods. Detailed fire testing and fire modeling documentation submitted with Proposal 7-145 compares NM cable with AC and ENT and clearly shows that the fire performance of NM cable is substantially equivalent to AC and ENT with respect to overall building fire safety. In addition, NFPA fire statistics submitted in support of the original proposal clearly show the fixed electrical wiring, no matter what wiring method is used, is not a significant fire problem.

Panel 7: "The Task Group report, which is the substantiation for the proposal, noted that there are potential hazards involving the use of Type NM cable that have not been adequately reviews. These include: 1. The compatibility of NM cable with modern building code requirements and construction methods and materials other than wood frame construction."

Comment: The three-story limit on NM cable has no relevance to the materials used in building construction. Although some relate the three-story limit to a mandate limiting the use of NM cable to buildings of wood frame construction, that relationship is arbitrary.

There is nothing in any of the building codes prohibiting a building that is three stories or less in height from using concrete or steel framing materials. In fact, many buildings that are three stories or less in height are build using concrete and/or steel. Those that claim that there is a problem regarding compatibility between NM cable and concrete or steel construction should be able to present some evidence to that effect. Since the use of NM cable in concrete and steel construction is commonplace. However, no evidence of any kind has been presented to substantiate these claims.

Furthermore, if the intent of the NEC were to limit the use of NM cable to buildings constructed with wood framing, the NEC is too restrictive to accomplish that intent anyway because current building codes permit wood-framed buildings to exceed three stories in height.

Finally, it is important to point out that plastic products, such as light-transmitting plastic wall panels, plastic roof panels, plastic skylights, foam plastic insulation, and plastic plumbing piping, just to name a few, are permitted to be used in all types of construction under the building codes. The presence of NM cable as a source of fuel for a fire in such buildings is inconsequential compared to all of the other combustible materials found in a building, including contents, that are constructed of plastics or otherwise.

Panel 7: "2. The NFPA Research Foundation's study of incapacitation and the possible contribution of PVC to this issue."

Comment: Based on the Standards Council Decision: D00-18, Agenda Item SC 98-60, dated April 28, 2000, the Standard Council directed that the advice of the Council's special Toxicity Advisory Committee be sought for guidance on how to handle toxicity concerns. The Toxicity Advisory Committee met on October 20, 2000, and determined that toxicity concern is not a valid basis for restricting the use of NM cable based on building height. The Toxicity Advisory Committee's comment is included in this ROC.

Panel 7: "3. The potential contribution to electromagnetic interference which is of particular concern in commercial and industrial applications."

Comment: This issue is not regulated by the NEC, for NM cable or any other wiring method. It is outside the scope of the NEC as defined under Section 90-1. In fact, even at the meetings of the NM Cable Task Group, it was agreed that this was not a problem since the electromagnetic currents between the wires in NM Cable will cancel each other out.

Panel 7: "The task group report also states "Of ongoing concern is the behavior of Nonmetallic-Sheathed Cable under fault or overload conditions. The task group disagrees on the extent to which nonmetallic sheathed cable becomes an ignition source under these conditions. Any expanded use of Nonmetallic-sheathed Cable would need to address this issue effectively."

Comment: The NM Cable Task Group and Panel 7 have been provided with sections and reference articles from NFPA 921 (14-11.4, 14-11.5, A-14-11.4 and Bruce Ettling's articles noted in NFPA 921, page 149.) These credible sources provide technical evidence that NM cable is no more likely to serve as a source of ignition than any other recognized wiring method. Fire data submitted in

support of this proposal also substantiates our position that electrical distribution wiring is not a common ignition source.

Panel 7: "Attachment 2 - In attachment 2 there are two parts, the first part is a letter with corresponding data covering various types of conduits (Scheduled 40, Schedule 80, and Electrical Nonmetallic Tubing). This is not relevant to the use of Type NM cable. The second item provides toxicity results of PVC without interpreting the data relative to the safety or dangers of the test results."

Based on the Standards Council Decision : D00-18, Agenda Item: SC 98-60, dated April 28, 2000, the Standards Council directed that the advice of the Council's special Toxicity Advisory Committee be sought for guidance on how to handle toxicity concerns. The Toxicity Advisory Committee met on October 20, 2000, and determined that toxicity concern is not a valid basis for restricting the use of NM cable based on building height. The Toxicity Advisory Committee's comment is included in this ROC. Because of the Toxicity Advisory Committee's expert opinion on this issue, it is now inappropriate for Panel 7 to continue to use the toxicity argument as a basis for restricting NM cable, given that the panel generally lacks credentialed expertise in the field of toxicity.

Panel 7: "Attachment 3 - A primary stated purpose of the tests was to determine the effect on the fire endurance of a one-hour fire-rated wall due to the installation of NM or AC cable. The fire-rating was reduced in both instances. Various "suppositions" are offered as to the reasons. The report notes in paragraph 4 of the introduction that the UL test is "a type of ease of ignition test." "It cannot be used for evaluating the effect of electrical wires on the fire resistance of a fire barrier."

Comment: Based on Panel 7's comments on this attachment, the Panel did not read the Report. The Panel's comment indicates that they understood the report's conclusions to have been based on "ease of ignition" tests that the Panel deemed irrelevant to the issue of fire resistance. Based on this incorrect assumption, the Panel then discredited the report's conclusions. In fact, the report specifically stated that existing ease of ignition tests were inadequate for drawing conclusions regarding the effect of wiring on the performance of fire-resistive assemblies, and on that basis, justified the use of the ASTM E119 test for analysis.

For the record, the statement in the report that the Panel expressed concern about stated:

"The test for electric wiring used by Underwriters' Laboratories [3,4] is a type of ease of ignition test. It cannot be used for evaluating the effect of the electrical wires on the fire resistance of a fire barrier. To the best of our knowledge, no controlled laboratory tests have been conducted to measure the relative effect of different kinds of electric cables on the fire endurance of residential wall construction; these reported tests represent an initial step in developing such information."

Footnote [3,4] were listed on page 11 of the Report as "References":

"[3] Standard for Rubber-Insulated Wires and Cables, UL 44, Underwriters' Laboratories, Northbrook, Illinois (1975) and Amendments dated June 8, 1976. Also listed as ANSI C33. 6-1974

[4] Standard for Thermo-Plastic Insulated Wires, UL 83, Underwriters' Laboratories, Northbrook, Illinois (1971). Also listed as ANSI C33. 80-1971."

Again, this paragraph established the basis for using the E119 test procedures for this study because the other UL tests noted in the footnote as UL 44 & UL 83 "…cannot be used for evaluating the effect of the electrical wires on the fire resistance of a fire barrier."

Since the Panel apparently missed the point of the report, we'll reiterate. Attachment 3, NBSIR 78-1415, "Fire Endurance Tests or Residential Walls Containing Branch Circuit Wiring – Preliminary Findings", Final Report, February 1978, was done by the National Bureau of Standards for U.S. Department of Housing & Urban Development. In this 1978 study using the ASTM E119 fire test, Type NM (nonmetallic sheathed) cable was tested along with Type AC (armored) cable. The Study's conclusions were:

- Page 1, "Abstract," Paragraph 2: "The tests showed no significant difference in the performance of the different cable types."
- Page 8, "Discussion of Results", paragraph 2: "The differences in the NM wired and the AC-wired assemblies were slight as measured by the times at which the air temperature in the studs spaces rose abruptly."
- Page 9, "Wall No. 2," Paragraph 2: "The differences between the AC an NM assemblies are probably not significant."
- Page 10, "Both Walls," Paragraph 4: "The differences in the fire performance between type NM and type AC branch circuit cables, within a particular one-hour fire rated wall assembly, as shown by these tests is slight."
- Page 10, "Summary," Paragraph 1: "The test showed little effect of the cable types on the fire performance of the walls. The reduced fire resistance appears to be more related to the cut-outs for the electric boxes than to the presence of electric cables."

The fire test conclusions dealing with the flow of hot gases along he paths of cables and conduit have since been addressed by the new products listed under E814 and the fire stopping requirements added in the 1980s by NEC Article 300-21 and by model building codes (1999 BOCA Code Section 714, "Penetrations," 1997 UBC Code Sections 709.6, 710.2, & 714, all entitled "Through-Penetrations," 1999 SBC Code Sections 705.5 and 705.6, all entitled "Through-Penetrations," 2000 IBC Code Section 711 , "Penetrations").

The fire test conclusions dealing with electrical outlet boxes have since been resolved by the new UL outlet box fire resistance classifications CEYY "Outlet Boxes and Fittings Classified for Fire Resistance" and CLIV "Wall Opening Protective materials." These new classifications came out in the 1980s and 1990s to address the issue of maintaining the fire rating of the walls that contain electrical boxes.

In summary, Attachment 3 demonstrated through ASTM E119 fire tests (the recognized method for testing assemblies for fire resistance) that neither NM or AC cable creates s fire spread problem from dwelling unit to dwelling unit or floor to floor. Therefore, because AC cable is not restricted with respect to building height and because NM cable demonstrated comparable properties with respect to the impact of wiring on the fire resistance of rated assemblies, there is no basis for maintaining a height restriction for NM cable based on concerns about the potential impact of wiring on fire-resistive assemblies.

Finally, as noted in the 8/27/00-8/3/00 minutes of the NM Cable Task Group, Item 00-8-4c and Enclosure 4 (Questions and Answer 11), UL stated its position on wiring installed in fire rated assemblies. UL's position was that NM wiring in fire rated assemblies does not have any adverse affects on the fire rating.

Panel 7: "Attachment 4-This documentation is addressing two subjects. The first is the likelihood of a staple igniting the insulation on the conductor or the wood to which it was stapled."

Comment: It should be noted that Panel 7 did NOT comment on, or dispute, the documentation that was submitted under Attachment 4. This documentation from the highly respected NFPA 921, "Guide for Fire and Explosion Investigation," clearly debunks the myth that overdriven or misdriven staples securing NM cable will commonly cause a fire. See NFPA 921 Section 14-11.4, 14-11.5 and A-14-11.4 and Appendix B on Referenced Publications.

Panel 7: "Table A from Statistical Report on Fire Losses Attributed to Electrical Wiring in Apartments and other Structures" prepared by Jeffrey M. Shapiro P.E., International Code Consultants was submitted. This table indicates that there were an average of 1,759 fixed wiring structure fires in high rise and low rise apartments and in buildings other than homes reported by US fire departments that caused an average of nine civilian deaths from 1993-1997. This data only supports what was contained in the task group's report concerning the other potential hazards involved in the expanded use of Type NM cable."

Comment: Panel 7's interpretation of the submitted fire data is difficult to comprehend. Our intent in submitting the statistical report was to demonstrate that fire losses associated with electrical wiring in concealed spaces accounts for a very, very small percentage of fires in multi-family residential occupancies.

It is true that neither the National Fire Incident Reporting System (NFIRS) nor the NFPA fire data currently available has the necessary information to discriminate between fire involving NM cable from other wiring methods. However, it can be reasonably concluded that if the overall losses associated with electrical distribution wiring fires in concealed spaces (inclusive of ALL WIRING METHODS), are only one-half of one percent (a number substantiated by subsequent data analysis), then any subset of this number associated with NM cable would never represent a large enough loss history to demonstrate a unique restriction for this product.

From the perspective argued by Panel 7, that the annual average of 1,759 fires involving ALL TYPES of electrical wiring, both concealed and exposed, is an unacceptable level of loss, the panel would have to conclude that all existing wiring methods are inadequate to provide an acceptable level of safety because the data is all-inclusive. Does this mean that all electrical wiring methods should be restricted to buildings that are three stories or less in height? Note that the same NFPA fire data shows that stoves caused an annual average of 30, 647 (29.6% of all fires) fires that result in an average of 48 (7% of all fire deaths) fire deaths per year. Would Panel 7 rationalize that we now prohibit installation of stoves above the third floor of apartment buildings?

There is NOTHING in the submitted data that supports Panel 7's conclusion that there are hazards associated with expanded use of NM cable, with respect to elevation or otherwise. The ONLY valid conclusion that can be drawn from the data that we presented with respect to this issue is that electrical wiring, and particularly wiring in concealed spaces, accounts for a very small percentage of fires in multi-family residential occupancies. Given that losses associated with NM cable are only a subset of a vary small number, no unique restriction on NM cable can be justified based on fire loss history.

One other point worth noting is that the Panel was also provided with statewide fire loss data from Michigan and Massachusetts for comparison purposes because these two states both amend the NEC to delete the three-story limit on NM cable, and they have both done so since the restriction was first added to the NEC in 1974. Both of these states took the position that the three-story limit on NM cable was never properly justified to substantiate inclusion in the NEC in the first place, and neither enacted the restriction. As a result, fire loss data associated with electrical distribution wiring from these states would be expected to be higher than national averages if NM cable was truly more hazardous than other wiring methods.

In fact, the opposite was found to be true. Fire loss data presented to the Panel in Tables C and D of the report showed that fire losses associated with electrical distribution wiring were actually lower, in percentage terms, that national averages. It is not our intent to convince the Panel that NM cable would thereby be judged to be a safer wiring method than others recognized by the NEC, but it is our intent to demonstrate that two states that most certainly have a more liberal stance with respect to the use of NM cable versus the rest of the country have fire loss histories that are certainly no out of line with national averages.

Panel 7: "The second part of Attachment 4 basically discusses different types of fire stops which does not provide substantiation for the proposal."

Comment: The second part of Attachment 4 provided information regarding UL listings for fire rated outlet boxes and fire-stopping systems that were designed in response to the fire test conclusions of the NBS report provided in Attachment 3. Our intent in providing information regarding these UL listings was to demonstrate that the safety recommendations presented in the NBS Report (none of which pertain to NM cable) have been addressed.

Panel 7: "Attachment 5 -The test submitted does not provide conclusive data as there are not firm test conditions. The cone calorimeter is not an accepted method for fire testing electrical wire and cable. Wire and cable is tested for flame propagation and, in some cases, for smoke release using actual flame tests on wire and cable products. The cone calorimeter measures heat release, not flame propagation."

Comment: Attachment 5, "Type NM Cable Fire Hazards Analysis," was prepared by Paul D. Sullivan, P.E., based on fire testing performed by Dr. Fred Mowrer (Fire Protection Engineering Department, University of Maryland). The report was third party reviewed by Dr. Fred Clarke (Benjamin/Clarke Associates, Inc.). The report was submitted for the purpose of demonstrating that the fire performance of NM cable and ENT are satisfactorily equivalent to substantiate equal treatment by the NEC with respect to use in buildings exceeding three stories in height.

This documentation provides the same level of analysis as that which was previously used to justify the removal of the three-story height restriction on ENT. Cone calorimeter testing in the Sullivan study concluded that the decomposition temperatures of ENT and NM cable are essentially equivalent (375 degrees Fahrenheit).

Sullivan's study also showed the importance of providing a 15-minute thermal barrier to maintain the temperature of the wall cavity well below the decomposition temperature of the wiring. The 15-minute barrier assures that a fire in the room of origin will yield untenable conditions in the room of origin long before the temperature in surrounding wall cavities would cause decomposition of wiring. The Sullivan report supports the use of NM cable on a par with ENT in that the NM cable will react the same as ENT when located in a wall cavity exposed to an external fire condition. In summary, there is no increased hazard associated with the use of NM cable as compared to ENT.

It is important to point out that prior to the 1986 NEC Code, NM Cable and ENT were both subject to the same three-story height restriction. NEC-TCT-86-A, Code Proposal 8-49-(331-3 and 331-4), submitted by Charles Forsberg, Carlon, eliminated the three-story limitation on ENT based on a research project that analyzed potential toxicity hazards from electrical nonmetallic tubing installations in walls, floors or ceiling where the room is involved in a fire situation. The research report, entitled "The Use of ENMT– Fire Hazard Analysis," was submitted by Benjamin/Clarke Associates, Inc. in support of Carlon's proposal. The NFPA Toxicity Advisory Committee reviewed this report and submitted Code Comment 8-32A-(331-3 and 331-4), recommending an action of accept in principle, requiring a thermal barrier when placing ENT in walls, floors or ceilings in buildings over three stories in height. In the end, Panel 8 ACCEPTED Carlon's proposal with a modification that was based on the Toxicity Advisory Committee's recommendation that a thermal barrier be provided. The Panel added a requirement that the barrier carry a finish rating of not less that 15 minutes.

In response to Panel 7's concern that the cone calorimeter test was not a proper test for the intended purpose, the intended purpose was NOT to address flame propagation or smoke release associated with NM cable or ENT. The intent was to determine the temperature at which these two products will begin to decompose. The cone calorimeter test is, in fact, a proper test for this purpose.

With respect to flame propagation, it is difficult to understand why the Panel has pushed this as an issue since both ENT and NM cable will pass the UL "All-Wire Test Procedure", given that they do not substantially support or spread the flame and that they will both self extinguish when the source of heat is removed.

Considering that the appropriate test method was used, that the analysis was essentially equivalent to that performed to justify removal of the three-story limit on ENT in the NEC and that the report was prepared and reviewed by subject matter experts, the report's conclusions are perfectly valid. These conclusions were:

i. "Type NM cable will not decrease the level of life safety within a building of any height when located in ceiling and wall spaces separated from the interior of the building by a 15 minute finish rating (i.e. 1/2" thick gypsum wallboard), and on this basis should not arbitrarily be limited to 3 stories in height."

ii. "In terms of building firesafety, these results indicate that Type NM Cable, like ENMT (which is not limited to 3 stories by the National Electrical Code), will not contribute to the hazard of a fire when the cable is separated from the interior of the building by a 15 minute finish rating [NFPA 70 Section 331-3(2)].

Panel 7: "Present restrictions for the use of Type NM Cable attests to the fact that it is a safe product provided it is used in accordance with the NEC."

Comment: This statement by Panel 7, in itself, should be regarded as adequate substantiation for approval of this comment. If panel 7 currently regards NM cable as a safe product when used in accordance with the NEC, than there is absolutely no basis for maintaining the three-story restriction in the NEC without evidence that NM cable somehow becomes less safe when used above the third floor level in a building. To date, no one on the Panel or otherwise has presented any evidence that the safety of NM cable is sensitive to elevation in a building. The product and all of the criteria needed for safe installation are identical on the first, third, tenth and any other floor level in a building. If one were to take a proper installation of NM cable on the third floor of a building and relocate that identical floor to the tenth level or higher, would the installation be any less safe?

Nevertheless, the conditions set forth in the code text proposed by this comment have been offered to ensure that every substantive concern expressed by Panel 7 and the NM Cable Task Group has been addressed so that there will not be a valid basis for rejection of this comment.

Panel 7: "Evidence is required by a committee of NFPA responsible for a particular standard or any portion thereof to make a change in the existing requirements."

Comment: Based on ANSI procedures, evidence by way of all the original attachments and the NFPA Fire Data has been provided for this code proposal. In fact, this proposal has more supporting documentation than any other issue considered by Panel 7 during this code cycle. While Panel 7 certainly has the right to disagree with what has been presented, it is incomprehensible how the Panel could suggest that "evidence" was not provided, as this statement suggests.

Panel 7's disagreements with the supporting documentation were provided in the Panel's ROP statement, and in accordance with NFPA/ANSI procedures, we have responded in this comment to ALL of the issues (point by point) identified by the Panel in their statement.

Panel 7: "It is not the responsibility of the responsible technical committee to substantiate the existing requirements. Submitter is required to provide necessary and sufficient technical substantiation for a proposed change."

Comment: When the validity of an existing provision in an NFPA code or standard is challenged by a substantial volume of technical evidence, it is incumbent on the technical committee responsible for the code or standard to exercise due diligence and reassess the validity of the existing provision. Such an assessment would absolutely have to include an analysis of the basis/substantiation

that served as the original justification for the provision. To date, neither Panel 7 nor the NM Cable Task Group has been able to provide a valid technical reason for maintaining the three-story restriction on NM cable. Every documented argument against removal of the restriction has been based on a concern that is not sensitive to the elevation of NM cable in a building.

To justify maintaining the three-story limit, it is incumbent on Panel 7 to identify at least one valid technical or statistical reason justifying the existing provision against which a proposed change to the provision can be measured.

In this particular instance, the National Multi Housing Council has provided what was believed to be sufficient technical substantiation to justify acceptance of the proposal The committee responded with a detailed critique of this substantiation, which did not substantiate the existing provision but instead provided what we accepted as a complete list of the committee's concerns given that the committee was obligated to make its ROP statement complete by prior actions of the Standards Council (see rulings associated with Standards Council Agenda Item: 98-60(b/c/d), dated July 17, 1998 and Standards Council Decision: D00-18, Agenda Item: SC98-60, dated April 28,2000 in which the Standards Council directed that Panel 7 "…should provide detailed substantiation for any position it takes."

Panel 7: "The Panel does not have any knowledge as to the substantiation used by the Commonwealth of Massachusetts and the State of Michigan in amending the three floor restriction since it first appeared in the NEC."

Comment: These jurisdictions have not developed specific substantiation for amending the NEC to remove the three-story limit on NM cable because neither believes that the restriction was adequately substantiated when it was added to the NEC in 1974. Lacking a valid reason for making their electrical codes more restrictive with respect to the allowable use of NM cable in 1974, no substantiation was deemed necessary to delete a provision that was never justified in the first place. Furthermore, it is now evident in our opinion that the three-story limit on NM cable was adopted in violation of NFPA/ANSI rules due to a procedural violation (no public review prior to consideration at the Annual Meeting) in processing of the provision.

Nevertheless, the reasons for Massachusetts and Michigan amending the NEC are irrelevant to the issue at hand. These jurisdictions certainly permit more widespread use of NM cable than jurisdictions who follow the NEC as published, and their fire loss histories are in line with, if not better than, national averages for fires involving electrical distribution systems in multi-family occupancies.

Panel 7: "Fire loss data does not differentiate the specific wiring methods used for Fixed Wiring."

Comment: See response above to the Panel's other comment regarding fire data.

Panel 7: "Fire spread of individual products is not compared using test methods applicable to wire and cable products."

Comment: All conductors and cables must be flame retardant if they are used inside a building. To assess flame resistance for wiring system, tests involve burning samples of the product and measuring the flame spread and duration.

Most building wire products are required to pass a flame test, depending on the conductor or cable type. The fire (flame) spread tests for wiring systems should be well know to NEC panel members, but are presented here for review:

1. For NM Cable, under UL 719, cable is required to pass the "All Wires Flame Test".
2. For ENT, under UL 1653, tubing is required to pass the "All Wires Flame Test".
3. For Rigid PVC Conduit, under UL 651, conduit is required to pass the "Cable Flame Test".
4. For MC with a jacket, under UL 1569, cable is required to pass the "All Wires Flame Test".
5. For AC (UL 4), MC without a jacket and Rigid Metallic Conduit, there are no requirements for flame spread testes.

In the All-Wires Flame Test, the flame test cabinet is placed in a draft-free environment. An 18-inch product sample is clamped in a vertical position in the center of the cabinet above a layer of cotton. A gas burner adjusted to provide a temperature of 1,500°F is pointed at the product. A strip of gummed kraft paper is wrapped around the sample 10 inches above the point where the gas flame contacts the cable as a flame indicator flag. The burner is moved into place and the flame is ignited. It is allowed to burn for 15 seconds, then turned off for 15 seconds. This is repeated until the flame has been applied a total of five times.

To pass the All-Wires Flame Test, the sample must not continue to burn for more than 60 seconds (For ENT, the maximum time for burning is 10 seconds). The flame must not travel up the sample to a point where more than 25% of the paper flag is consumed. The cotton must not be ignited by flaming particles. This test shows if the product is flame retardant. The product passes the test if it does not support or spread the flame, and if it self-extinguishes when the source of heat is removed.

The Cable Flame Test is the multi-conductor cable version of the All-Wires test, which is for single conductors only. In this test, the flame is turned on for 60 seconds and turned off for 30 seconds three times. The criteria for acceptance are identical to those in the All-Wires test.

As can be see by the flame tests noted above, NM Cable is treated in a similar fashion in its flame (fire spread) testing criteria to other comparable wiring methods permitted by the NEC Code without a three-story height restriction.

Panel 7: "Fire Hazard Analysis comparison of Type NM Cable versus wiring in ENT does not compare all other differences in the two wiring methods."

Comment: The fire hazard analysis comparison of NM Cable vs. ENT did compare all the differences in the two wiring methods that are relevant to the issue of the three-story limitation. Comparing the requirements of NEC Article 331 (ENT) to Article 336 (NM) shows that the only relevant difference between the two wiring methods is the three-story limitation that was present for both NM cable and ENT before 1987, that has since been applicable only to NM cable.

NEC-TCT-86-A, Code Proposal 8-49 (331-3 & 331-4), submitted by Charles Forsberg, Carlon, eliminated the three-story limit for ENT. The fire hazard analysis comparison of NM cable vs. ENT that was submitted to Panel 7 used the same parameters that were used in the ENT research project, which justified removal of the height limit on ENT. The analysis compares "apples to apples" and shows that NM cable is equal to or better than ENT with respect to toxicity, which was the major issue inhibiting expanded use of ENT in 1986.

Accordingly, there is no logical reason for maintaining the height restriction on NM cable but not ENT. If the NM cable height restriction is still considered valid, then it is incumbent on the NEC Correlating Committee and the Standards Council, to justify why a height restriction isn't placed on ENT.

As indicated previously, panel 7 is obligated to consider that the Standards Council's Toxicity Advisory Committee met on October 20, 2000 and determined that toxicity, as it relates to the use of NM cable above three stories, is a non-issue (See the Toxicity Advisory Committee's Comment in this ROC). Thereby, the Sullivan NM Cable Fire Hazard Analysis meets all the parameters required of the ENT research project done by Carlon to justify removal of the three-story limit on ENT. Given that NM cable has now been shown to meet the same criteria as those used to justify elimination of the three-story limit on ENT, the height restriction on NM cable can no longer be justified.

Conclusion

These rebuttal comments, along with the revised text, the supporting statements above and the original substantiation submitted for Code Proposal 7-145 provide a more than adequate technical basis for acceptance of the proposed code text, as required by NFPA/ANSI procedures. It is important to emphasize that the focus of this proposal is very specific. It deals only with the removal of a height limit on the use of NM cable in multifamily dwelling buildings.

Nowhere in any of the Panel's comments or the NM Cable Task Group's comments has there been any valid substantiation offered to justify a three-story limit on the use of NM cable. The three-story limit is entirely arbitrary, and lacking a valid technical reason that supports a specific height limit, such as data showing that the product creates an unsafe condition if used at a particular elevation, we can find no basis under the NFPA rules for rejection of this comment.

PANEL ACTION: Reject.

PANEL STATEMENT: Review of material provided with this comment, presentations made at the ROC panel meeting, review of material distributed at the ROC panel meeting, and panel action on Comment 7-48 along with the substantiation provided with that comment support the following:

· The panel's action on this comment.
· The present requirements in the Code relative to the permitted uses of Type NM cable.
· The need for a comprehensive fact-finding report as stipulated in Item 5 of the substantiation for Comment 7-48.

Items submitted to the panel for review at the ROC meeting include:

1. Statistical Report-Structure Fires in Apartments by Area of Fire Origin, prepared by: Fire Analysis and Research Division, NFPA,

November 2000. This document affirms that the current requirements in the NEC are adequate.
2. Document entitled-Test Report: Investigation of the potential for fire propagation along Type NMC cable within a steel stud wall cavity. The document states that the test was conducted at the Potomac Laboratory of the Department of Fire Protection Engineering at the University of Maryland. The panel noted that the two typed pages were not on letterhead stationary and did not contain any signature or date. This document does not satisfy the concern relating to a fire originating in a concealed space as stipulated in Item 3 nor the comparison requested in Item 5 in the substantiation for Comment 7-48.

Note: Supporting material available at NFPA Headquarters.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NEGATIVE: 3
EXPLANATION OF NEGATIVE:

NICKSON: Comment 7-52 should be approved. In rejecting Comment 7-52 without a detailed substantiation and introducing a new requirement for a "fact finding report," Panel 7 failed to comply with the NFPA Standards Council directive set forth in decision D#98-22 and reaffirmed in decision D#00-18, directing Panel 7 to "provide clear direction relative to what substantiation would be required before favorable consideration could be given to proposals to eliminate or modify the three floor limit."

The requirement for a fact finding report by a third-party testing laboratory is simply a delay tactic intended to sidestep the Council's directive. Furthermore, in requiring a fact finding report that supports the comment prior to further consideration, the Panel has established an insurmountable hurdle because the proponent has been advised the testing laboratories will not make any specific recommendations with regard to modifying the three story limit. The laboratories advise that they will only provide technical data that must be interpreted by others. Nevertheless, the type of information that would be addressed in a fact finding report has already been supplied to the Panel in the supporting documentation submitted with Proposal 7-145 and Comment 7-52.

By mandating that a fact finding report be submitted and not responding to technical modifications offered in Comment 7-52, Panel 7 has violated Section 4-4.6.3 of the Regulations Governing Committee Projects, which requires that TCs must provide a statement substantiating their action that is "preferably technical in nature, on the reason for the TC action." The regulations further state: "Such statement shall be sufficiently detailed so as to convey the TC's rationale for its action so that rebuttal may, if desired, be offered when the Committee presents its Technical Committee Report to the Association for consideration."

By establishing a prerequisite for a fact finding report prior to further consideration of proposals modifying the three-story limit on NM cable, Panel 7 has also exceeded its authority in the code development process by independently imposing a supplemental regulation governing submittal contents. NFPA procedures clearly delineate minimum requirements for submittal contents in Section 4-3.3 of the Regulations Governing Committee Projects, and technical committees are not authorized to change this threshold.

After 25 years of debate, there is one simple fact that sums up the entire issue. There is absolutely no documented evidence that correlates the safety of NM cable with the elevation of its installation in a building. NONE. If such information existed, surely it would have surfaced by now.

In contrast, the proponent has submitted technical analyses demonstrating satisfactory equivalence of NM cable to other wiring methods already permitted above three-storeies. Furthermore, Comment 7-52 clearly responded to all issues documented by Panel 7 in opposing the original proposal, Proposal 7-145.

In addition, the fire data prepared by the NFPA Fire Research Division clearly indicates that fixed wiring in concealed spaces in apartment occupancies is not a statistically significant source of fire ignition, accounting for less than 0.5-percent of all apartment fires. Supplemental data submitted during the comment stage further refined the initial statistical report based on sprinklered buildings, and indicated that nationally, there have been an annual average of only 28 fires in sprinklered apartments attributed to fixed electrical wiring in concealed spaces. These fires caused an average of zero deaths, three injuries, and $500,000 in damage per year, and the figures represent all wiring methods, not just NM cable.

NUTT: See my explanation of negavite vote on Comment 7-27.

PROPST: I do not support the panel's belief that a rigorous fact finding report related to the application of NM cable is mandatory for the acceptance of NM cable use in multifamily dwellings. We should not be focusing only on whether or not NM wiring methods are as good as, better, or worse than other wiring methods, but rather on whether or not the wiring method will meet or exceed acceptable safety risks when used in multifamily dwellings. The panel seems to be in agreement that the use of NM cable meets acceptable safety risks when used in residential applications. It was pointed out in the panel discussion that the probability of failure is not a function of height. However, the consequences of failure can be height and occupancy related. In order to maintain the same level of risk in multifamily dwellings that we already have accepted for single family residential units, we then need to only demonstrate that the increase in consequences when using NM cable for applications above 3 floors and multifamily dwellings is equally offset by providing additional safeguards to reduce either the consequences or the probability of failure. During the panel discussion, I believe that Mr. Klein's comments and data clearly showed that several of the seven proposed requirements alone, could provide these additional safeguards. When the risk reduction of all seven are considered together, I believe the risk of using NM cable in multifamily dwellings was shown to be far less than the currently accepted risk for using NM cable in single family residences.

COMMENT ON AFFIRMATIVE:

SCHUMACHER: This comment should be rejected. The work of the task group on NM cable shows that this cable has not been tested to the extent of the cables that are approved for over three floor construction. Although safe in wood frame construction, this cable cannot withstand the rigors placed on it during the construction of buildings that are built of other materials.

(Log #1921)

7- 53 - (336-5): Accept
SUBMITTER: Michael I. Callanan, International Brotherhood of Electrical Workers
COMMENT ON PROPOSAL NO: 7-145
RECOMMENDATION: Continue to Reject this proposal.
SUBSTANTIATION: The use of NM Cable in buildings or structures over 3 stories should be rejected.
NM Cable is not specifically evaluated and listed for use in the proposed expanded applications.

The substantiation submitted to expand the use is inadequate. We agree with the panel's rejection.

This comment represents the official position of the International Brotherhood of Electrical Workers Codes & Standards Committee.

PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NEGATIVE: 3
EXPLANATION OF NEGATIVE:

NICKSON: Comment should be rejected. ROP 7-145 should be accepted as modified in Comment 7-52. See NMHC Explanation of Negative vote on Comment 7-52.

NUTT: See my explanation of negavite vote on Comment 7-27.

PROPST: See my explanation of negative vote on Comment 7-27.

(Log #1964)

7- 54 - (336-5): Accept
SUBMITTER: Phil Simmons, Simmons Electrical Services
COMMENT ON PROPOSAL NO: 7-145
RECOMMENDATION: Continue to reject the proposal.
SUBSTANTIATION: The proposed exception is faulty as it would permit Type NM, NMC and NMS cables in any building of any type and height so long as it has a multifamily dwelling exceeding three floors above grade. The submitter did not provide adequate substantiation for such a proposal.

The submitter states that "there is no unique fire hazard associated with NM wiring when compared to other code recognized wiring methods." This is not a correct statement. Type NM cable is unique when compared to other code recognized wiring methods. Type NM cable readily ignites and propagates flame. Metallic wiring methods such as Type AC and MC cables do not. The fire performance difference between Type NM and armored cable products is dramatic with the armored cable products being significantly better.

Type NM cable must only meet the UL Vertical Flame test. It is the least severe flame test for any cable that is listed by UL. The test involves a single 18 inch length of NM cable that is subjected to a 5-inch flame from a 3/8-inch diameter Bunsen type burner (about the size of your little finger). The heat from the flame is 1,700 BTU/hr. The flame applied to the cable is 15 seconds on

and 15 seconds off five times for a total exposure to the fame of 1 minute 15 seconds. The cable is permitted to flame for 60 seconds after the test flame is removed.

CMX communications cable is a power-limited communications cable that is closest to NM cable (a power cable) in fire characteristics. Even CMX cable must meet the UL Vertical Wire flame test. CMX must also either (1) be installed in raceway, (2) be installed in nonconcealed spaces and be no longer than 10 ft. long, (3) be less than 0.25 in. in diameter where installed in one or two family dwellings, or (4) be less than 0.25 in. and installed only in nonconcealed spaces of multifamily dwellings.

MC and AC armored cables meet ULs Vertical Tray Flame Propagation and Smoke Release test. The test involves up to 10 cables, eight feet long, installed vertically. The cables are subject to a 13 - 7/16-inch wide burner flame with a heat of 70,000 BTU/hr. The flame is applied to the cable for 20 minutes. In addition to the flame test, Types MC and AC armored cables meet the smoke release requirements of 0.95m2 total smoke release and 0.25m2/s peak smoke release so that the cables are permitted to be marked as "Limited Smoke."

	NM	MC and AC
No. of cables	1	10
Length of cable	18 incles	8 feet
Burner Size	3/8 inch diameter	13-7/16 inch
Heat rate of flame	1,700 BTU/hr.	70,000 BTU/hr.
Time of flame exposure	1 minute 15 seconds	20 minutes
Limtied Smoke rating	None	“LS” rated
Tensile strength	1500 psi	38-40,000 psi

Type NM and armored cable products each contain the same type of insulted conductors. This, however, is where the similarity ends. If the wiring methods were equal, there would be no need for an outer covering over the insulated conductors. The outer covering is what distinguishes the cables, and their appropriate use.

Type NM cable is constructed with a combination outer covering of 0.020-inch of flexible PVC and 0/.010 inch of paper. As an illustration, a 0.020-inch thickness of flexible PVC is the thickness of 6 pages from the Report on Proposals. The physical property of the flexible PVC is 1500 psi tensile strength. The physical properties of the paper are not specified.

Armored cables are constructed with outer coverings of steel and aluminum ranging from 0.012 inch to 0.025 inch in thickness with the physical property of 38,000 psi tensile strength for aluminum and 40,000 psi tensile strength for steel.

PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NEGATIVE: 3
EXPLANATION OF NEGATIVE:
NICKSON: Comment should be rejected. ROP 7-145 should be accepted as modified in Comment 7-52. See NMHC Explanation of Negative vote on Comment 7-52.
NUTT: See my explanation of negavite vote on Comment 7-27.
PROPST: See my explanation of negative vote on Comment 7-27.

(Log #2091)

7- 55 - (336-5): Accept
SUBMITTER: Frank Ricketti, Deerfield Beach, FL
COMMENT ON PROPOSAL NO: 7-145
RECOMMENDATION: Continue to reject the proposal.
SUBSTANTIATION: The proposal would replace conduit and metal jacketed cables in buildings above three floors with NM cable which is a fragile wiring method by comparison. It is evident that the incidents and severity of fires in buildings will increase and not decrease as a result of this proposal based on the physical and fire performance differences between the wiring methods. The substantiation for the proposal seems to indicate that the submitter believes that a certain amount of fires is acceptable. The goal should be safer buildings not an acceptable level of fire safety.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NEGATIVE: 3
EXPLANATION OF NEGATIVE:
NICKSON: Comment should be rejected. ROP 7-145 should be accepted as modified in Comment 7-52. See NMHC Explanation of Negative vote on Comment 7-52.
NUTT: See my explanation of negavite vote on Comment 7-27.
PROPST: See my explanation of negative vote on Comment 7-27.

(Log #2127)

7- 56 - (336-5): Accept
SUBMITTER: James C. Dollins, AFC Cable Systems
COMMENT ON PROPOSAL NO: 7-145
RECOMMENDATION: Continue to reject the proposal.
SUBSTANTIATION: The manufacturers of type NM cable are the best judges of how and where NM cable should be used. By a unanimous vote the Building Wire Technical Committee of NEMA developed a position that the current uses of NM should not be expanded. The position was based on the lack of technical justification for expanding the scope of permitted uses beyond those currently permitted by the NEC. The NEMA Building Wire Section includes all major manufacturers of NM.

It should also be pointed out that during the 25 plus years that the three-story rule has been in the NEC, not once has a manufacturer of NM submitted a proposal to the NEC to remove or modify the current requirement. The manufacturers of NM know the product best in terms of how the cable is designed, constructed, and tested. The product does have its limitations and manufacturers are acting in a safe and responsible manner in not supporting the expanded use.

The vocal and open lack of support by the manufacturers to expand the use of NM should serve as a strong recommendation to those who would use the product in an application for which it is not suitably designed.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NEGATIVE: 3
EXPLANATION OF NEGATIVE:
NICKSON: Comment should be rejected. ROP 7-145 should be accepted as modified in Comment 7-52. See NMHC Explanation of Negative vote on Comment 7-52.
NUTT: See my explanation of negavite vote on Comment 7-27.
PROPST: See my explanation of negative vote on Comment 7-27.

(Log #2294)

7- 57 - (336-5): Accept
SUBMITTER: James C. Dollins, AFC Cable Systems
COMMENT ON PROPOSAL NO: 7-145
RECOMMENDATION: Continue to reject the proposal.
SUBSTANTIATION: The Manufacturers of Type NM cable are the best judges of how and where NM cable should be used. By a unanimous vote the Building Wire Technical Committee of NEMA developed a position that the current uses of NM should not be expanded. The position was based on the lack of technical justification for expanding the scope of permitted uses beyond those currently permitted by the NEC. The NEMA Building Wire Section includes all major manufacturers of NM.

It should also be pointed out that during the 25 plus years that the three-story rule has been in the NEC, not once has a manufacturer of NM submitted a proposal to the NEC to remove or modify the current requirement. The manufacturers of NM know the product best in terms of how the cable is designed, constructed, and tested. The product does have its limitations and manufacturers are acting in a safe and responsible manner in not supporting the expanded use.

The vocal and open lack of support by the manufacturers to expand the use of NM should serve as a strong recommendation to those who would use the product in an application for which it is not suitably designed.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NEGATIVE: 3
EXPLANATION OF NEGATIVE:
NICKSON: Comment should be rejected. ROP 7-145 should be accepted as modified in Comment 7-52. See NMHC Explanation of Negative vote on Comment 7-52.

NUTT: See my explanation of negavite vote on Comment 7-27.
PROPST: See my explanation of negative vote on Comment 7-27.

(Log #2382)

7- 58 - (336-5): Accept
SUBMITTER: Toxicity Technical Advisory Committee
COMMENT ON PROPOSAL NO: 7-145
RECOMMENDATION: See TTAC recommendation on Comment 7-47 (Log 2381).
SUBSTANTIATION: Summary of Proposal: The use of NM cable would be expanded to buildings taller than three stories if installed behind a 15-minute finish rated barrier.
Toxicity Issues: Please see toxicity issues identified in comment 7-47 (log 2381).
General Statements: Please see general statements of the substantiation submitted with Comment 7-45 (Log #2379).
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NEGATIVE: 2
EXPLANATION OF NEGATIVE:
NICKSON: Comment should be rejected. ROP 7-145 should be accepted as modified in Comment 7-52. See NMHC Explanation of Negative vote on Comment 7-52.
SCHUMACHER: See my explanation of negative vote on Comment 7-45.

(Log #641)

7- 59 - (336-5(a)): Accept
SUBMITTER: James M. Daly, BICC General
COMMENT ON PROPOSAL NO: 7-147
RECOMMENDATION: Continue to reject this proposal.
SUBSTANTIATION: This proposal should continue to be rejected as supported by the Panel Statement regarding Massachusetts and Michigan. Refer to my Comments on Proposals 7-137 and 7-145. In addition, it is noted that the NFPA Annual Meeting floor vote in Cincinnati in expanding the use of Type NM cable in 1998 was to reject all four amendments. Over the years, justification has been submitted and evaluated by Code-Making Panel 7, some of which is documented in Appendix A of the 1986 Technical Committee Documentation (TCD) for the NEC. The submitter has no justification for contending that NEC rules have been based on business issues and bottom lines rather than safety.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NEGATIVE: 3
EXPLANATION OF NEGATIVE:
NICKSON: Comment should be rejected. ROP 7-147 should be Accepted in Principle. See NMHC Explanation of Negative vote on Comment 7-52.
NUTT: See my explanation of negavite vote on Comment 7-27.
PROPST: See my explanation of negative vote on Comment 7-27.

(Log #900)

7- 60 - (336-5(a)): Reject
SUBMITTER: Art Cummins, City of Decatur
COMMENT ON PROPOSAL NO: 7-144
RECOMMENDATION: Add sentence number 10 to read:
In complete raceway system.
SUBSTANTIATION: Many homeowners and unqualified people install cable inside raceways ,usually 1 conduit length at a time, damaging the cable plus making it impossible to install new conductors at a later time. Types NM, NMC, and NMS cables should not be allowed to be installed in raceways in place of Type TW, THHN, etc. cables.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel is unclear on the intent of the comment.
Installation in a raceway is a permitted use for Type NM Cable. Improper installation of a raceway can be equally damaging to other recognized conductor types identified in the substantiation.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #1808)

7- 61 - (336-5(a)): Accept
SUBMITTER: Tim Andrassy, Steel Tube Inst.
COMMENT ON PROPOSAL NO: 7-147
RECOMMENDATION: Continue to reject this proposal.
SUBSTANTIATION: This proposal would permit N/M Cable in practically every application except hazardous locations, some places of assembly, and patient care areas, without justification. The fact that Michigan and Massachusetts do not have a 3 story rule does not prove that NM cable is actually used in all of these buildings. Acceptance of this proposal will lower the bar on combustibles in buildings over 3 stories. SEE COMMENT AND DATA PROVIDED FOR proposal 7-145. The International Residential Building Code stops at three stories. Doesn't that say a lot about extra protection necessary above that level? If N/M cable, with its known fire hazards of ignition, flammability, and prolific smoke, can be run throughout buildings, what is next? Even if one assumes that the use of N/M cable will not be extensive or that local jurisdictions will continue to make amendments if the NEC expands the use of N/M cable, the precedent will be used to add more and more combustibles to the buildings in which we live and work. We see that each cycle in the NEC and the building codes. Redundant panels must concern themselves with addressing and maintaining building safety that could be compromised by the electrical system. Other groups are responsible for different fire safety concerns. A hazard in noncombustible buildings that has not been addressed is corrosion of the structural elements in the event of an N/M fire in a concealed space. This may not be a dangerous fire for people, but could mean that the building framework would not even be examined and cleaned. Corrosive products of combustion have not received the attention they deserve, and should be of particular concern in high-rise buildings such as would be permitted by this proposal. Refusal to expand the permitted use of N/M cable by ever-changing Code Panel 7, the NFPA floor vote, and the building codes says a lot about personal knowledge and experience. The International Electrical Code (ICC Codes) did vote for 4 stories this Fall, but we would caution that the attic spaces and other concealed spaces of 4 story buildings will not require sprinklers. Again, the primary concern is fires in concealed spaces, and we are not sure that point was clear.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NEGATIVE: 3
EXPLANATION OF NEGATIVE:
NICKSON: Comment should be rejected. ROP 7-147 should be Accepted In Principle. See NMHC Explanation of Negative vote on Comment 7-52.
NUTT: See my explanation of negavite vote on Comment 7-27.
PROPST: See my explanation of negative vote on Comment 7-27.

(Log #2383)

7- 62 - (336-5(a)): Accept
SUBMITTER: Toxicity Technical Advisory Committee
COMMENT ON PROPOSAL NO: 7-147
RECOMMENDATION: See TTAC recommendation on Comment 7-46 (Log 2380).
SUBSTANTIATION: Summary of Proposal: The use of NM cable would be expanded to permit the concealed and exposed installation with no fire barrier or other protection in buildings over three stories in height.
Toxicity Issues: Please see toxicity issues identified in comment 7-46 (log 2380).
General Statements: Please see general statements of the substantiation submitted with Comment 7-45 (Log #2379).
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
SCHUMACHER: See my explanation of negative vote on Comment 7-45.

(Log #642)

7- 63 - (336-5(a)(1)): Accept
SUBMITTER: James M. Daly, BICC General
COMMENT ON PROPOSAL NO: 7-148
RECOMMENDATION: Continue to reject this proposal.
SUBSTANTIATION: This proposal should continue to be rejected as supported by the Panel Statement regarding Michigan. The submitter did not provide the studies that are referenced in the substantiation. Refer to my Comments on Proposals 7-137 and 7-145.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NEGATIVE: 3
EXPLANATION OF NEGATIVE:
NICKSON: Comment should be rejected. ROP 7-148 should be Accepted In Principle. See NMHC Explanation of Negative vote on Comment 7-52.
NUTT: See my explanation of negavite vote on Comment 7-27.
PROPST: See my explanation of negative vote on Comment 7-27.

(Log #643)

7- 64 - (336-5(a)(1)): Accept
SUBMITTER: James M. Daly, BICC General
COMMENT ON PROPOSAL NO: 7-149
RECOMMENDATION: Continue to reject this proposal.
SUBSTANTIATION: The submitter did not provide any technical substantiation for the proposal. Refer to my Comments on Proposals 7-137 and 7-145. In response to the statement in the submitter's substantiation, the history of justification for Article 336 appears in Appendix A of the 1986 Technical Committee Documentation (TCD). Since that time, Code-Making Panel 7 has continued to review documentation each code cycle.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NEGATIVE: 3
EXPLANATION OF NEGATIVE:
NICKSON: Comment should be rejected. ROP 7-149 should be Accepted In Principle. See NMHC Explanation of Negative vote on Comment 7-52.
NUTT: See my explanation of negavite vote on Comment 7-27.
PROPST: See my explanation of negative vote on Comment 7-27.

(Log #1811)

7- 65 - (336-5(a)(1)): Accept
SUBMITTER: Tim Andrassy, Steel Tube Inst.
COMMENT ON PROPOSAL NO: 7-148
RECOMMENDATION: Continue to reject this proposal.
SUBSTANTIATION: See comment on 7-145.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NEGATIVE: 3
EXPLANATION OF NEGATIVE:
NICKSON: Comment should be rejected. ROP 7-148 should be Accepted In Principle. See NMHC Explanation of Negative vote on Comment 7-52.
NUTT: See my explanation of negavite vote on Comment 7-27.
PROPST: See my explanation of negative vote on Comment 7-27.

(Log #1834)

7- 66 - (336-5(a)(1)): Accept
SUBMITTER: Patricia Horton, Elaine Thompson, Allied Tube & Conduit
COMMENT ON PROPOSAL NO: 7-149
RECOMMENDATION: Continue to reject this proposal.
SUBSTANTIATION: It is not true that the 3-story rule is unsubstantiated. In the 1987 TCD (now called ROC) the NFPA Legal Counsel prepared a recap of the 3-story rule for the Technical Correlating Committee due to accusations of this nature. This was called Appendix A of that TCD. Since that time additional data supporting this rule has continued to be supplied for the Code-Making Panel. The proponent states: "Acceptance of this proposal will restore credibility to our NFPA consensus process." We believe just the opposite will happen. This rule has been evaluated thoroughly for over 25 years with the same results. This cycle even more data has been supplied to NFPA. In addition to the Code panel, a special 3-story Task Group has spent ten days reviewing materials submitted by both proponents and opponents of expanded use of NM Cable. This has served to reinforce that expansion of the current product would reduce the safety provided by the current Article 336. If anything, this review has served to show that perhaps additional installation requirements should be implemented. With no information to support expanded use, acceptance of this proposal would serve to discredit the work of Code-Making Panel 7 and the NFPA membership voting at the annual meeting for 25 years. This proposal would permit use of N/M Cable in buildings of any height and almost any occupancy. This is certainly not justified.
Note: Supporting material available for review upon request at NFPA headquarters.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NEGATIVE: 3
EXPLANATION OF NEGATIVE:
NICKSON: Comment should be rejected. ROP 7-149 should be Accepted In Principle. See NMHC Explanation of Negative vote on Comment 7-52.
NUTT: See my explanation of negavite vote on Comment 7-27.
PROPST: See my explanation of negative vote on Comment 7-27.

(Log #1965)

7- 67 - (336-5(a)(1)): Accept
SUBMITTER: Phil Simmons, Simmons Electrical Services
COMMENT ON PROPOSAL NO: 7-148
RECOMMENDATION: Continue to reject the proposal.
SUBSTANTIATION: See my comments on Proposals 7-135 and 7-145.
Also, we agree with the Panel's Statement that the proposal was not properly substantiated.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NEGATIVE: 3
EXPLANATION OF NEGATIVE:
NICKSON: Comment should be rejected. ROP 7-148 should be Accepted in Principle. See NMHC Explanation of Negative vote on Comment 7-52.
NUTT: See my explanation of negavite vote on Comment 7-27.
PROPST: See my explanation of negative vote on Comment 7-27.

(Log #1968)

7- 68 - (336-5(a)(1)): Accept
SUBMITTER: Phil Simmons, Simmons Electrical Services
COMMENT ON PROPOSAL NO: 7-149
RECOMMENDATION: Continue to reject the proposal.
SUBSTANTIATION: See my comments on Proposals 7-135 and 7-145.
Also, we agree with the Panel's Statement that the proposal was not properly substantiated.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NEGATIVE: 3
EXPLANATION OF NEGATIVE:
NICKSON: Comment should be rejected. ROP 7-149 should be Accepted in Principle. See NMHC Explanation of Negative vote on Comment 7-52.
NUTT: See my explanation of negavite vote on Comment 7-27.
PROPST: See my explanation of negative vote on Comment 7-27.

(Log #2217)

7- 69 - (336-5(a)(1)): Reject
SUBMITTER: Robert H. Keis, Dover, DE
COMMENT ON PROPOSAL NO: 7-149
RECOMMENDATION: This proposal should be accepted.
SUBSTANTIATION: I agree with Mr. Cartal's substantiation. There was never any valid substantiation given for this restriction in the first place.
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter has not provided any new substantiation. See panel action on Comment 7-48.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NEGATIVE: 3
EXPLANATION OF NEGATIVE:
NICKSON: Comment should be rejected. ROP 7-149 should be Accepted in Principle. See NMHC Explanation of Negative vote on Comment 7-52.
NUTT: See my explanation of negavite vote on Comment 7-27.
PROPST: See my explanation of negative vote on Comment 7-27.

(Log #2369)

7- 70 - (336-5(a)(1)): Reject
SUBMITTER: Andre R. Cartal, Princeton Borough Building Dept.
COMMENT ON PROPOSAL NO: 7-149
RECOMMENDATION: Please reconsider the proposal.
SUBSTANTIATION: Some members of Panel 7 may have a company directed economic incentive to continue the limitations on the use of NM cable and that is understandable although I do not think that should be part of a code process. What I do not understand is the identical "lock step" position taken by panel members representing national organizations. The absence of any individual comments from these panel members has to be a source of concern to those of us that believe in the true consensus process.
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter has not provided any new substantiation. See panel action on Comment 7-48.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NEGATIVE: 2
EXPLANATION OF NEGATIVE:
NICKSON: Comment should be rejected. ROP 7-149 should be Accepted in Principle. See NMHC Explanation of Negative vote on Comment 7-52.
NUTT: See my explanation of negavite vote on Comment 7-27.

(Log #2384)

7- 71 - (336-5(a)(1)): Accept
SUBMITTER: Toxicity Technical Advisory Committee
COMMENT ON PROPOSAL NO: 7-148
RECOMMENDATION: See TTAC recommendation on Commnet 7-46 (Log 2380).
SUBSTANTIATION: Summary of Proposal: The use of NM cable would be expanded to permit the concealed and exposed installation with no fire barrier or other protection in buildings over three stories in height.
Toxicity Issues: Please see toxicity issues identified in comment 7-46 (log 2380).
General Statements: Please see general statements of the substantiation submitted with Comment 7-45 (Log #2379).
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NEGATIVE: 3
EXPLANATION OF NEGATIVE:
NICKSON: Comment should be rejected. ROP 7-148 should be Accepted in Principle. See NMHC Explanation of Negative vote on Comment 7-52.
PROPST: See my explanation of negative vote on Comment 7-27.
SCHUMACHER: See my explanation of negative vote on Comment 7-45.

(Log #2385)

7- 72 - (336-5(a)(1)): Accept
SUBMITTER: Toxicity Technical Advisory Committee
COMMENT ON PROPOSAL NO: 7-149
RECOMMENDATION: See TTAC recommendation on Commnet 7-46 (Log 2380).
SUBSTANTIATION: Summary of Proposal: The use of NM cable would be expanded to permit the concealed and exposed installation with no fire barrier or other protection in buildings over three stories in height.
Toxicity Issues: Please see toxicity issues identified in comment 7-46 (Log 2380).
General Statements: Please see general statements of the substantiation submitted with Comment 7-45 (Log #2379).
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NEGATIVE: 2
EXPLANATION OF NEGATIVE:
NICKSON: Comment should be rejected. ROP 7-149 should be Accepted in Principle. See NMHC Explanation of Negative vote on Comment 7-52.
SCHUMACHER: See my explanation of negative vote on Comment 7-45.

(Log #644)

7- 73 - (336-5(a)(1), Exception): Accept
SUBMITTER: James M. Daly, BICC General
COMMENT ON PROPOSAL NO: 7-150
RECOMMENDATION: Continue to reject this proposal.
SUBSTANTIATION: This proposal should continue to be rejected as supported by the Panel Statement. The submitter did not provide any technical substantiation for the proposal. Refer to my Comments on Proposals 7-137 and 7-145.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NEGATIVE: 3
EXPLANATION OF NEGATIVE:
NICKSON: Comment should be rejected. ROP 7-150 should be Accepted in Principle. See NMHC Explanation of Negative vote on Comment 7-52.
NUTT: See my explanation of negavite vote on Comment 7-27.
PROPST: See my explanation of negative vote on Comment 7-27.

(Log #645)

7- 74 - (336-5(a)(1), Exception): Accept
SUBMITTER: James M. Daly, BICC General
COMMENT ON PROPOSAL NO: 7-151
RECOMMENDATION: Continue to reject this proposal.
SUBSTANTIATION: The submitter did not provide any technical substantiation for the proposal. Refer to my Comments on Proposals 7-137 and 7-145.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NEGATIVE: 3
EXPLANATION OF NEGATIVE:
NICKSON: Comment should be rejected. ROP 7-151 should be Accepted in Principle. See NMHC Explanation of Negative vote on Comment 7-52.
NUTT: See my explanation of negavite vote on Comment 7-27.
PROPST: See my explanation of negative vote on Comment 7-27.

(Log #991)

7- 75 - (336-5(a)(1), Exception (New)): Reject
SUBMITTER: John Mangan, Medford, MA
COMMENT ON PROPOSAL NO: 7-150
RECOMMENDATION: Add text to read as follows:
Exception: Type NM, type NMC, and type NMS cables shall be permitted to be used in one and two family dwellings, multi-family dwellings and other structures provided that where such dwellings or structures exceed three floors above grade type NM and NMC

cables shall not be permitted to leave the floor or dwelling unit from which the cables originated.
SUBSTANTIATION: 336-2 Definition requires the outer sheath to be moisture-resistant, flame retardant and nonmetallic. The Commonwealth of Massachusetts has allowed this exception since 1975. This restriction on nonmetallic cable was voted on at a general meeting without input from the panel and changed NFPA rules on proposed changes to the NEC.
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter has not provided any new substantiation. See panel action on Comment 7-48.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NEGATIVE: 2
EXPLANATION OF NEGATIVE:
NICKSON: Comment should be rejected. ROP 7-150 should be Accepted in Principle. See NMHC Explanation of Negative vote on Comment 7-52.
NUTT: See my explanation of negavite vote on Comment 7-27.

(Log #1809)

7- 76 - (336-5(a)(1), Exception (New)): Accept
SUBMITTER: Tim Andrassy, Steel Tube Inst.
COMMENT ON PROPOSAL NO: 7-151
RECOMMENDATION: Continue to reject this proposal.
SUBSTANTIATION: See comment on 7-145. The concept of not permitting N/M cable to leave the floor on which it originates is a good one and critical should the use of N/M cable be expanded. However, this proposal would permit unlimited use of N/M cable (except for a few prohibitions elsewhere in the Code) and that is not justified.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NEGATIVE: 3
EXPLANATION OF NEGATIVE:
NICKSON: Comment should be rejected. ROP 7-151 should be Accepted in Principle. See NMHC Explanation of Negative vote on Comment 7-52.
NUTT: See my explanation of negavite vote on Comment 7-27.
PROPST: See my explanation of negative vote on Comment 7-27.

(Log #1812)

7- 77 - (336-5(a)(1), Exception (New)): Accept
SUBMITTER: Tim Andrassy, Steel Tube Inst.
COMMENT ON PROPOSAL NO: 7-150
RECOMMENDATION: Continue to reject this proposal.
SUBSTANTIATION: See comment on 7-145. The concept of not permitting N/M cable to leave the floor on which it originates is a good one and critical should the use of N/M cable be expanded. However, this proposal would permit unlimited use of N/M cable (except for a few prohibitions elsewhere in the Code) and that is not justified.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NEGATIVE: 3
EXPLANATION OF NEGATIVE:
NICKSON: Comment should be rejected. ROP 7-150 should be Accepted in Principle. See NMHC Explanation of Negative vote on Comment 7-52.
NUTT: See my explanation of negavite vote on Comment 7-27.
PROPST: See my explanation of negative vote on Comment 7-27.

(Log #1966)

7- 78 - (336-5(a)(1), Exception): Accept
SUBMITTER: Phil Simmons, Simmons Electrical Services
COMMENT ON PROPOSAL NO: 7-150
RECOMMENDATION: Continue to reject the proposal.
SUBSTANTIATION: See my comments on Proposals 7-135 and 7-145.
Also, we agree with the Panel's Statement that the proposal was not properly substantiated.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NEGATIVE: 3
EXPLANATION OF NEGATIVE:
NICKSON: Comment should be rejected. ROP 7-150 should be Accepted in Principle. See NMHC Explanation of Negative vote on Comment 7-52.
NUTT: See my explanation of negavite vote on Comment 7-27.
PROPST: See my explanation of negative vote on Comment 7-27.

(Log #1967)

7- 79 - (336-5(a)(1), Exception): Accept
SUBMITTER: Phil Simmons, Simmons Electrical Services
COMMENT ON PROPOSAL NO: 7-151
RECOMMENDATION: Continue to reject the proposal.
SUBSTANTIATION: See my comments on Proposals 7-135 and 7-145.
Also, we agree with the Panel's Statement that the proposal was not properly substantiated.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NEGATIVE: 3
EXPLANATION OF NEGATIVE:
NICKSON: Comment should be rejected. ROP 7-151should be Accepted in Principle. See NMHC Explanation of Negative vote on Comment 7-52.
NUTT: See my explanation of negavite vote on Comment 7-27.
PROPST: See my explanation of negative vote on Comment 7-27.

(Log #1998)

7- 80 - (336-5(a)(1), Exception): Reject
SUBMITTER: William F. Laidler, Rep. Massachusetts Electrical Code Advisory Committee
COMMENT ON PROPOSAL NO: 7-151
RECOMMENDATION: The proposal should be accepted.
SUBSTANTIATION: As stated in our original proposal, Massachusetts approaches thirty years of experience allowing this type of use and if there had been any concerns of safety it surely would have surfaced by now. The cable is widely used in buildings above three stories in urban areas of the state. In fact, when the NFPA Standards Council met at the Sonesta Hotel in Cambridge to take final action on the 1999 NEC in July of 1998, they were meeting in a high rise building wired with Type NM cable. It is simply not true that the Massachusetts experience is limited, as has been asserted, by design choices that make the use of the product rare, however allowable, in such buildings. The Committee is continuing to gather statistics about the use of this product in such occupancies, and hopes to have more complete information by the December meetings.
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter has not provided any new substantiation. See panel action on Comment 7-48.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NEGATIVE: 2
EXPLANATION OF NEGATIVE:
NICKSON: Comment should be rejected. ROP 7-151 should be Accepted in Principle. See NMHC Explanation of Negative vote on Comment 7-52.
NUTT: See my explanation of negavite vote on Comment 7-27.

(Log #2386)

7- 81 - (336-5(a)(1), Exception (New)): Accept
SUBMITTER: Toxicity Technical Advisory Committee
COMMENT ON PROPOSAL NO: 7-151
RECOMMENDATION: The potential for C/D cable to transfer the fire from one compartment to another is an issue of general fire hazard, not toxic hazard in particular.
SUBSTANTIATION: Summary of Proposal: The use of NM cable would be expanded to permit the concealed and exposed installation with no fire barrier or other protection in buildings over three stories in height provided that the cables do not pass between floors or dwelling units.

General Statements: Please see general statements in the substantiation submitted with Comment 7-45 (Log #2379).
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NEGATIVE: 2
EXPLANATION OF NEGATIVE:
NICKSON: Comment should be rejected. ROP 7-151 should be Accepted in Principle. See NMHC Explanation of Negative vote on Comment 7-52.
SCHUMACHER: See my explanation of negative vote on Comment 7-45.

(Log #1874)

7- 82 - (336-6(f)): Accept in Principle
Note: The Technical Correlating Committee understands that the panel action on Comment 7-82a is the final action on the issue by placing the appropriate text in 336.17. There will not be a separate 336.6(F) in the 2002 NEC.
SUBMITTER: David G. Foreman, The Foreman's Inc.
COMMENT ON PROPOSAL NO: 7-158
RECOMMENDATION: Revise text to read as follows:
(f) Grommets in Metal Studs. Grommets shall be used in metal studs as required in 300-4(b)(1) shall remain in place during the wall finishing process and shall be listed for the purpose of cable protection.
Deleted text: , shall cover the complete opening,
SUBSTANTIATION: Although well-intentioned, the proposal that grommets cover the complete opening mandates that all penetrations through metal studs be either drilled or punched. Two-piece, snap-together grommets which are designed to protect cables running through pre-punched factory openings in studs (and which by design will not come out of these holes) are perfectly suited for use with metal studs from all manufacturers. All "shall cover the complete opening" does is to increase the cost of every job where metal studs are employed.
PANEL ACTION: Accept in Principle.
Revise recommended text to read:
Grommets in Metal Studs. Grommets shall be used in metal studs as required in 300-4(b)(1), shall remain in place and shall be listed for the purpose of cable protection.
PANEL STATEMENT: The panel understands this panel action requires that the listing process for grommets will address the evaluation of specific designs for their capability to provide required protection to the cables passing through the openings in the metal studs. The panel action also eliminates the wording "during the wall finishing process", as the listing process should address the capability of the gromments to remain in place.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #CC704)

7- 82a - (336-17): Accept
Note: The Technical Correlating Committee directs that the second sentence of the Recommendation be revised to read as follows: "Grommets used as required in 300.4(B)(1) shall remain in place and be listed for the purpose of cable protection." This action complies with 3.3.4 of the NEC Style Manual.
SUBMITTER: CMP 7
COMMENT ON PROPOSAL NO: 7-128a
RECOMMENDATION: Revise 336-17 to read:
336-17. Through or Parallel to Framing Members. Types NM, NMC, or NMS cable shall be protected in accordance with 300-4 where installed through or parallel to framing members. Grommets shall be used in metal studs as required in 300-4(b)(1), shall remain in place and shall be listed for the purpose of cable protection.
SUBSTANTIATION: The panel has revised this section to be consistent with corresponding sections in Articles 330, 333 and 334. The language on the use of grommets reflects the panel action on Comment 7-82.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #1999)

7- 83 - (336-18): Reject
SUBMITTER: William F. Laidler, Rep. Massachusetts Electrical Code Advisory Committee
COMMENT ON PROPOSAL NO: 7-164
RECOMMENDATION: The proposal should be accepted.
SUBSTANTIATION: For no significant cost, extra protection is afforded by the insulated staple. If an uninsulated staple is struck too hard it will damage the cable, especially if the staple has sharp edges.
PANEL ACTION: Reject.
PANEL STATEMENT: Present code requirements do not prohibit the use of insulated staples. The recommendation to prohibit the use of uninsulated staples lacks technical substantiation.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #2216)

7- 84 - (336-18): Accept
SUBMITTER: Robert H. Keis, Dover, DE
COMMENT ON PROPOSAL NO: 7-164
RECOMMENDATION: This proposal should remain "rejected."
SUBSTANTIATION: Mr. Hartwell made the comment that it is difficult to control the force on a hammer. This is true, but good workmanship would require knowing how to use a hammer. Just because the staple is insulated will not prevent damage to the insulation itself. If it is over driven, the damage will most likely be to the insulation between conductors, not to the staple. I have seen a lot more fires caused by arcing between conductors through damaged insulation, than I have from arcing to the staple. The insulated staples that I have seen are made for two-conductor flat cable and will will not properly seat against 3-conductor. Or must electricians now carry two kinds of staples. I am curious how the State of Massachusetts can tell that insulated staples have prevented fires. How do you derive statistics on fires that don't happen? Maybe electricians just finally learned how to use a hammer.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #376)

7- 85 - (336-18 Exception No. 3): Accept in Principle
SUBMITTER: Dan Leaf, Palmdale, CA
COMMENT ON PROPOSAL NO: 7-169
RECOMMENDATION: Accept in principle revised: Delete present wording and substitute the following: Exception No. 3: The support interval from terminations at luminaires or equipment in or on suspended ceilings shall be permitted to be increased where all the following conditions are met: (1) structural members (including support wires or rods and ceiling grid members where permitted to be used) do not permit the support interval required by this section; (2) the nearest readily available support member is used; (3) the support interval does not exceed 1.4 m (4 1/2 ft); and (4) the cable is above the suspended ceiling.
SUBSTANTIATION: The broad exemption of support within 12 in. is not warranted where structural support above a suspended ceiling is less than 4 1/2 ft. above or where support wires, rods, or ceiling grids not prohibited for support are available at intervals less than 4 1/2 ft. The 4 1/2 ft. maximum should apply only where no closer support is available. The proposal would address some concern of Mr. Trainor in that runs between fixtures would require fastening at some interval less than 4 1/2 ft. where the building structure or ceiling assembly would permit.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action on Comment 7-87a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #1830)

7- 86 - (336-26): Reject
SUBMITTER: Patricia Horton, Elaine Thompson, Allied Tube & Conduit
COMMENT ON PROPOSAL NO: 7-179
RECOMMENDATION: Accept this proposal.
SUBSTANTIATION: The need for a 60°C ampacity derating factor with a 90°C actual insulation on NM Cable was well documented when the 90° requirement went into the 1984 Code. The permission to start derating from 90° is erasing that safety factor. In addition, the Panel should review Proposal 7-190. The summary of the study that led to 90°C insulation for the Panel, is (NBSIR 78-1477). Temperatures reached as high as 298°F on paralleled nonmetallic-sheathed cables carrying, 135 percent of rated current, 27a; for one hour, and located between two layers of R-11 glass fiber insulation simulating a ceiling joist space.
Note: Supporting material available for review upon request at NFPA headquarters.
PANEL ACTION: Reject.
PANEL STATEMENT: There is no new technical substantiation provided to change the requirements specified for the ampacity of Type NM Cable.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NEGATIVE: 2
EXPLANATION OF NEGATIVE:
SCHUMACHER: This comment should be accepted. The outer jacket of Type NM cable is not rated for 90 degrees C, even though the conductors are, when this cable is installed in thermal insulation, or bundles of cables, can cause excessive heat that the outer jacket is not rated for.
STRANIERO: New technical substantiation should not be necessary to correct previous panel actions to permit derating based on 90°C which is contrary to the recommendation of the original study referenced by this comment. The original study referenced by the comment was the basis for requiring a 90°C insulation rating and 60°C ampacity for NM where located in thermal insulation.

(Log #2000)

7- 87 - (336-26): Reject
SUBMITTER: William F. Laidler, Rep. Massachusetts Electrical Code Advisory Committee
COMMENT ON PROPOSAL NO: 7-180
RECOMMENDATION: The proposal should be accepted
SUBSTANTIATION: Effectively 7-177 meets the intent of the proposal, however, the wording (clarity) is inconsistent with 330-20. Also 7-177 does not require that the cable insulation be rated 90° and does not reference 310-15.
PANEL ACTION: Reject.
PANEL STATEMENT: Proposal 7-177 was part of the rewrite effort for Article 336. The panel is not clear about submitter's inference that the panel action on Proposal 7-177 effectively meets the intent of Proposal 7-180. The panel believes that the submitter's reference to Section 330-20 is actually to Section 333-20. The insulation for a conductor used in Type NM Cable is required to be rated 90° C as shown in 336-112.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
STRANIERO: See my explanation of negative on Comments 7-86 and 7-93.

(Log #373)

7- 88 - (336-30): Accept in Principle
SUBMITTER: Dan Leaf, Palmdale, CA
COMMENT ON PROPOSAL NO: 7-128
RECOMMENDATION: Accept in principle, revise last sentence of 336-30: Horizontal runs of cables ~~run through holes in wood or metal joists, rafters, or studs shall be considered to be supported and secured~~ supported by openings in framing members at intervals not exceeding 1.4 m (4 1/2 ft) shall be permitted.
SUBSTANTIATION: Proposal covers necessary provisions where cable is run through framing members, including horizontal requirement, support intervals, and notches (openings). Since this section covers support, the requirement for protecting cables (plates) need not be reiterated as it is covered in 300-4.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action on Comment 7-87a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #CC708)

7- 87a - (336-30): Accept
SUBMITTER: CMP 7
COMMENT ON PROPOSAL NO: 7-128a
RECOMMENDATION: Revise 336-30 to read:
336-30. Securing and Supporting. Nonmetallic-sheathed cable shall be secured by staples, cable ties, straps, hangers, or similar fittings designed and installed so as not to damage the cable at intervals not exceeding 1.4 m (4 1/2 ft) and within 300 mm (12 in.) of every cabinet, box, or fitting. Flat cables shall not be stapled on edge.
(A) Horizontal Runs Through Holes and Notches. In other than vertical runs, cables installed in accordance with 300-4 shall be considered supported and secured where such support does not exceed 1.4 m (4 1/2 ft) intervals and the nonmetallic-sheathed cable is securely fastened in place by an approved means within 300 mm (12 in.) of each box, cabinet, conduit body, or other nonmetallic-sheathed cable termination.
FPN: See 370-17(c) for support where nonmetallic boxes are used.
(B) Unsupported Cables. Nonmetallic-sheathed cable shall be permitted to be unsupported where the cable is
(1) Fished between access points, where concealed in finished buildings or finished panels for prefabricated buildings and supporting is impracticable; or
(2) Not more than 1.4 m (4 1/2 ft) from the last point of support for connections within an accessible ceiling to luminaire(s) [lighting fixture(s)] or equipment.
(C) Wiring Device without a Separate Outlet Box. A wiring device identified for the use, without a separate outlet box, incorporating an integral cable clamp shall be permitted where the cable is secured in place at intervals not exceeding 1.4 m (4 1/2 ft.) and within 300 mm (12 in.) from the wiring device wall opening, and there shall be at least a 300mm (12 in.) loop of unbroken cable or 150 mm (6 in.) of a cable end available on the interior side of the finished wall to permit replacement.
SUBSTANTIATION: The panel has revised this section to be consistent with corresponding sections in Articles 330, 333 and 334.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #1385)

7- 89 - (336-30):
Note: It was the action of the Technical Correlating Committee that this comment be reported as "Accept in Principle" to correlate with the panel action on Comment 7-92.
SUBMITTER: Kari Barrett, American Chemistry Council
COMMENT ON PROPOSAL NO: 7-183
RECOMMENDATION: The American Chemistry Council recommends that proposal 7-183 should have been accepted as proposed.
SUBSTANTIATION: As noted in the negative explanation of Mr. Propst and Mr. Trainor, the risks associated with the use of nonlisted type NM cable is potentially significant whereas the burden for implementation is essentially zero.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel reaffirms its position in the panel statement on Proposal 7-183.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NEGATIVE: 3
EXPLANATION OF NEGATIVE:
GUIDA: This comment should be accepted. The definition of "Listed" in the NEC states that the listing organization is required to be acceptable to the authority having jurisdiction, and that equipment meets identified standards or has been tested and found suitable for a specified purpose. Many other cables and most raceways in the NEC are required to be listed.
The panel statement indicates that company reputation or a supplier's declaration are acceptable alternatives to listing. It should be noted that Code Making Panel 1 has rejected similar proposals due to the potential for inconsistent interpretations by

authorities having jurisdiction. Listing is based on compliance with recognized product safety standards.

As additional information, the Standard for Nonmetallic-Sheathed Cables, UL 719, requires a thorough construction and performance evaluation for all nonmetallic-sheathed cables. Among others, testing includes flammability, dielectric voltage-withstand, unwinding at low temperatures, pulling through joists, conductor pullout, crushing, and abrasion. Nonlisted cables may not have been evaluated for compliance with these requirements, and may not function correctly with listed termination fittings.

PROPST: This proposal should have been accepted in principle with a panel statement that referenced the panel's action on Comment 7-92, which accepted the same concept with editorial changes to relocate it to the appropriate section of the NEC.

SCHUMACHER: This comment should be accepted. Type NM Cable is used by not only trained electricians, but by "home handymen" as well. Listing of this product will raise the standard to where all users will be using a product that has been recognized as safe.

(Log #1813)

7- 90 - (336-30(b)): Reject
SUBMITTER: Tim Andrassy, Steel Tube Inst.
COMMENT ON PROPOSAL NO: 7-191
RECOMMENDATION: If the use of N/M cable is expanded above 3 stories, this proposal should be accepted.
SUBSTANTIATION: Expanded use of N/M Cable requires improvement in its fire characteristics. This is not the ultimate, but would be better than no improvement. "Accept in Principal" with more stringent requirements to make N/M performance equal to that of A/C and M/C cable would be more appropriate.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action on Comment 7-48.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #1832)

7- 91 - (336-30(b)): Reject
SUBMITTER: Patricia Horton, Elaine Thompson, Allied Tube & Conduit
COMMENT ON PROPOSAL NO: 7-190
RECOMMENDATION: Accept this proposal.
SUBSTANTIATION: The proponent has been submitted real life data on problems with NM Cable. He has also offered a solution that has already proven effective in his own jurisdiction. The panel has rejected Proposal 7-179 that would require ampacity derating for NM cable to apply as though the insulation rating is 60°C. This need was well documented when the 90° insulation was required (see Comment on 7-179). Rejection of this proposal will compound the overheating hazard.
PANEL ACTION: Reject.
PANEL STATEMENT: No additional technical substantiation has been provided to support increasing the minimum conductor size for this particular wiring method.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
STRANIERO: Overheating of conductors is an actual problem as reported by the original proposal. The broad brush approach of increasing the conductor size will provide an increased safety factor to account for the long term aging effects of conductors operating in ambient temperatures above 30°C and at ampacity levels resulting in insulated conductor operating temperatures above that for which it is rated.

(Log #1831)

7- 92 - (336-32 (New)): Accept
SUBMITTER: Patricia Horton, Elaine Thompson, Allied Tube & Conduit
COMMENT ON PROPOSAL NO: 7-194
RECOMMENDATION: Accept this proposal.
SUBSTANTIATION: Requiring listing for nonmetallic sheathed cable does not mean that all cables under the jurisdiction of Code-Making Panel 7 would necessarily need to be listed. This particular cable is the subject of much controversy and it is especially important that we are addressing standardized product as we go forward. As noted by Mr. Guida and Mr. Trainor, most NM cable in the U.S. is listed. This will aid in assuring NM cable is constructed as necessary for the permitted uses where the NEC is used in international jurisdictions. It will also provide a basis for imported NM cable to meet expectations relative to the electrical and fire characteristics. Any NM produced in the U.S. that is not listed should be. This is basic standardization and provides a means for any construction characteristics that may need to be changed in the future.
PANEL ACTION: Accept.
PANEL STATEMENT: The panel notes that this section should be numbered 336-6.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
TEMBLADOR: We continue to support the Panel Action and Panel Statement at the ROP Meeting on Proposal 7-194.
COMMENT ON AFFIRMATIVE:
GUIDA: This comment should be accepted. The definition of "listed" in the NEC states that the listing organization is required to be acceptable to the authority having jurisdiction, and that equipment meets identified standards or has been tested and found suitable for a specified purpose. Many other cables and most raceways in the NEC are required to be listed.

As additional information, the Standard for Nonmetallic-Sheathed Cables, UL 719 requires a thorough construction and performance evaluation for all nonmetallic-sheathed cables. Among others, testing includes flammability, dielectric voltage-withstand, unwinding at low temperatures, pulling through joists, conductor pullout, crushing, and abrasion. Nonlisted cables may not have been evaluated for compliance with these requirements, and may not function correctly with listed termination fittings.

PROPST: In order to help assure that NM cable, which is widely used by the general public for residential use, meets acceptable minimum product safety standards, I support the requirement that type NM cable should be listed. Since essentially all types NM cable is already listed, this requirement should have no financial impact on the manufacturers or users while at the same time enhancing safety.

SCHUMACHER: See my explanation of negative vote on Comment 7-89.

(Log #2042)

7- 93 - (336-80): Reject
SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc.
COMMENT ON PROPOSAL NO: 7-180
RECOMMENDATION: Accept the proposal, and relocate to 336.80.
SUBSTANTIATION: The panel statement says there has been no problem applying 60°C ampacities to this cable where located in thermal insulation, but utilizing 90°C conductors for derating. How then, should we characterize the NEMA research of 15 years ago, showing literal incineration of embedded 90°C SE cables at rated ampacity, and overheating when drawing current 10A below the 60°C table ampacity? The term "final ampacity" in the panel statement is meaningless. Ampacity is the current carrying ability of a wire under conditions of use. It is determined by thermodynamics, not politics. If the use impedes free circulation of air, then the ampacity is reduced to whatever it is. The proposal is correct. If there are no thermal impediments to air circulation, then allow the 90°C number for derating purposes. If installed in thermal insulation, start with the 60°C number, just as in the case of armored cable.
PANEL ACTION: Reject.
PANEL STATEMENT: There has been no additional technical substantiation provided to support changing the ampacity requirements of Type NM cable.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
STRANIERO: The comment should be accepted. The submitter provided technical substantiation for supporting the comment which was the original study that showed thermal degradation of the conductor insulating materials when operating at 60°C ampacity where the cable is located in thermal insulation. Permitting derating based on 90°C ampacity will result in insulated conductor operating temperatures in excess of the insulated conductor temperature rating for cables installed in thermal insulation.

(Log #396)

7- 94 - (337-7(b)(3)): Accept in Principle
SUBMITTER: Dan Leaf, Palmdale, CA
COMMENT ON PROPOSAL NO: 7-101
RECOMMENDATION: Accept in Principle revised as follows:
Delete proposal wording and substitute: (3) Used in suspended ceilings for connections to lunimaires or equipment in or on the ceiling and (a) structural members (including support wires or rods and ceiling grid members where permitted to be used) do not readily permit support intervals from terminations as required in (a); (b) the nearest readily available support member is used; (c) the support interval shall not exceed 1.8 m (6 ft); (d) The cable is above the suspended ceiling.
SUBSTANTIATION: The broad exemption of support is not warranted where structural support above a suspended ceiling or support wires or rods and ceiling grid members are available at less than 6 ft intervals. The 6 ft maximum should only apply where no closer support is available. The proposal addresses some concern expressed by Mr. Trainor in that runs between fixtures would require fastening if the structural ceiling, suitable ceiling assembly provides support at less than 6 ft. It also specifies intervals "from terminations" which would not permit a 50 ft run to a fixture to be supported at 6 ft intervals. Present wording can be interpreted to apply to support for the entire run.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action on Comment 7-16c. The panel notes that this comment is on Section 333-7(b)(3), not Section 337-7(b)(3).
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

ARTICLE 338 — SERVICE-ENTRANCE CABLE

(Log #629)

7- 95 - (338-2, 338-100 (New)): Accept
SUBMITTER: James M. Daly, BICC General
COMMENT ON PROPOSAL NO: 7-195a
RECOMMENDATION: The proposal should be accepted in part in principle.
Change the title of Section 338-2 from "Definition" to "Definitions."
Delete the last three paragraphs from 338-2 which read:
"Cabled, single-conductor, Type USE constructions recognized for underground use may have a bare copper conductor cabled with the assembly. Type USE single, parallel, or cabled conductor assemblies recognized for underground use may have a bare copper concentric conductor applied. These constructions do not require an outer overall covering.
FPN: See 230-41, Exception, item (b) for directly buried, uninsulated service-entrance conductors.
(c) One Uninsulated Conductor. If Type SE or USE cable consists of two or more conductors, one shall be permitted to be uninsulated."
Relocate the deleted text by adding the following section to read as follows:
338-100. Construction. Cabled, single-conductor, Type USE constructions recognized for underground use ~~may~~ shall be permitted to have a bare copper conductor cabled with the assembly. Type USE single, parallel, or cabled conductor assemblies recognized for underground use ~~may~~ shall be permitted to have a bare copper concentric conductor applied. These constructions ~~do~~ shall not require an outer overall covering.
FPN: See 230-41, Exception, item (b) for directly buried, uninsulated service-entrance conductors.
~~(c) One Uninsulated Conductor. If Type SE or USE cable consists of two or more conductors, one shall be permitted to be uninsulated.~~ Type SE or USE cable containing two or more conductors shall be permitted to have one conductor uninsulated."
SUBSTANTIATION: There is no more than one definition in the section and the proposed revision complies with the National Electrical Code Style Manual, Section 2.2.2.
The relocated text contained requirements or recommendations that are not permitted in definitions in accordance with the National Electrical Code Style Manual, Section 2.2.2.
The revised text uses positive code language in compliance with the National Electrical Code Style Manual, Section 3.1.1.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #82)

7- 96 - (338-3(a), (b) and Exception (New)): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 7-202
RECOMMENDATION: The Technical Correlating Committee directs the Panel to correlate the action on this Proposal with the action on Proposals 7-203 and 7-209.
The Technical Correlating Committee understands that the recommended text replaces the text in 338-10(b)(1) and (2) in Proposal 7-195a.
This action will be considered by the Panel as a Public Comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
Revise 338-10 to read:
338-10. Uses Permitted
(a) Service-Entrance Conductors. Service-entrance cable used as service-entrance conductors shall be installed as required by Article 230.
Type USE used for service laterals shall be permitted to emerge from the ground outside at terminations in meter bases or other enclosures where protected in accordance with Section 300-5(d).
(b). Branch Circuits or Feeders
(1) Grounded Conductor Insulated. Type SE service-entrance cables shall be permitted in wiring systems where all of the circuit conductors of the cable are of the rubber-covered or thermoplastic type.
(2) Grounded Conductor Not Insulated. Type SE service-entrance cable shall be permitted for use where the insulated conductors are used for circuit wiring and the uninsulated conductor is used only for equipment grounding purposes.
Exception: Uninsulated conductors shall be permitted as a grounded conductor in accordance with 250-140.
(3) Temperature Limitations. Type SE service-entrance cable used to supply appliances shall not be subject to conductor temperatures in excess of the temperature specified for the type of insulation involved.
(4) Installation Methods for Branch Circuits and Feeders.
(a) Interior Installations. In addition to the provisions of this article, Type SE service-entrance cable used for interior wiring shall comply with the installation requirements of Parts I and II of Article 336, excluding 336-80.
FPN: See Section 310-10 for temperature limitation of conductors.
(b) Exterior Installations. In addition to the provisions of this article, service-entrance cable used for feeders or branch circuits, where installed as exterior wiring, shall be installed as required by Article 225. The cable shall be supported in accordance with Section 336-30, unless used as messenger-supported wiring as allowed by Article 321.
Type USE cable shall be installed outside in accordance with the provisions of Article 339. Type USE shall be permitted to be terminated in enclosures at an indoor location where Type USE cable emerges from the ground. The length of the cable extending indoors to the first termination box shall not exceed 1.8m (6 ft.). Where Type USE cable emerges from the ground at terminations, it shall be protected in accordance with Section 300-5(d).
Multiconductor service-entrance cable shall be permitted to be installed as messenger-supported wiring in accordance with Articles 225 and 321.
PANEL STATEMENT: This revised text correlates the actions taken on Proposals 7-195a, 7-202, 7-203 and 7-209. This action incorporates the intent expressed in these proposals. The panel has amended the text of Section 338-10(B) relating to the cable emerging from the ground as an editorial correction.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #83)

7- 97 - (338-4(a)): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 7-205
RECOMMENDATION: It was the action of the Technical Correlating Committee that this Proposal be reconsidered and correlated with the action on Proposal 6-84. The Technical Correlating Committee understands that the action text replaces 338-10(b)(4)(a) of Proposal 7-195a.
This action will be considered by the Panel as a Public Comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
PANEL STATEMENT: See panel action and statement on Comment 7-98. Since CMP-7 has addressed the issue as required, CMP-6 can revisit panel action on Proposal 6-84 in accordance with their panel statement.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #1057)

7- 98 - (338-4(a)): Reject
SUBMITTER: Lanny McMahill, Rep. IAEI SW Section
COMMENT ON PROPOSAL NO: 7-205
RECOMMENDATION: Delete the words "excluding Section 336-26."
SUBSTANTIATION: The ampacity requirements for Type SE cable should be the same as for Types NM, NMC and NMS cables. The cable types are similar in construction and application. This will provide another step towards consistency. Agree with comments by Mr. Straniero.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel action on Proposal 7-205 was to correct an inadvertent correlation oversight. No techncial substantiation has been provided to equate the ampacity requirements of Types NM and SE cables.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
STRANIERO: The basis for the ampacity limitations placed on Type NM cable are applicable to any wiring method that is installed and used as Type NM cable. The panel statement in rejecting this comment does not address the technical substantiation provided. Stating that an oversight is being corrected, does not address the technical issues raised by the comment. Type SE cables that are installed and used in the same manner as Type NM cable will be subjected to the same thermal degradation and so should be treated the same.

(Log #1182)

7- 99 - (338-4(a)): Reject
SUBMITTER: Arthur J. Carlson, Pocatello, ID
COMMENT ON PROPOSAL NO: 7-205
RECOMMENDATION: Excluding Section 336-26.
SUBSTANTIATION: Whatever substantiation was used in the 1984 Code to require 90°C insulation and 60°C ampacity for NMC should also apply to service entrance cable used for interior wiring.
Note: Supporting Material is available for review at NFPA Headquarters.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Comment 7-98.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
STRANIERO: The comment is correct and should be accepted. See my explanation of negative vote on Comment 7-98.

(Log #1561)

7- 100 - (338-10(b)(1) and (2)): Accept in Principle
SUBMITTER: Ravindra H. Ganatra, Alcan Cable
COMMENT ON PROPOSAL NO: 7-202 & 7-203
RECOMMENDATION: Accept Panel Action on both Proposals.
ROP Draft shows the revised text for 338-3 (a) and (b) from 1999 NEC as 338.10 (B) (1) and (2) as a result of the Panel Action on these two proposals.
SUBSTANTIATION: Type SE cables are manufactured as Style U and Style R in accordance with UL 851. Although their predominant application is for service entrance applications, they are also suitable for feeders and branch circuits. Therefore, it is essential to clarify the Panel Actions on these two proposals by review following constructions and their applications for feeders and branch circuits:
For 338.10(B)(1): These deals with those constructions of Type SE products in which an insulated grounded conductor is either designated or provided and the construction is suitable for following permitted feeder or branch circuit applications:
SEU:
(2 insulated + 1 concentric bare): Single phase circuits. Bare conductor is used as an equipment grounding conductor. (Note: One of the insulated conductors is used as the grounded conductor and the concentric bare conductor is used as an EGC. All three conductors are of the same size (example: 2-2-2 SEU).)
SER:
(2 insulated + 1 bare): Single phase circuits. Bare conductor is used as an equipment grounding conductor. (See note above, example 2-2-2 SER).
(3 insulated): Single phase circuits. In this case, the equipment grounding conductor is insulated. (See note above, example 2-2-2 SER).
(3 insulated + 1 bare): For feeder and branch circuits. Bare conductor is used as an equipment grounding conductor. (Example 2-2-2-4, 4/0-4/0-4/0-2/0).
(4 insulated): For feeder and branch circuits. In this case, the equipment grounding conductor is insulated. (Example 2-2-2-4, 4/0-4/0-4/0-2/0, etc.)
(4 insulated + 1 bare): For three phase applications. Bare conductor is used as an equipment grounding conductor. (Example 2-2-2-2-4, 4/0-4/0-4/0/4/0-2/0, etc.)
For 338.10(B)(2): These deals with those constructions of Type SE products in which the typically designated grounded conductor is uninsulated and the construction is suitable for following permitted feeder or branch circuit applications:
SEU:
(2 insulated + 1 concentric bare): Single phase circuits. Bare conductor is used as an equipment grounding conductor. (Note: One of the insulated conductors is used as the grounded conductor and the concentric bare conductor is used as an EGC. All three conductors are of the same size (example: 8-8-8 SEU, 6-6-6 SEU, etc.).)
The exception (as shown in ROP Draft) permits the use of such SEU construction for existing ranges and clothes dryer where the uninsulated conductor is used as a grounded conductor in accordance with 250-140.
SER:
(2 insulated + 1 bare): Single phase circuits. Bare conductor is used as an equipment grounding conductor. (See note above, example 8-8-8 SER, 6-6-6 SER, etc.).
The exception (as shown in ROP Draft) permits the use of such SER construction for existing ranges and clothes dryer where the uninsulated conductor is used as a grounded conductor in accordance with 250-140.
Lastly, since the conductors used in Type SE Cable are suitable for wet locations, the Panel Action on these proposals also clarifies the installation of Type SE Cables underground in raceways where all circuit conductors are insulated and the bare conductor (if present) is used only for equipment grounding purposes.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Comment 7-96.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #1562)

7- 101 - (338-10(b)(4)b): Accept
SUBMITTER: Ravindra H. Ganatra, Alcan Cable
COMMENT ON PROPOSAL NO: 7-209
RECOMMENDATION: Reject this proposal.
Note: Acceptance of this comment should result in no change in the text for 338-4(b) as it appears in 1999 NEC, except for renubering where required. The final rewrite of Article 338 should reflect this accordingly and 338.10(B)(4)(b) should read:
(b) Exterior Installations. In addition to the provisions of this article, service-entrance cable used for feeders or branch circuits, where installed as exterior wiring, shall be installed as required by Article 225. The cable shall be supported in accordance with 336-18336.30, unless used as messenger-supported wiring as allowed by Article 321.
Type USE cable shall be installed outside in accordance with the provisions of Article 339. Where Type USE cable emerges above ground at terminations, it shall be protected in accordance with 300-5(d).
Multiconductor service-entrance cable shall be permitted to be installed as messenger-supported wiring in accordance with Articles 225 and 321.
SUBSTANTIATION: I believe that CMP 7 needs to review the Panel Action for follwing reasons to reject this proposal:
(1) Product referenced in the substantiation for Mobile Homes carries multiple ratings (i.e. "USE-2 or RHH or RHW-2"), which make it suitable for termination inside. Markings "Types RHH" and "RHW-2" make it suitable for installation inside. In case of Mobile Home, the product is an assembly of four conductors to satisfy the requirement of 550.33(A) (or 199 NEC 550-24(a)). In case of aluminum conductors, Type RHH or RHW-2 markings also require a compliance with 310-14.
(2) Product marked Type USE (or Type USE-2) only is not permitted for termination inside and the submitter's incomplete reasoning should not make it suitable for termination inside.
PANEL ACTION: Accept.
PANEL STATEMENT: The panel concurs with the substatiation that the Type USE is not appropriate for interior wiring as recommended in Proposal 7-209.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15
COMMENT ON AFFIRMATIVE:
TEMBLADOR: We support the panel action to accept Comment 7-101 to reject Proposal 7-209. In addition to the substantiation provided with the comment, it should be noted that since Type USE (or USE-2) are intended for outdoor applications, the insulation on Type USE (or USE-2) products is not required to be flame-retardant. For Mobile Home Feeder Cable application, the required cable assemblies consisting of four conductors (two phase conductors, a grounded conductor, and an equipment grounding conductor) is available to satisfy the requirements of 550-33(A) or (550-24(a) per the 1999 NEC). Conductors are identified as USE-2 or RHH or RHW-2 to meet the requirements on both sides, outdoor and indoor, of the service point or the meter as the case may be. Further, recommendation, if permitted, would entail field modification of the standard three-conducotr assembly of USE (or USE-2) conductors to provide for the fourth conductor required for equipment grounding purpose when used as Mobile Home Feeder Cable.

ARTICLE 339 — UNDERGROUND FEEDER AND BRANCH-CIRCUIT CABLE: TYPE UF

(Log #2043)

7- 102 - (339): Reject
SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc.
COMMENT ON PROPOSAL NO: 7-210a
RECOMMENDATION: Delete the last sentence in 339.10(1) and 10(3); delete all of 339.10(7).
Create a new 339.70 as follows:
Reactivate deleted 339.3 as follows:
339.3 Other Articles.
(A) Underground. Underground cable installations shall comply with the requirements in 300.5.
(B) Nonheating Leads. Single conductor Type UF cables used as nonheating leads for heating cables shall comply with the provisions of 424.43(B) and (C).
339.70. Single Conductors. Type UF configured as single conductor cables shall be installed with all conductors of the feeder or branch circuit run together in the same trench or raceway.
SUBSTANTIATION: This is a companion comment to others on Articles 334 and 330, all suggesting a common section numbering placement for single conductor topics. It also creates a more appropriate location for other article references, making new 339.10 less congested and more readable.
PANEL ACTION: Reject.
PANEL STATEMENT: The present location of text in the last sentence of Section 339.10(1) and Section 339.10(3); and text in 339.10(7) is more appropriate and is consistent with other cable articles.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #84)

7- 103 - (339-3(a)(1)): Accept
Note: Based on the Panel Action on Comment 7-105, the Technical Correlating Committee notes that 339-10(2) as referenced in the Panel Action on this Comment has been deleted.
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 7-222
RECOMMENDATION: It was the action of the Technical Correlating Committee that this Proposal be reconsidered and correlated with the action on Proposal 7-210a. This action will be considered by the Panel as a Public Comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
In Proposal 7-210a change the reference in Section 339-10(2) from 339-4 to 240-3(1999 NEC).
PANEL STATEMENT: The intent of Proposal 7-222 has been incorporated into Section 339-10 per Proposal 7-210a. The panel inadvertently omitted a reference to Proposal 7-222 in its statement on Proposal 7-210a. The panel notes that the reference in Section 339-10(2) to 339-4 should be changed to 240-3(1999 NEC).
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #901)

7- 104 - (339-3(b)): Reject
SUBMITTER: Art Cummins, City of Decatur
COMMENT ON PROPOSAL NO: 7-225
RECOMMENDATION: Add sentence number 10 to read:
In complete raceway system.
SUBSTANTIATION: Many homeowners and unqualified people install cable inside raceways, usually 1 conduit length at a time, damaging the cable plus making it impossible to install new conductors at a later time. Type UF cable should not be allowed to be installed in raceways in place of Type TW, THHhN, etc. cables.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel is unclear on the intent of the comment.
Installation in a raceway is a permitted use for Type UF Cable. Improper installation of a raceway can be equally damaging to other recognized conductor types identified in the substantiation.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #395)

7- 105 - (339-10, 339-12): Accept in Part
SUBMITTER: Dan Leaf, Palmdale, CA
COMMENT ON PROPOSAL NO: 7-210a
RECOMMENDATION: Accept in Principle revised:
"339-10 ~~(2) As feeder or branch circuit cable where provided with overcurrent protection of the rated ampacity as required in 339.4. (3)~~ (2) AS SINGLE CONDUCTOR CABLES. Where ~~so~~ installed as single conductor cables, all conductors of the feeder or branch-circuit, including the ~~neutral~~ grounded conductor and equipment grounding conductor, if any, shall be installed in

accordance with 300-3. ~~run together in the same trench or raceway. (4)~~ (3) For ~~interior~~ wiring in wet, dry, or corrosive locations under the recognized wiring methods of this Code."

"339-12 USED NOT PERMITTED. Multiconductor Type UF cable shall not be used..." (remainder unchanged)

SUBSTANTIATION: There is no longer a 339-4 and overcurrent protection is not rated in ampacity. In present (3) "grounded" is more inclusive than "neutral". A reference to 300-3 is more comprehensive in providing for parallel runs, isolated phases, etc. In present (4) limiting locations to interiors conflicts with (1) and 321-3. Limitation to use as feeders or branch circuits denies permission for single conductors in raceways for service entrance, service lateral, and control and signal conductors.

The proposed word "multiconductor" for 339-12 is intended to allow for single-conductor Type UF in raceways or other wiring methods suitable for the use and locations indicated in that section. Table 310-13 includes Type UF as conductors for general wiring.

PANEL ACTION: Accept in Part.

The panel accepts the changes to Section 339-10. The panel rejects the proposed change to Section 339-12.

PANEL STATEMENT: The panel understands that the accepted portions of the comment only impacts items 2, 3 and 4 in Section 339-10. The remainder of this section remains unchanged. Staff is directed to renumber accordingly. The panel does not accept the change to add "multiconductor" in Section 339-12. Section 339-12 does not prohibit the use of single conductor Type UF cable for general wiring purposes in a raceway.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:

AFFIRMATIVE: 15

ARTICLE 340 — POWER AND CONTROL TRAY CABLE: TYPE TC

(Log #630)

7- 106 - (340-2): Reject

SUBMITTER: James M. Daly, BICC General

COMMENT ON PROPOSAL NO: 7-231a

RECOMMENDATION: The proposal should be accepted in principle.

In Section 340-2, delete "for installation in cable trays, in raceways, or where supported by a messenger wire."

SUBSTANTIATION: The deleted text is not appropriate for a definition; it is more appropriate in Uses Permitted and is already addressed in 340-10(2). The deleted text contains requirements or recommendations that are not permitted in definitions in accordance with the National Electrical Code Style Manual, Section 2.2.2.

PANEL ACTION: Reject.

PANEL STATEMENT: Type TC Cable is required to be supported by cable trays or raceways or messengers. Elimination of these specific identifiers from the definition of Type TC Cable, as suggested in this comment, will permit Type TC Cable to be installed without any support or protection. Text in Section 340-10(2) addresses permitted uses and not installation requirements for Type TC Cable in all installations.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:

AFFIRMATIVE: 15

(Log #85)

7- 107 - (340-3 and 727-6): Accept

SUBMITTER: Technical Correlating Committee National Electrical Code

COMMENT ON PROPOSAL NO: 7-241

RECOMMENDATION: The Technical Correlating Committee understands that the text modifies 340-100 of Proposal 7-231a. In addition, the panel is directed to reconsider the Proposal and correlate with Proposal 7-239. This action will be considered by the Panel as a Public Comment.

SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.

PANEL ACTION: Accept.

PANEL STATEMENT: Based its actions taken on Proposals 7-239 and 7-241, the panel affirms that the text of Section 340-100 is to read:

Construction. A metallic sheath or armor as defined in 334-22 shall not be permitted either under or over the nonmetallic jacket. Metallic shield(s) shall be permitted over groups of conductors, under the outer jacket, or both.

Per the Panel's action on Proposal 7-239, amend Section 340-116(in Proposal 7-231a) by changing "sheath" to "jacket".

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:

AFFIRMATIVE: 15

(Log #1384)

7- 108 - (340-3): Reject

SUBMITTER: Kari Barrett, American Chemistry Council

COMMENT ON PROPOSAL NO: 7-242

RECOMMENDATION: The American Chemistry Council recommends that proposal 7-242 should be accepted as proposed.

SUBSTANTIATION: As noted in the negative comments of Mr. Propst and Mr. Stewart, the requirements of Article 334 would assure that only the appropriate types of TC cables were used with this exception while at the same time improving reliability and reducing the opportunity for installation errors.

PANEL ACTION: Reject.

PANEL STATEMENT: See panel action and statement on Comment 7-109.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:

AFFIRMATIVE: 15

(Log #281)

7- 109 - (340-3, Exception): Reject

SUBMITTER: Frank H. Rocchio, The Okonite Co., Inc.

COMMENT ON PROPOSAL NO: 7-242

RECOMMENDATION: Revise as follows:

Exception: Type TC cable, meeting the requirements of a Type MC core, can be converted to Type MC cable with the addition of a metallic sheath and an overall jacket marked in accordance with Article 334.

SUBSTANTIATION: There is a distinct application for Type TC cable per Article 340 and Type MC cable per Article 334 and this distinction should be continued. On the other hand, there are times when a Type TC core meeting the requirements of a Type MC core is required to be armored. The addition of a metallic sheath over a completed Type TC cable is consistent with the proposed exception. To further clarify when a Type TC core can be used, the wording "meeting the requirements of a Type MC core," has been added to the exception to allay any of the panel's questions on the armoring of a Type TC cable. This exception is definitely needed as provided in the initial substantiation and does not effect the safety of the cable in any manner. If anything, the panel's initial rejection and the addition to the proposed exception make this an even safer cable.

PANEL ACTION: Reject.

PANEL STATEMENT: The concern raised by the submitter is a product certification issue and not one that should be covered in the NEC. It is the panel's understanding that standards development organizations are in the process of addressing this issue.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:

AFFIRMATIVE: 15

(Log #654)

7- 110 - (340-3, Exception (New)): Reject

SUBMITTER: Robert B. Alexander, Fluor Daniel

COMMENT ON PROPOSAL NO: 7-242

RECOMMENDATION: Accept Proposal 7-242 "in principle" and revise as follows:

Exception: Type TC cable shall be permitted to serve as the core of Type MC cable.

SUBSTANTIATION: Current Panel Statement to Proposal 7-242:

"All type TC cables may not be appropriate for use as MC cables. There are inherent construciton differences such as equipment grounding conductor provisions and type of conductor insulation that preclude a dual designation."

While the Panel Statement may be literally true, a simple "side-by-side" comparison of the root definitions (as currently proposed in the 2002 "draft" by Code-Making Panel 7) would indicate that very few type TC cables actually would be unsuitable as cores for type MC cables. The grounding requirements of "new" Section 334.108 would not exclude the Type TC cable core and the insulation requirements described in "new" 334.112 are compatible with those of "new" 340.104. A review of UL product standards 1277 and 1569 do not indicate substantial exclusions either.

334.2 Definition.

Metal Clad Cable, Type MC. A factory assembly of one or more insulated circuit conductors with or without optical fiber members enclosed in an armor of interlocking metal tape, or a smooth or corrugated metallic.

340.2 Definition.

Power and Control Tray Cable, Type TC. A factory assembly of two or more insulated conductors, with or without associated bare or covered grounding conductors, under a nonmetallic jacket, for installation in cable trays, in race-ways, or where supported by a message wire. (ROP 7-236)

These definitions along with the construction standards in the "draft" for both Articles Part III would suggest that Type MC is a very general construction with respect to its core.

III Construction Specifications (Metal Clad)

334.104 Conductors. The conductors shall be of copper, aluminum, or copper-clad aluminum, solid or stranded. The minimum conductor size shall be 18 AWG copper and 12 AWG aluminum or copper-clad aluminum. (ROP 7-108)

334.108 Equipment Grounding. Type MC cable shall provide an adequate path for equipment grounding as required by Article 250.

334.112 Insulation. The insulated conductors shall comply with (A) or (B).

(A) 600 Volts. Insulated conductors in sizes 18 and 16 AGW shall be of a type listed in Table 402.3, with a maximum operating temperature not less than 90C (194F), and as permitted by 725.27. Conductors larger than 16 AWG shall be of a type listed in Table 310.13 or of a type identified for use in Type MC cable.

(B) Over 600 Volts. Insulated conductors shall be of a type listed in Tables 310.61 through 310.64.

334.116 Sheath. The metallic covering shall be one of the following types: smooth metallic sheath, corrugated metallic sheath, interlocking metal tape armor. The metallic sheath shall be continuous and close fitting. A nonmagnetic sheath or armor shall be used on single conductor Type MC. Supplemental protection of an outer covering of corrosion-resistant material shall be permitted and shall be required where such protection is needed. The sheath shall not be used as a current-carrying conductor. (ROP 7-126a)

FPN: See 300.6 for protection against corrosion.

III Construction Specifications (Tray Cable)

340-100. Construction. A metallic sheath shall not be permitted either under or over the nonmetallic sheath.

340-104. Conductors. The insulated conductors of Type TC tray cable shall be in sixzes 18 AWG through 1000 kcmil copper and sizes 12 AWG through 1000 kcmil aluminum or copper-clad aluminum. Insulated conductors of sizes 14 AWG and larger copper and sizes 12 AWG and larger aluminum or copper-clad aluminum shall be one of the types listed in Table 310-13 or 310-62 that is suitabe for branch circuit and feeder circuits or one that is identified for such use.

(a) Fire Alarm Systems. Where used for fire alarm systems, conductors shall also be in accordance with 760-27.

(b) Thermocouple Circuits. Conductors in Type TC cables used for thermocouple circuits in accordance with Article 725 shall also be permitted to be any of the materials used for thermocouple extension wire.

(c) Class 1 Circuit Conductors. Insulated conductors of sizes 18 AWG and 16 AWG copper shall also be in accordance with 725.27.

340-116. Sheath. The outer sheath shall be a flame-retardant, nonmetallic material.

340-120. Marking. There shall be no voltage marking on a Type TC cable employing thermocouple extension wire.

[It is noted that Panel Actions/Statements on Proposals 7-239 and 7-241 do not appear to be reflected in the "Draft" of new sections 340-116 and 340-100.]

Except for the direct statement in Section 340-100, which itself appears unnecessary - at least for safety purposes, there would seem to be no contradictory Type TC construction that would preclude them serving as a type MC core.

The real issue appears to be one of "labeling," not cable construction. While the addition of an improper label certainly could cause a safety problem, it is difficult to ascribe a safety problem by omitting one. Neither this comment or the original proposal suggests dual listing but, even if a cable were dual labeled it would have to meet the most stringent applicable installation requirement.

Finally, any type MC cable that included a Type TC cable core would still be required to meet the product standards of UL 1569.

PANEL ACTION: Reject.

PANEL STATEMENT: See panel action and statement on Comment 7-109.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:

AFFIRMATIVE: 15

(Log #2351)

7- 111 - (340-3, Exception (New)): Reject

SUBMITTER: Paul S. Hamer, San Ramon, CA

COMMENT ON PROPOSAL NO: 7-242

RECOMMENDATION: Accept the proposal, as written.

SUBSTANTIATION: Mr. Propst's explanation of his negative vote is justification to accept this proposal.

PANEL ACTION: Reject.

PANEL STATEMENT: See panel action and statement on Comment 7-109.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:

AFFIRMATIVE: 15

(Log #86)

10- 69 - (340-3(d)): Accept

SUBMITTER: Technical Correlating Committee National Electrical Code

COMMENT ON PROPOSAL NO: 7-243

RECOMMENDATION: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 10 for action. This action will be considered by the Panel as a Public Comment.

SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.

PANEL ACTION: Accept.

The panel accepts the action of the Technical Correlating Committee to consider and take action on Proposal 7-243.

The panel action is to reject Proposal 7-243.

PANEL STATEMENT: Rules related to overcurrent protection of conductors and specific conductor applications are an essential part of Article 240. Relocating this information to Tables 310-16 and 310-17 will cause unnecessary confusion and misapplication.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

(Log #574)

7- 112 - (340-4(6)): Accept in Principle

SUBMITTER: Joe Cox, Bluff City, TN

COMMENT ON PROPOSAL NO: 7-245

RECOMMENDATION: The panel should accept the proposal as modified in Mr. Propost's negative comment to include the wording "supported and protected against physical damage using mechanical protection, such as struts, angles, or channel."

SUBSTANTIATION: With the additional requirements for protection and support of the cable, there is no reason to keep the 50 ft limit. If the panel accepts that installation up to 50 ft are safe, then installations exceeding 50 ft should also be safe.

Since reliability of power is of utmost concern in industrial establishments, I would not expect that this allowance would be abused.

PANEL ACTION: Accept in Principle.

PANEL STATEMENT: See panel action and statement on Comment 7-115.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:

AFFIRMATIVE: 15

(Log #652)

7- 113 - (340-4(6)): Accept in Principle
SUBMITTER: Robert L. Hughes, Chattanooga, TN
COMMENT ON PROPOSAL NO: 7-245
RECOMMENDATION: Delete from the first sentence the clause:
"In lengths not to exceed a total of 50 ft. (15.42m) between a cable tray and the utilization equipment or device."
SUBSTANTIATION: Limiting the length of open cable to 50 ft has no practical substantiation. The panel's concern regarding "increased exposure to physical damage" is already covered in the text of 340-4(6) where it states "and where the cable is not subject to physical damage".
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Comment 7-115
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #1196)

7- 114 - (340-4(6)): Accept in Principle
SUBMITTER: Kenneth P. White, Olin Corp.
COMMENT ON PROPOSAL NO: 7-245
RECOMMENDATION: The panel should have accepted the proposal.
SUBSTANTIATION: The proposal does not allow open wiring but requires that it be supported every 6 ft and it cannot be subject to physical damage. This is a special tray cable that meets the mechanical requirements of MC cable. With cable trays above pipe racks which are very often well above 50 ft high this would allow industrial users the ability of not having to change cable methods when leaving a overhead tray.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Comment 7-115
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #1386)

7- 115 - (340-4(6)): Accept in Principle
SUBMITTER: Kari Barrett, American Chemistry Council
COMMENT ON PROPOSAL NO: 7-245
RECOMMENDATION: The American Chemistry Council supports the following revised text for 340-4(6) as proposed in Mr. Propst's explanation of negative comment:

340-4(6). In industrial establishments where the conditions of maintenance and supervision ensure that only qualified persons will service the installation, and where the cable is ~~not subject to physical damage~~ supported and protected against physical damage using mechanical protection, such as struts, angles, or channel, Type TC tray cable that complies with the crush and impact requirements of Type MC cable and is identified for such use shall be permitted as open wiring ~~in lengths not to exceed a total of 50 ft (15.24 m)~~ between a cable tray and the utilization equipment or device.

The cable shall be supported and secured at intervals not exceeding 6 ft (1.83m).

Equipment grounding for the utilization equipment shall be provided by an equipment grounding conductor within the cable. FPN: See Section 310-10 for temperature limitation of conductors.

SUBSTANTIATION: As noted in Mr. Propst's explanation of negative comment, this is an application of a hybrid type cable only in industrial applications. While the panel's general concerns about abuse of the exception may be warranted if it were permitted for general use, the "industrial" exceptions have a proven track record of not being abused while at the same time meeting the special needs of industry. The existing support requirements will assure adequate support of this type cable. As noted in Mr. Propst's comments, installation economics will automatically result in the maximum use of tray and the minimum use of this exception. Also, as noted in Mr. Stewart's comments, this option will also improve reliability and safety by reducing the need for alternate wiring methods for the same application.
PANEL ACTION: Accept in Principle.
Revise 340-4(6) to read:

340-4(6). In industrial establishments where the conditions of maintenance and supervision ensure that only qualified persons will service the installation, and where the cable is continuously supported and protected against physical damage using mechanical protection, such as struts, angles, or channel, Type TC tray cable that complies with the crush and impact requirements of Type MC cable and is identified for such use shall be permitted between a cable tray and the utilization equipment or device.

The cable shall be secured at intervals not exceeding 1.8m (6 ft).

Equipment grounding for the utilization equipment shall be provided by an equipment grounding conductor within the cable. FPN: See Section 310-10 for temperature limitation of conductors.

PANEL STATEMENT: The panel has clarified that Type TC cable is not permitted to be installed as "open wiring" and that it shall be continuously supported on struts, angles or channels. In addition the panel has added the provision that physical protection for the cable is required where installed on struts, angles or channels.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15
COMMENT ON AFFIRMATIVE:
GUIDA: The wording shown in the panel action was revised to meet the intent of the submitter and does so effectively. However, when making this revision the panel did not consider the revision to the last paragraph of 340-4(6) in Proposal 7-244 that was accepted in principle. The final wording of 340-4(6) should therefore be the first two paragraphs shown under this panel action and the third paragraph as shown under the panel action for Proposal 7-244.
TEMBLADOR: We support the panel action and the panel statement on this comment. It clearly differentiates, as it should, installation requirement for Type TC from "open wiring" methods such as raceways and Type MC cable.

(Log #2305)

7- 116 - (340-4(6)): Reject
SUBMITTER: Frank H. Rocchio, The Okonite Co., Inc.
COMMENT ON PROPOSAL NO: 7-245
RECOMMENDATION: I agree with the panel action in Proposal 7-245 (340-4(6)) to maintain the distinction and permitted use of Type TC (Tray Cable) and Type MC (Metal Clad) cable currently as defined in Articles 340 and 334, respectively.
SUBSTANTIATION: Subjecting Type TC - Tray cable to the mechanical crush and impact test protocol required for Type MC - Metal Clad cable and concluding that the two cable types are functionally equal and can be used in all areas of an industrial establishment is misleading.

The mechanical crush and impact test protocol for Type MC - Metal Clad cable in UL Standard 1569 is applied to the Type TC - Tray Cable optional application for the "Open Wiring" listing and restricted to a 50 foot length per Article 340-4(6). The UL qualification test requires that a 3/C 14 AWG with grounding conductor withstand an impact of 15 foot-pounds (a 2 inch wide weight of 10 pounds hitting the cable form a height of 1.5 feet) and a 3/C 2 AWG with grounding conductor withstand a 50 foot-pound (a 2 in. wide weight of 50 pounds hitting the cable from a height of 1 foot) impact application. Each sample must pass 8 out of 10 impacts performed at 1 foot intervals along an 11 foot length of cable.

The Type MC - Metal Clad cable construction easily passes this requirement. The cable's armor or metal sheath protects the cable core as intended and designed.

Type TC - Tray Cable "Open Wiring" presents a safety issue. When the cable assembly is penetrated by a mechanical device, the cable will fail electrically directly to the intruding device or to a companion insulated conductor or the grounding conductor (insulated or bare). The systems protection devices may not operate correctly in this scenario.

The Type MC - Metal Clad cable construction offers the metallic sheath as a path to ground in addition to the grounding conductor. This design feature offers a low resistance path to ground permitting the fault protection equipment to safely operate. Type MC cable may also not be penetrated by the same intruding device that could enter a Type TC cable.

In summary, since there can be two failures out of ten samples tested, the Type TC - Tray cable "Open Wiring" construction is not inherently safe. Type MC - Metal Clad cables, when crushed or impacted, fail to the metallic sheath or the grounding conductor or to each other, all of which are low resistance paths to ground and the intruding device is protected.

The - Uses Permitted - definitions in Articles 334, 334-3 for Type MC - Metal Clad cable and Articles 340, 340-4 for Type TC - Tray Cable correctly define and recognize these separate cable types for industrial applications. Type MC - Metal Clad cable is the proper

application to safeguard equipment and personnel in open wiring, exposed installations. Type TC - Tray Cable cannot be installed where it will be exposed to physical damage.

The panels vote to maintain the distinction between Type TC - Tray Cable and Type MC - Metal clad cable in proposal 7-245 is consistent with the panel action on proposal 7-242.

PANEL ACTION: Reject.

PANEL STATEMENT: The cable will be required to be continuously supported in accordance with the panel action on Comment 7-115. See panel action and statement on Comment 115.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:

AFFIRMATIVE: 15

(Log #2319)

7- 117 - (340-4(6)): Accept in Principle

SUBMITTER: William M. Lewis, Eli Lilly and Co.

COMMENT ON PROPOSAL NO: 7-245

RECOMMENDATION: I recommend that the proposal should be accept in principle, with the wording as proposed in Mr. Propst's comment.

SUBSTANTIATION: All of the concerns of the panel were met by the proposal in the comment. The 50 ft length limitation is not really a safety nor technical issue and it can create a hardship for industrial installations where a greater than 50 foot length makes sense. Reliability and safety are foremost in the day to day operation of an industrial facility and any installation which might be unsafe would not be installed. Limitations on length with no technical justification are not necessary.

PANEL ACTION: Accept in Principle.

PANEL STATEMENT: See panel action and statement on Comment 7-115

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:

AFFIRMATIVE: 15

(Log #2352)

7- 118 - (340-4(6)): Accept in Principle

SUBMITTER: Paul S. Hamer, San Ramon, CA

COMMENT ON PROPOSAL NO: 7-245

RECOMMENDATION: Accept the revised wording of the proposal, as suggested by Mr. Propst in his Explanation of Negative in the ROP.

SUBSTANTIATION: See the negative comments of Mr. Propst.

PANEL ACTION: Accept in Principle.

PANEL STATEMENT: See panel action and statement on Comment 7-115

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:

AFFIRMATIVE: 15

(Log #326)

7- 119 - (340-8): Accept

SUBMITTER: James M. Daly, Upper Saddle River, NJ

COMMENT ON PROPOSAL NO: 7-252a

RECOMMENDATION: The proposal should be accepted in principle with the following revisions:

(1) ~~Cables with an outside diameter of 1.000 inches or less 4~~ Four times the overall diameter for cables 25 mm (1 in.) or less in diameter.

(2) ~~Cables with diameter of 1.001 to 2.000 inch 5~~ Five times the overall diameter for cables larger than 25 mm (1 in.) but not more than 50 mm (2 in) in diameter.

(3) ~~Cables with diameters of 2.001 inch and larger 6~~ Six times the overall diameter for cables larger than 50 mm (2 in.) in diameter.

The remainder of the proposed text is unchanged.

SUBSTANTIATION: The proposed revised text complies with the NFPA No. 1M Manual of Style, Section 4, with respect to the placement of units and values of measurement and addresses the Technical Correlating Committee comment shown in the ROP.

The text is consistent with the text used in Section 334-11.

The original proposed values imply a degree of precision not required for safety.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:

AFFIRMATIVE: 15

(Log #513)

7- 120 - (340-8): Accept in Principle

SUBMITTER: James M. Daly, Upper Saddle River, NJ

COMMENT ON PROPOSAL NO: 7-252a

RECOMMENDATION: The proposal should be accepted in principle with the following revisions:

(1) Cables with an outside diameter of 25 mm (1.000 inches) or less - 4 times the overall diameter

(2) Cables with diameter greater than 25 mm ~~of 1.001~~ (1,000 inch) to 50 mm (2.000 inch) - 5 times the overall diameter

(3) Cables with diameters greater than 50 mm (2.000 inch) ~~of 2.001 inch and larger~~ - 6 times the overall diameter.

The remainder of the proposed text is unchanged.

SUBSTANTIATION: The proposed revision is intended to comply with the NFPA No. 1M Manual of Style Section 4 with respect to the placement of units and values of measurement and addresses the Technical Correlating Committee comment shown in the ROP.

It was developed by the NEC Technical Correlating Committee Metrication Task Group which included: Craig Wellman, Chair; Bruce Barrow; Richard Berman; Michael Callanan; James Daly, George Dauberger; Ravi Ganatra; Jack A. Gruber; Neil LaBrake, Jr.; Ed Lawry; and Jim Pauley.

PANEL ACTION: Accept in Principle.

PANEL STATEMENT: See panel action on Comment 7-119.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:

AFFIRMATIVE: 15

(Log #655)

7- 121 - (340-10(6)): Reject

SUBMITTER: Robert B. Alexander, Fluor Daniel

COMMENT ON PROPOSAL NO: 7-245

RECOMMENDATION: Accept the original proposal "in principle" and revise "new" section 340-10(6) as follows:

340.10 Uses Permitted...

(6) In industrial establishments where the conditions of maintenance and supervision ensure that only qualified persons will service the installation, and where the cable is not subject to physical damage, Type TC tray cable that complies with the crush and impact requirements of Type MC cable and is identified for such use shall be permitted as open wiring. ~~in length not to exceed a total of 15m (50 ft) between a cable tray and the utilization equipment or device.~~

The cable shall be supported and secured at intervals not exceeding 1.8 m (6 ft). An equipment-grounding conductor within the cable shall provide equipment grounding for the utilization equipment.

In cables containing conductors 6 AWG or smaller, the equipment grounding conductor shall be provided within the cable or, at the time of installation, one or more insulated conductors shall be permanently identified as an equipment-grounding conductor in accordance with 250.119(B). (ROP 7-244)

SUBSTANTIATION: "Points" from and rebuttals to the current panel statement:

1. By definition Type TC cable is intended to be supported by a cable tray, in raceways or where supported by a messenger wire. As a "statement" this is accurate; however, if these were absolute restrictions then "new" Section 340-10(6) should not be permitted at all.

2. The panel has concerns relative to the use of the cable in unlimited lengths as open wiring including increased exposure to physical damage.

From "new" section 340-10(6), as proposed, the installation already has the following substantial restrictions:

The Cable:

- is installed..."in industrial establishments where the conditions of maintenance and supervision ensure that only qualified persons will service the installation,"
- "is not subject to physical damage,"
- "complies with the crush and impact requirements of Type MC cable, " and

• "is identified for such use"

3. Section 340-5(2) does not permit the installation of Type TC cable as open cable on brackets or cleats. This was corrected by Proposal 7-248. See "new" Section 340.12(2).

A review of UL Standard 1277, Sections 20A and 20B indicates that Tray Cable suitable for identification as "open wiring" are tested to identical standards for those of Metal Clad cables in UL Standard 1569, Sections 24 and 25. The commentator is aware that Metal Clad cables may exceed the requirement to "pass" the tests, while Tray Cables identified as "open wiring" just "get by;" however, if the criteria for acceptance are valid then this is irrelevant. It the criteria are not valid, then the product standard should be corrected, but his comment should still be accepted.

Finally, the fundamental substantiation of the original Proposal 7-245 is still valid; i.e., there has been no offer to public review in any ROP, ROC, TCR or TCD - past or present - that ever substantiated the 50 ft. limit in the first place.

PANEL ACTION: Reject.

PANEL STATEMENT: The submitter has not provided technical substantiation to remove the restriction on installing Type TC cable only from the cable tray to "the utilization equipment or device." See panel action and statement on Comment 7-115.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:

AFFIRMATIVE: 15

ARTICLE 342 — NONMETALLIC EXTENSIONS

(Log #2044)

7- 122 - (342): Reject

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

COMMENT ON PROPOSAL NO: 7-254a

RECOMMENDATION: Correlate the article title and some of its sections with the withdrawal of aerial cable, as follows:

1. Return the title of the article to the pre-1962 NEC title for this article, when aerial cable went into the Code for the first time, i.e. "Nonmetallic Surface Extensions."

2. In 342.10(C), delete the phrase "For nonmetallic surface extensions" since the other type of extension has been withdrawn; all that must be said is "The building is occupied..."

SUBSTANTIATION: This comment addresses minor correlation issues occasioned by the withdrawal of aerial cable.

PANEL ACTION: Reject.

PANEL STATEMENT: The proposed title and wording changes do not enhance the understanding of what is covered in this Article. See panel action on Comment 7-123.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:

AFFIRMATIVE: 15

(Log #631)

7- 123 - (342-2, 342-10(c)): Accept

SUBMITTER: James M. Daly, BICC General

COMMENT ON PROPOSAL NO: 7-254a

RECOMMENDATION: The proposal should be accepted in principle.

In Section 342-2, delete the last sentence that reads: "The classification includes surface extensions intended for mounting directly on the surface of walls or ceilings."

Revise 342-10(c) as follows:

(c) ~~Nonmetallic Surface Extensions.~~ Residential or Offices. For nonmetallic surface extensions mounted directly on the surface of walls or ceilings, the building is occupied for residential or office purposes and does not exceed the height limitations specified in 336-5(a)(1).

SUBSTANTIATION: The deleted text is not appropriate for a definition; it is more appropriate for Uses Permitted and is partially addressed in 342-10(c). The revised text proposed above incorporates the additional clarification. The deleted text contains requirements or recommendations that are not permitted in Definitions in accordance with the National Electrical Code Style Manual, Section 2.2.2.

The revised section heading more accurately reflects the additional requirement in (c) on the use of nonmetallic surface extensions.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:

AFFIRMATIVE: 15

ARTICLE 343 — NONMETALLIC UNDERGROUND CONDUIT WITH CONDUCTORS: TYPE NUCC

(Log #91)

8- 34 - (343-1): Accept

Note: The Technical Correlating Committee notes that the panel action indicates text from Proposal 8-77 is the appropriate text for 343.100(B).

SUBMITTER: Technical Correlating Committee National Electrical Code

COMMENT ON PROPOSAL NO: 8-77

RECOMMENDATION: The Technical Correlating Committee directs the panel to clarify the action on this Proposal. The Technical Correlating Committee assumes that the Panel Action on Proposal 8-74 appropriately handles the issue through the introduction of 343-6. This action will be considered by the Panel as a Public Comment.

SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.

PANEL ACTION: Accept.

PANEL STATEMENT: The Technical Correlating Committee pointed out the need to correlate between Proposal 8-74 covering the complete assembly, and Proposal 8-77 covering the components. To meet the intent of Proposal 8-77, proposed Section 343-100(b) was revised as follows:

"The nonmetallic underground conduit shall be listed and composed of a material that is resistant to moisture and corrosive agents."

The NEC draft has correctly correlated these proposals.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:

AFFIRMATIVE: 14

ARTICLE 345 — INTERMEDIATE METAL CONDUIT: TYPE IMC

(Log #776)

8- 35 - (345-12(b)(3)): Accept in Principle

SUBMITTER: Richard E. Loyd, Perryville, AR

COMMENT ON PROPOSAL NO: 8-221

RECOMMENDATION: Reconsider action. The action on this proposal was correct, however, the wording accepted was incorrect. Consider the voting comments and revise wording to incorporate "stationary equipment."

SUBSTANTIATION: The panel acted without substantiation to delete industrial machinery and not accepting stationary equipment which would still permit industrial equipment to be connected using this section. I feel the panel has responsibility to provide substantiation to change the code. They require of the public to provide substantiation and state a need for changing the code. The panel should not be permitted to substantially change a code requirement without doing the same thing.

PANEL ACTION: Accept in Principle.

PANEL STATEMENT: See panel action and statement on Comment 8-36.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:

AFFIRMATIVE: 14

(Log #777)

8- 36 - (345-12(b)(3)): Accept in Part

SUBMITTER: Richard E. Loyd, Perryville, AR

COMMENT ON PROPOSAL NO: 8-222

RECOMMENDATION: Reconsider action, this proposal should have been accepted. Consider the voting comments and incorporate "stationary equipment."

SUBSTANTIATION: The panel acted without substantiation to delete industrial machinery and not accepting stationary equipment which would still permit industrial equipment to be connected using this section. I feel the panel has responsibility to provide substantiation to change the code. They require of the public to

provide substantiation and state a need for changing the code. The panel should not be permitted to substantially change a code requirement without doing the same thing.
PANEL ACTION: Accept in Part.
The panel rejects the deletion of "industrial machinery" and the addition of "stationary equipment."
The panel accepts the addition of "fixed equipment."
Revise Section 345-12(b)(3) to read:
(3). Exposed vertical risers from industrial machinery or fixed equipment shall be permitted to be supported at intervals not exceeding 6.0 m (20 ft.), if the conduit is made up with threaded couplings, is firmly supported at the top and bottom of the riser, and no other means of intermediate support is readily available.
PANEL STATEMENT: Staff is advised that Section 345-12(b)(3) in the 1999 NEC is Section 345-30(b)(3) in the reorganized Article 345 as found in Proposal 8-204.
Proposal 8-222 sought to delete the words "industrial machinery" and insert the words "fixed or stationary equipment ". The language "industrial machinery" implies a heavy piece of equipment that is not likely to be moved without intentional effort. As a result, the IMC vertical riser was not likely to be subjected to horizontal stresses that could result in damage to couplings, fittings, termination points, and points where it was supported and secured. The vertical riser was expected to remain vertical.
The use of the term "stationary" in the language of the proposal does not convey the need that the equipment must be fixed in place or otherwise not likely to move, as was implied with the language "industrial machinery". A stationary store fixture, such as a display case, is easily moved depending on its weight. That same display case is not easily moved if it is "fixed".
The language "industrial machinery or fixed equipment, " will still allow the same use of IMC vertical risers for heavy industrial machinery that has been permitted. At the same time it will permit an expanded application of the concept to other equipment that is fixed in place while limiting the potential for damage to the IMC, points where it is secured or supported, and its couplings and fittings.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #837)

8- 37 - (345-12(b)(3)): Reject
SUBMITTER: Larry F. Miller, National Electrical Manufacturers Association (NEMA)
COMMENT ON PROPOSAL NO: 8-221
RECOMMENDATION: The panel should accept the proposal as originally submitted.
SUBSTANTIATION: NEMA proposed this change in language for IMC in order to correlate with the language in 346-12(b)(3) for rigid metal conduit. IMC is equivalent to rigid conduit, with physical characteristics equal to or greater than RMC. The Panel changed the proposed language without any substantiation that a problem exists with "stationary equipment for fixtures", the same language that the Panel accepted for rigid metal conduit in the 1999 code cycle. We agree with the negative comment of Mr. Cox that when the language was originally put in the code, the submitter's intent was to be able to wire heavy equipment that would not move during operation, without fastening it to the floor. We also agree with the negative comment of Mr. Griffith who states that no substantiation has been provided to deny the application to stationary equipment. There is confusion over the definitions of the terms "fixed" and "stationary" and in the manner in which these words are used in the Code.
Also see comments on 8-222 and 8-249.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Comment 8-36.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #838)

8- 38 - (345-12(b)(3)): Accept in Principle
SUBMITTER: Larry F. Miller, National Electrical Manufacturers Association (NEMA)
COMMENT ON PROPOSAL NO: 8-222
RECOMMENDATION: The panel should accept this proposal as originally submitted.
SUBSTANTIATION: Mr. Hartwell was merely trying to correlate the language in Article 345 with the language currently used in Article 346. He uses the words "fixed" instead of "fixture" (which he may be interpreting as lighting) but supplies no substantiation of a problem with stationary equipment.
Note: The language in Proposal 8-249 for 346-12(b) and the language in this proposal should agree. Either the current language of 346-12(b) or that proposed by Mr. Hartwell is acceptable.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Comment 8-36.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

ARTICLE 346 — RIGID METAL CONDUIT: TYPE RMC

(Log #92)

8- 39 - (346-3(a)): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 8-242
RECOMMENDATION: The Technical Correlating Committee directs the Panel to clarify the action on this Proposal and correlate the Proposal with the action on Proposal 8-231. This action will be considered by the Panel as a Public Comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
PANEL STATEMENT: The proposed text shall be accepted as a new Section 346.14 (as shown in the 2002 NEC Draft).
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #93)

8- 40 - (346-7): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 8-244a
RECOMMENDATION: It was the action of the Technical Correlating Committee that this Proposal be reconsidered and correlated with the action on Proposal 8-231. This action will be considered by the Panel as a Public Comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
PANEL STATEMENT: The proposed text shall be accepted as a new paragraph to Section 346.22 (as shown in the 2002 NEC Draft).
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #1036)

8- 41 - (346-10): Accept
SUBMITTER: Kenneth L. Hagemeyer, Greenlee Textron
COMMENT ON PROPOSAL NO: 8-245
RECOMMENDATION: I am in full agreement with the changes as proposed and the panel's recommendations.
SUBSTANTIATION: This will help to clarify the current code and bring it up to date with what is being done in the field today.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #779)

8- 42 - (346-12(b)(3)): Accept in Principle in Part
SUBMITTER: Richard E. Loyd, Perryville, AR
COMMENT ON PROPOSAL NO: 8-249
RECOMMENDATION: Reconsider action. This proposal should have been accepted. Consider the voting comments and retain "stationary equipment."
SUBSTANTIATION: The panel acted without substantiation to delete stationary equipment in this section. I feel the panel has responsibility to provide substantiation to change the code. They require of the public to provide substantiation and state a need for changing the code. The panel should not be permitted to substantially change a code requirement without doing the same thing. The 2002 NEC will no longer include "fixtures" in the laundry list in the definition of "Equipment" in Article 100.
PANEL ACTION: Accept in Principle in Part.
The panel revises Section 346-12(b)(3) to read:
(3). Exposed vertical risers from industrial machinery or fixed equipment shall be permitted to be supported at intervals not exceeding 6.0 m (20 ft.), if the conduit is made up with threaded couplings, is firmly supported at the top and bottom of the riser, and no other means of intermediate support is readily available.
PANEL STATEMENT: This change satisfies the intent of the submitter and correlates with the change made in Section 345-12(b)(3) by Comment 8-36. The panel did not retain "stationary equipment" in the text of this section. Staff is advised that Section 346-12(b)(3) in the 1999 NEC is Section 346-30(b)(3) in the reorganized Article 346 as found in Proposal 8-231.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #839)

8- 43 - (346-12(b)(3)): Reject
SUBMITTER: Larry F. Miller, National Electrical Manufacturers Association (NEMA)
COMMENT ON PROPOSAL NO: 8-249
RECOMMENDATION: The panel should reject the original proposal.
SUBSTANTIATION: The definition supplied in Mr. Loyd's negative substantiates that "fixtures" already covers "fixed equipment." No substantiation has been supplied for removing the term "stationary", as required by NFPA Regulations.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Comment 8-42.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #94)

8- 44 - (346-17 (New)): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 8-253
RECOMMENDATION: The Technical Correlating Committee directs the panel to clarify the action on this Proposal considering the Panel Action to add a new 346-6 in Proposal 8-231. This action will be considered by the Panel as a Public Comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
PANEL STATEMENT: The proposed text shall be accepted as a new Section 346.6 (as shown in the 2002 NEC Draft).
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #2045)

8- 45 - (346-24): Reject
SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc.
COMMENT ON PROPOSAL NO: 8-245
RECOMMENDATION: Reconsider and insist on more comprehensive technical substantiation for this proposal.
SUBSTANTIATION: None of the stated dimension numbers in the table are changing, only the nomenclature. In the case of the one-shot bends (allowed to have a reduced radius) presently covered in the exception, these were always measured to the centerline, and won't change. However, the present exception only applies to a "bending machine". As such it presumably doesn't apply to a hand bender, which now, at least theoretically, uses the larger radii in the basic rule. The column in the new table with the smaller radii, however, doesn't mention machines but instead covers "One Shot and Full Shoe Benders" which would include full-shoe hand benders for the first time. Hickeys would still use the larger radii, however, since those radii are now to be measured to the centerline, all those bends end up tighter by one half the raceway diameter. None of these technical changes was addressed on their merits, and whether they will force a redesign of present bending products. Some technical discussion of these issues would help those of us who must explain why things happen.
PANEL ACTION: Reject.
PANEL STATEMENT: In part, the substantiation for this proposal states "Manufacturers of bending equipment measure to the centerline. This revised text and table clarifies the measurement in accordance with current field practice." One shot and full shoe type benders as well as factory made bends have been made with the required minimum radius measured to the centerline for a number of years. Field personnel making bends with these types of benders have been making bends with the measurement to the centerline. The resultant elbows have not resulted in a diminished level of performance or in installation difficulties. This long history of successful use provides a measure by which the acceptance of the centerline measurement is appropriate.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

ARTICLE 347 — RIGID NONMETALLIC CONDUIT: TYPE RNC

(Log #95)

8- 46 - (347): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 8-256
RECOMMENDATION: The Technical Correlating Committee directs the panel to clarify the action on this Proposal and specifically state what the proper title for the table should be and to correlate that action with Proposal 8-266. This action will be considered by the Panel as a Public Comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
PANEL STATEMENT: The panel accepts the revised text in Proposal 8-256 with the exception of deleting Table 347-9 (A) (reorganization Table 347.44(A)). Proposal 8-266 was accepted by the panel which corrected the table and title to include the numeric value in SI units. Table 347.44(A) shall appear as shown in the 2002 NEC Draft.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #433)

8- 47 - (347-2(h)): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
COMMENT ON PROPOSAL NO: 8-259
RECOMMENDATION: Accept proposal.
SUBSTANTIATION: Wire connectors for splicing conductors are "devices" by definition. This sentence literally excludes them. The Code should clearly indicate the intent and be specific and clear per Style Manual 3.3.4.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel reaffirms its position as stated in its action on Proposal 8-259.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #2001)

8- 48 - (347-9): Reject
SUBMITTER: William F. Laidler, Rep. Massachusetts Electrical Code Advisory Committee
COMMENT ON PROPOSAL NO: 8-265
RECOMMENDATION: The proposal should be accepted.
SUBSTANTIATION: Straight run is not the concern. The concern is movement that can occur regardless of the run that will damage the box or conduit. There should be no limit to straight runs only. An expansion fitting needs to be installed if any movement is anticipated that will exceed 1/8 in. to avoid damage to the box.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel reaffirms its position as stated in its action on Proposal 8-265.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #2046)

8- 49 - (347-9): Reject
SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc.
COMMENT ON PROPOSAL NO: 8-265
RECOMMENDATION: Accept the proposal as written, except add the phrase "over a straight run" following the 1/8-in. specification [...will exceed 3 mm (1/8 in.) over a straight run at securely mounted items ..."
SUBSTANTIATION: As noted by the comment in the voting, the original proposal was correct. The addition of the reference to straight runs addresses the panel statement. If all of the present 1/4-in. allowable movement occurs at one point, particularly if propelled in one direction over a straight run, most equipment connected to the conduit will fail in some way.
PANEL ACTION: Reject.
PANEL STATEMENT: There have been several proposals over the years to reduce the entry level for application of an expansion fitting from 1/4 inch to 1/8 inch. Insufficient technical substantiation has been provided to warrant a change from 1/4-inch to 1/8-inch as the entry level for installation of expansion fittings.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #96)

8- 50 - (Table 347-9(a)): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 8-266
RECOMMENDATION: The Technical Correlating Committee directs the Panel to correlate the Panel Action with Proposal 8-256. This action will be considered by the Panel as a Public Comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
PANEL STATEMENT: See panel statement on Comment 8-46.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #2332)

8- 51 - (Table 347-9(a) Note): Accept
SUBMITTER: Wayne A. Lilly, Bridgewater, VA
COMMENT ON PROPOSAL NO: 8-267
RECOMMENDATION: This proposal should be rejected.
SUBSTANTIATION: The substantiation for this proposal is for outdoor installations only. The wording of the proposed note would make it applicable to all installations "in direct sunlight". This means indoor installation in direct sunlight would be required to have 30°F added to the estimated temperature change even though no substantiation was provided. For indoor installations that do not have heat or air conditioning, consideration of an increase in the temperature change due to direct sunlight exposure might be justified based on length of exposure. However, if the indoor installation is in a controlled environment, where heating and air-conditioning are provided, an increase is not warranted. The heating and air conditioning regulate the temperature of the raceway and expansion and contraction are not a factor.
The substantiation did not provide information on how much direct sunlight exposure is needed before adding 30°F to the total temperature change is required. Is a fifteen-minute exposure required? Perhaps a two-hour exposure is needed. There are many installations where the direct sunlight exposure is limited by items such as adjacent buildings. The proposed wording of the note would require the addition of 30°F for those installations with even a single minute of direct sunlight exposure.
I agree that consideration should be given to the impact direct sunlight might have on the overall temperature change of PVC RNC. However, the proposed wording would require an addition of 30°F to installations where it is not necessary to do so. This proposal should be rejected until language is proposed that will provide consideration for expansion and contraction while not requiring such consideration to be given to installations where it is not required.
PANEL ACTION: Accept.
PANEL STATEMENT: Staff is instructed to delete the note to Table 347.44(A) in the 2002 NEC Draft.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #2331)

8- 52 - (Table 347-9(b) Note): Accept
SUBMITTER: Wayne A. Lilly, Bridgewater, VA
COMMENT ON PROPOSAL NO: 8-269
RECOMMENDATION: This proposal should be rejected.
SUBSTANTIATION: The substantiation for this proposal is for outdoor installations only. The wording of the proposed note would make it applicable to all installations "in direct sunlight". This means indoor installations in direct sunlight would be required to have 30°F added to the estimated temperature change even though no substantiation was provided. For indoor installations that do not have heat or air conditioning, consideration of an increase in the temperature change due to direct sunlight exposure might be justified based on the length of exposure. However, if the indoor installation is in a controlled environment, where heating and air-conditioning are provided, an increase is not warranted. The heating and air conditioning regulate the temperature of the raceway and expansion and contraction are not a factor.
The substantiation did not provide information on how much direct sunlight exposure is needed before adding 30°F to the total temperature change is required. Is a fifteen-minute exposure required? Perhaps a two-hour exposure is needed. There are many installations where the direct sunlight exposure is limited by items such as adjacent buildings. The proposed wording of the note would require the addition of 30°F for those installations with even a single minute of direct sunlight exposure.
I agree that consideration should be given to the impact direct sunlight might have on the overall temperature change of Fiberglass Reinforced Conduit RNC. However, the proposed wording would require an addition of 30°F to installations where it is not necessary to do so. This proposal should be rejected until language is proposed that will provide consideration for expansion and contraction while not requiring such consideration to be given to installations where it is not required.
PANEL ACTION: Accept.
PANEL STATEMENT: Staff is instructed to delete the note to Table 347.44(B) in the 2002 NEC Draft.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #515)

8- 53 - (347-12(e), Exception (New)): Hold
SUBMITTER: James M. Daly, BICC General
COMMENT ON PROPOSAL NO: 8-255
RECOMMENDATION: The proposal should continue to be accepted in principle and the following exception should be added to 347-12(e):
Exception: Insulated conductors or multiconductor cables rated at a higher temperature than the RNC listed temperature rating shall be permitted to be installed in RNC provided they are not operated at a temperature higher than the RNC listed temperature rating.

SUBSTANTIATION: This exception will resolve a conflict within the code.

Most wire and cable manufacturers no longer mark Type MV conductors for 90°C since the conductors meet the 105°C requirements and are marked for the higher temperature rating. Without the exception, the code currently prohibits the installation of 105°C Type MV insulated conductors and cables in RNC since they are rated higher than the RNC. The exception will permit the higher rated conductors or cables to be installed in RNC provided they are not operated at a temperature higher than the RNC temperature rating.

The temperature rating of the RNC will not be exceeded, equivalent safety will be provided, and the product will not be prohibited from being used in RNC.

Except for electric utilities in major cities, users do not operative MV conductors or cables above 90°C anyhow so the restrictions of limiting the conductor operating temperature to the temperature rating of the RNC will not require any change from current practice.

Also, there are other conductors and cables in the NEC that are rated higher than 90°C such as PLTC which is rated 105°C and yet, because of the power limited requirements, can never reach the rated temperature. The rated temperature is based upon the rating of the insulation and the jacketing material used in the construction, not the operational temperature. There is no reason to exclude these conductors and cables from being installed in RNC provided the RNC temperature rating is not exceeded.

PANEL ACTION: Hold.

PANEL STATEMENT: In accordance with Section 4-4.6.2.2(a) of the NFPA Regulations Governing Committee Projects this comment is held as the proposed exception introduces new material that has not had public review.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:

AFFIRMATIVE: 14

(Log #791)

8- 54 - (347-22): Accept

SUBMITTER: David H. Kendall, Carlon

COMMENT ON PROPOSAL NO: 8-255

RECOMMENDATION: New paragraph in proposed Section 347.22:

Cables shall be permitted to be installed where such use is permitted by the respective cable articles. The number of cables shall not exceed the allowable percentage fill specified in Table 1, Chapter 9.

SUBSTANTIATION: This proposed text is to harmonize with the other raceway articles and allows cables to be installed in the raceway as long as the respective cable article permits it.

PANEL ACTION: Accept.

PANEL STATEMENT: The panel directs that the paragraph be arranged as a second paragraph to correlate with the same section in other articles.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:

AFFIRMATIVE: 14

(Log #2122)

8- 55 - (Table 347-44(a)): Reject

SUBMITTER: Neil F. LeBrake, Jr., Baldwinsville, NY

COMMENT ON PROPOSAL NO: 8-269

RECOMMENDATION: This proposal should be accept in principle. The added note to Table 347.44(A) should be amended as follows by ~~strikethrough~~ for deletions and underline for additions to include SI units.

Note: Add 17ºC (30°F) to estimated... (remainder unchanged).

SUBSTANTIATION: The Panel's action needs to include the Technical Correlating Committee's directive on metrication according to the NFPA No. 1M Manual of Style Section 4.1 with respect to the placement of units and values of measurements for including the SI equivalent of a 30°F change. The 17°C change value is calculated based on item 1 of the Proposal 8-268 substantiation by dividing the °F value by 1.8 for the °C equivalent.

PANEL ACTION: Reject.

PANEL STATEMENT: The notes to Tables 347.44(A) and 347.44(B) (as shown in the 2002 NEC Draft) have been deleted. See panel action and statement on Comments 8-51 and 8-52.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:

AFFIRMATIVE: 14

ARTICLE 348 — ELECTRICAL METALLIC TUBING: TYPE EMT

(Log #97)

8- 56 - (348): Accept

SUBMITTER: Technical Correlating Committee National Electrical Code

COMMENT ON PROPOSAL NO: 8-276

RECOMMENDATION: The Technical Correlating Committee advises that Article Scope statements are the responsibility of the Technical Correlating Committee and the Technical Correlating Committee accepts the Panel Action. It was the action of the Technical Correlating Committee that this Proposal be reconsidered and correlated with the action on Proposal 8-289a. This action will be considered by the Panel as a Public Comment.

SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.

PANEL ACTION: Accept.

PANEL STATEMENT: The Technical Correlating Committee's understanding is correct for Proposal 8-289(a) and the proposed text shall be accepted as a new paragraph in Section 348.22 (as shown in the 2002 NEC Draft).

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:

AFFIRMATIVE: 14

(Log #766)

8- 57 - (348-4(a)): Accept

SUBMITTER: Richard E. Loyd, Perryville, AR

COMMENT ON PROPOSAL NO: 8-283

RECOMMENDATION: I support the panel action, continue to reject this proposal.

SUBSTANTIATION: See my comment on Proposal 8-282 and consider the panel comments on the voting

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

NEGATIVE: 3

EXPLANATION OF NEGATIVE:

COX: Many of the problems addressed by the proposal are workmanship issues. Improvements in the connection between coupling and conduit were reported and new installation guides have been published. It was also stated that the conductivity of the connection between coupling and conduit for EMT is better than rigid.

However, the discussions also brought out that there is no life cycle testing done that would address the effects of temperature and time on the integrity of the coupling/conduit connection.

I believe properly made up coupling to conduit connections can come loose over time and the relief sought should be given.

GRIFFITH: It is believed the inherent design characteristics and general durability of an EMT raceway system remain such that there is an appreciable likelihood it will lose its ground continuity due to the unpredictable conditions of exposure over the entire installation life of the system. Further, it is unrealistic to expect a raceway system to be periodically maintained by tightening or replacing raceway couplings. For these reasons, the panel should have accepted the concept of the original proposal requiring a separate equipment grounding conductor, which would better ensure the long-term safety of such systems.

POHOLSKI: Reject panel action to accept this comment. The use of conduit or metallic raceway that encloses the conductors provides an excellent fault return path. When a high current fault occurs, a shower of sparks can occur from the fittings and couplings. These sparks can set fires in nearby combustible materials and this can happen even when the raceway has been installed properly with all joints pulled up to normal tightness or a little more. As installations age with time the fittings and coupling of a raceway can corrode and even loosen from expansion and contraction and accidental contact, also service amperes are getting larger and require larger transformers that have larger fault current available. For these reasons the installation of an internal

equipment-grounding conductor, in parallel with the raceway conductors, can the current carried by the raceway be reduced. And also the all joints in conduit and raceways must be connected wrenchtight, using proper tools, for the raceway to function effectively as an equipment-grounding conductor. The grounding conductor with proper bonding in the system will reduce the difference in impedance.

(Log #778)

8- 58 - (348-4(a)): Accept
SUBMITTER: Richard E. Loyd, Perryville, AR
COMMENT ON PROPOSAL NO: 8-282
RECOMMENDATION: I support the panel action, continue to reject this proposal.
SUBSTANTIATION: Consideration should be given to the panel comments on the voting. The submitter has not provided any new substantiation from his proposal to the 1996 or 1999 NEC. Although workmanship cannot be regulated by this code, many changes have been made. This industry has made extensive improvements. The fittings industry continue to improve their fittings. Installation recommended practices have been developed and published to be used by national apprenticeship programs and for engineers and contractors to use as specification requirements. The articles governing raceways have been restructured to make support requirements easier to find in the code, which should emphasize the requirements.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 3
EXPLANATION OF NEGATIVE:
COX: See my explanation of negative vote on Comment 8-57.
GRIFFITH: See my explanation of negative vote on Comment 8-57.
POHOLSKI: Reject panel action to accept this comment and accept the proposal as submitted. See Comment 8-57 (348-4(a)).

(Log #840)

8- 59 - (348-4(a) (New)): Accept
SUBMITTER: Larry F. Miller, National Electrical Manufacturers Association (NEMA)
COMMENT ON PROPOSAL NO: 8-283
RECOMMENDATION: The panel should continue to reject this proposal.
SUBSTANTIATION: The submitter states that EMT does not provide adequate grounding due to separation, corrosion, loose fittings, thermal expansion, etc., and maintains that there are inadequate code requirements to cover these situations. On the contrary, 348-4 covers corrosion protection; 348-5 states EMT shall not be used where subject to severe physical damage; 348-10 requires couplings and connectors to be made up tight; 300-7(b) covers requirements for expansion fittings; 110-3(b) requires a product be installed in accordance with its listing; 110-12 requires electrical equipment be installed in a neat and workmanlike manner. When the current code requirements are followed, EMT has been proven to be an effective equipment grounding conductor.

Steel conduit manufacturers are in the process of finishing an Installation Guide that will provide information on the proper installation of steel conduit. This will likely be published before the new Code is. The NEMA Fittings Section (5-FB) has already completed an installation guide on fittings, which is available from NEMA. Both publications are written to encourage good workmanship and proper installation.

The submitter cites his concerns about EMT on rooftops. If the installation is one where the EMT would be subjected to severe physical damage, 348-5 says that it shall not be used. There are new pipe support systems on the market that reduce rooftop wear and tear and provide protective cushioning between mounting hardware and the roof.

The submitter states: "It has been proven everyday that the raceway system has a high impedance path." A 1994 research report on grounding by the Georgia Institute of Technology show sthe EMT actually has the lowest impedance path of all metal conduits.

There is nothing in the Code that prohibits the use of a supplemental grounding conductor. This should remain a design decision.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 3
EXPLANATION OF NEGATIVE:
COX: See my explanation of negative vote on Comment 8-57.
GRIFFITH: See my explanation of negative vote for Comment 8-57.
POHOLSKI: Reject panel ction to accept this comment and accept the proposal as submitted. See comment 8-57 (348-4(a)).

(Log #841)

8- 60 - (348-4(a) (New)): Accept
SUBMITTER: Larry F. Miller, National Electrical Manufacturers Association (NEMA)
COMMENT ON PROPOSAL NO: 8-282
RECOMMENDATION: The panel should reject this proposal.
SUBSTANTIATION: The submitter states that EMT does not provide adequate grounding due to separation, corrosion, loose fittings, thermal expansion, etc., and maintains that there are inadequate code requirements to cover these situations. On the contrary, 348-4 covers corrosion protection; 348-5 states EMT shall not be used where subject to severe physical damage; 348-10 requires couplings and connectors to be made up tight; 300-7(b) covers requirements for expansion fittings; 110-3(b) requires a product be installed in accordance with its listing; 110-12 requires electrical equipment be installed in a neat and workmanlike manner. When the current code requirements are followed, EMT has been proven to be an effective equipment grounding conductor.

We agree with M . Berman's negative that this issue has been considered by code-making panels 5 and 8 for several code cycle and that the substantiation has consisted primarily of reports of incidents where the EMT was improperly installed or subject to severe physical abuse, which is not permitted by 348-5(1). No new substantiation has been submitted this code cycle.

The submitter mentions a Factory Mutual report to substantiate this proposal. This report was prepared as substantiation for several proposals for the 1990 NEC. NEMA submitted a comment to reject the proposal. The Panel voted unanimously to accept the NEMA comments. In NEMA's substantiation the following points were made:

The FM loss reports contained a statement that "the exact ignition scenarios for these fires is open to discussion and speculation."

The installations cited in t =he loss reports had an average age of 40 years and did not reflect current products, code requirements, etc.

Several Code violations were described including improper grounding, no overcurrent protection, etc.

Inadequate maintenance was cited.

The submitter cites his concerns about EMT on rooftops. IF the installation is one where the EMT would be subjected to severe physical damage, 348-5 says that it shall not be used. There are new pipe support systems on the market that reduce rooftop wear and tear and provide protective cushioning between mounting hardware and the roof.

Steel conduit manufacturers are in the process of finishing an Installation Guide that will provide information on the proper installation of steel conduit. This will be published before the next Code is published. The NEMA Fittings Section (5-FB) has completed an installation guide on fittings, the primary element in connections, which is available from NEMA. Both publications are written to encourage good workmanship and proper installation.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 3
EXPLANATION OF NEGATIVE:
COX: See my explanation of negative vote on Comment 8-57.
GRIFFITH: See my explanation of negative vote for Comment 8-57.
POHOLSKI: Reject panel action to accept this comment and accept the proposal as submitted. See Comment 8-57 (348-4(a)).

(Log #1220)

8- 61 - (348-4(a)): Accept
SUBMITTER: Dann Strube, Lanesville, IN
COMMENT ON PROPOSAL NO: 8-282
RECOMMENDATION: This proposal should remain as rejected.
SUBSTANTIATION: The proposer cites accidents caused by improper installation, poor workmanship and poor maintenance. The code cannot address damage that occurs after the system is installed. Proper inspection and training of electrical workers will take care of proper installation and workmanship issues.
The use of EMT without a separate grounding conductor has a proven track record over many years with millions of feet in place. The current code requirements are adequate.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 3
EXPLANATION OF NEGATIVE:
COX: See my explanation of negative vote on Comment 8-57.
GRIFFITH: See my explanation of negative vote for Comment 8-57.
POHOLSKI: Reject panel action to accept this comment of this proposal and accept the proposal as submitted. See Comment 8-57 (348-4(a)).

(Log #1221)

8- 62 - (348-4(a)): Accept
SUBMITTER: Dann Strube, Lanesville, IN
COMMENT ON PROPOSAL NO: 8-283
RECOMMENDATION: This proposal should remain as rejected.
SUBSTANTIATION: The proposer cites accidents caused by improper installation, poor workmanship and poor maintenance. The code cannot address damage that occurs after the system is installed. Proper inspection and training of electrical workers will take care of proper installation and workmanship issues.
The use of EMT without a separate grounding conductor has a proven track record over many years with millions of feet in place. The current code requirements are adequate.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 3
EXPLANATION OF NEGATIVE:
COX: See my explanation of negative vote on Comment 8-57.
GRIFFITH: See my explanation of negative vote for Comment 8-57.
POHOLSKI: Reject panel action to accept this comment and accept the proposal as submitted. See Comment 8-57 (348-4(a)).

(Log #1137)

8- 63 - (348-4(a), Exception): Reject
SUBMITTER: Elliot Rappaport, Electro Technology Consulltants
COMMENT ON PROPOSAL NO: 8-282
RECOMMENDATION: Revise wording of proposal, as indicated below, and relocate as an exception to new 348-60 as accepted in Proposal 8-305.
Exception: A separate equipment grounding conductor, sized as required in Section 250-122, shall be installed in all electrical metallic tubing trade sized 1 in. and smaller.
SUBSTANTIATION: This proposal, and similar ones in at least the previous three code cycles, of which I am aware of, provide substantiation that there is a problem in the field. It appears that the panel members who have voted negative on this proposal would require a detailed listing of a multitude of new deaths and electrocutions in order to accept this proposal. This motivation for rejection appears to be that we live in a perfect world, the code is perfect, UL testing is totally adequate for all conditions, and that electricians follow all of the manufacturers' recommended installation procedures. If all of that were true, we would not have the examples of electrocutions as reported over the past nine years, of which I am personally aware of as a member of Code-Making Panel 5. During the comment phase of the 1999 NEC, it appeared that Code-Making Panel 5 might accept a similar proposal, the Technical Correlating Committee ruled that this issue was the responsibility of Code-Making Panel 8. (See Comment 5-186, A98 ROC).
Most of the previous documentation appears to be related to small branch circuits including roof top circuits. "Large" EMT tubing is generally not subject to the daily contact that small branch circuits are. It is the intent of the revised text to provide additional requirements for the smaller ampacity circuits that are the most susceptible to accidental contact that destroys the equipment ground continuity. Even when installed properly, an inspector or an electrician will seldom know what kind of abuse the electrical installation is likely to be subjected to.
No detailed substantiation for why 1 in. is selected as the upper limit for requiring a supplementary equipment grounding conductor. The choice was arbitrary and is based upon my experience in designing and examining electrical installations after construction. I leave it to Code-Making Panel 8 to modify the indicated upper limit, as it sees fit, but to maintain the concept that certain installations require a supplementary equipment grounding conductor in order to ensure an adequate ground return path.
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter has not provided sufficient technical substantiation to require a separate equipment grounding conductor in 1 inch and smaller raceways.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NEGATIVE: 4
EXPLANATION OF NEGATIVE:
GRIFFITH: Although I agree with the panel that the submitter of Comment 8-63 has not substantiated his proposed wording, it does for certain designs of EMT raceway systems offer a solution to a loss of ground continuity possibility believed to exist over the life of an installation. See also my explanation of negative vote on Comment 8-57.
POHOLSKI: Reject panel action to reject this comment and accept the proposal as submitted. See Comment 8-57 (348-4(a)).
ROWE: I believe there has been provided sufficient substantiation to amend the NEC to require the installation of a separate equipment grounding conductor for electrical circuits installed in electrical metallic tubing, trade size 1 inch and smaller.
My personal observations and experience while conducting premises electrical inspections has convinced me that a significant hazard exists by relying on the mechanical integrity of the (EMT) raceway installation to provide an adequate, low impedance grounding path for fault current. While I agree that some failures of the grounding integrity is attributable to poor workmanship during installation of the raceway system and some failures are attributable to a lack of proper maintenance, none the less people are being killed and injured as a result of fault current present on this type of raceway installation.
Aside from the premises installations that I have officially inspected, I have informally noted, at each of the hotel/motels I have stayed since this grounding conductor issue was proposed to the panel several cycles ago. Almost without exception, there have been installations of EMT raceway that did not afford a continuous grounding path and were not NEC compliant. Some due to improper use of the product, some due to workmanship or lack of proper maintenance and perhaps some where attributable to noncompliant or substandard materials.
Each of the installations I refer to was typically size 1/2 or 3/4 inch trade size. However, I believe that the requirement for a separate grounding conductor should apply to 1 in. trade size and smaller due to the design of the fitting associated with size 1/2 through 1 in. and the greater incident of failure that I personally have knowledge of falls within that size range.
It makes no difference to an electrocution victim why the fault current was present, or why an adequate low impedance path to earth was not available. Whether deficient because of workmanship, defective material or other reason the net result is the same, unnecessary death or injury.
SIMPSON: The panel action was to reject this proposal, however I still maintain that there is sufficient substantiation that a separate equipment grounding conductor in 1 inch and smaller EMT raceways would increase safety to the public, equipment, and property. GRIFFITH: See my explanation of negative vote for Comment 8-57.

(Log #760)

8- 64 - (348-5(6) (New)): Accept
SUBMITTER: Richard E. Loyd, Perryville, AR
COMMENT ON PROPOSAL NO: 8-286
RECOMMENDATION: I support the panel action to reject this proposal it is unsubstantiated and overly restrictive.

SUBSTANTIATION: The submitter has not provided any substantiation. EMT is used successfully outdoors all over the US and where there are extreme corrosion conditions the code and the listing requirements (300-6 and 110-3(b)) covers this very adequately.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NEGATIVE: 2
EXPLANATION OF NEGATIVE:
GRIFFITH: It is believed that the original proposal, 8-286 expresses valid concerns about the long-term suitability of EMT on outdoor rooftops, where the raceway is exposed to the elements over its instalaltion life.
POHOLSKI: Reject the panel action to accept this comment and accept the proposal as submitted. See Log #260 on Proposal 8-286 as substantiation for this rejection.

(Log #2287)

8- 65 - (348-5(6) (New)): Reject
SUBMITTER: Christopher R. Pharo, Marlton, NJ
COMMENT ON PROPOSAL NO: 8-286
RECOMMENDATION: I would urge acceptance of this proposal.
SUBSTANTIATION: If EMT is continued to be used on rooftops as an acceptable wiring method, then a grounding electrode conductor should be installed.
EMT installed on rooftops is subject to the weather and physical damage.
The weather has an obvious detrimental effect on the raceway due to its thinwall steel design. The fittings used, when compared to its rigid steel equivalent, also has a shorter life expectancy.
Rooftops are rugged places. Service contractors are constantly stepping on conduits to get across the roof. These same conduits are also used to help pull yourself up or lower yourself into a better position.
It is because of the two scenarios, that I believe a good installation may become faulty, thus creating a safety hazard.
While I do not support the need for an EGC in EMT in other parts of the Code (Proposal 8-282), I do feel it is necessary in this particular application.
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter has not provided sufficient technical substantiation to require a separate equipment grounding conductor for rooftop installations.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NEGATIVE: 2
EXPLANATION OF NEGATIVE:
POHOLSKI: Reject the Panel Action to reject this comment and accept the proposal as submitted. See Log #260 on Proposal 8-286 as substantiation for this rejection. See Comment 8-57 (348-4(a)).
SIMPSON: The panel action was to reject this proposal. I disagree and believe that there is plenty of proof that EMT does not hold up when used on rooftops and such use needs to be further restricted.

(Log #530)

8- 66 - (348-13): Accept
SUBMITTER: Craig M. Wellman, Newark, DE
COMMENT ON PROPOSAL NO: 8-277
RECOMMENDATION: Revise last sentence of proposal for this section as follows:
"... fastened within ~~3 ft (914 mm)~~ 900 mm (3 ft) of termination...".
SUBSTANTIATION: The proposal missed this metrication conversion. This comment was developed by the NEC Technical Correlating Committee Metrication Task Group which included: James Daly; Bruce Barrow; Michael Callanan; Richard Berman; Ed Lawry; Neil LaBrake, Jr.; Jim Pauley; Jack A. Gruber; George Dauberger; Ravi Ganatra; and Craig Wellman.
PANEL ACTION: Accept.
PANEL STATEMENT: The change is editorial in nature.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #2330)

8- 67 - (348-13): Accept in Principle
SUBMITTER: Wayne A. Lilly, Bridgewater, VA
COMMENT ON PROPOSAL NO: 8-293
RECOMMENDATION: Revise the proposed language in this Section so it will be as follows:
"(A) Securely Fastened. EMT shall be installed as a complete system as provided in Article 300. ~~It~~ Each tubing run between any combination of outlet boxes, junction boxes, device boxes, cabinets, conduit bodies, or other tubing termination shall be securely fastened in place at least every 3 m (10 ft). In addition, EMT shall be securely fastened within 914 mm (3 ft) of each outlet box, junction box, device box, cabinet, conduit body, or other tubing termination."
SUBSTANTIATION: The substantiation for Proposal 8-162 of the 1998 ROP was "Many interpretations have been made pertaining to this situation where installers wish to "take credit" for supports on opposite sides of an outlet box, junction box, device box, etc. The new wording would clarify the intent that supports are needed for each conduit terminating in such boxes, not just on one side of the box."
The language accepted in this proposal, Proposal 8-293, allows this section to be interpreted as it was prior to the 1999 NEC. This will cause the code to regress by creating the same problem that was solved by Proposal 8-162 of the 1999 NEC. The proposed language of this comment maintains the corrective work done in the 1999 NEC while still addressing the concerns of the person making the proposal for the 2002 NEC.
PANEL ACTION: Accept in Principle.
Revise 348.30(A) in the 2002 NEC Draft and Proposal 8-276 to read:
(A) Securely Fastened. EMT shall be securely fastened in place at least every 3 m (10 ft). In addition, each EMT run between termination points shall be securely fastened within 900 mm (3 ft) of each outlet box, junction box, device box, cabinet, conduit body, or other tubing termination.
PANEL STATEMENT: Editorial changes were made to correlate the comment with the action taken on Proposal 8-276.
The comment language was reorganized to apply to the termination points rather than the 3 m (10 ft) requirement. These changes were made to address the submitter's concerns that the requirement for securing within 900mm (3 ft) of termination points be made clear.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #792)

8- 68 - (348-22(a)): Accept
SUBMITTER: David H. Kendall, Carlon
COMMENT ON PROPOSAL NO: 8-306
RECOMMENDATION: New paragraph in proposed Section 349.22(a):
Cables shall be permitted to be installed where such use is permitted by the respective cable articles. The number of cables shall not exceed the allowable percentage fill specified in Table 1, Chapter 9.
SUBSTANTIATION: This proposed text is to harmonize with the other raceway articles and allows cables to be installed in the raceway as long as the respective cable article permits it.
PANEL ACTION: Accept.
PANEL STATEMENT: The panel directs that the paragraph be arranged as a second paragraph to correlate with the same section in other articles.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #889)

8- 69 - (348-60 (New)): Reject
SUBMITTER: Joel A. Rencsok, Scottsdale, AZ
COMMENT ON PROPOSAL NO: 8-305
RECOMMENDATION: This proposal should have been rejected.
SUBSTANTIATION: There was no technical substantiation submitted.
Just because an article did not have a grounding section is not a requirement to add one.

I agree with Mr. Griffith's statement to this proposal.
It appears a panel member who submits a proposed change does not have to submit the same technical substantiation as people who are not members.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel action is consistent with Section 250-118(4). This change correlates Articles 250 and 348.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
GRIFFITH: It is not believed, in general, that EMT raceway systems are suitable to be recognized as a dependable equipment grounding conductor over the life of an installation. See also my explanation of negative vote for Comment 8-57.

(Log #1732)

8- 70 - (348-60 (New)): Accept
SUBMITTER: Edward W. Langschwager, Langschwager Electric Corp.
COMMENT ON PROPOSAL NO: 8-305
RECOMMENDATION: I support Proposal 8-305 and urge acceptance as stated by the proposal in its original form.
SUBSTANTIATION: Let there be no question, that if the raceway is permitted as an equipment grounding conductor, the Code states that fact clearly!
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
GRIFFITH: See my explanation of negative vote on Comment 8-69.

ARTICLE 349 — FLEXIBLE METALLIC TUBING: TYPE FMT

(Log #2047)

8- 71 - (349-60): Accept in Principle
SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc.
COMMENT ON PROPOSAL NO: 8-306
RECOMMENDATION: Revise as follows:
Flexible metallic tubing shall be permitted as a grounding means as covered in Section 250-118(8).
SUBSTANTIATION: The wording in the proposal essentially takes a fine print note and makes it normal sized text, which leaves it improperly worded for a rule. This comment improves the syntax.
PANEL ACTION: Accept in Principle.
Revise 349.60 of the 2002 NEC Draft as follows:
349.60 Grounding. FMT shall be permitted as an equipment grounding conductor where installed in accordance with 250.118(8).
PANEL STATEMENT: The panel action on the submitter's proposed language has enhanced clarity.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
POHOLSKI: Reject panel action to accept in principle this comment. Flexible metallic tubing is installed because it is flexible. When it is installed at a motor it moves from vibration, when it is installed at fixture or box it acts as an expansion joint and moves over time. Bonding jumps should be installed on all flexible metallic tubing for these reasons. Also see Comment 8-57 (348-4(a)).

ARTICLE 350 — FLEXIBLE METAL CONDUIT: TYPE FMC

(Log #98)

8- 72 - (350-16): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 8-325
RECOMMENDATION: The Technical Correlating Committee understands that the panel action replaces the last sentence of 350-26 in Proposal 8-315. It was the action of the Technical Correlating Committee that this Proposal be reconsidered and that the panel utilize the common numbering system for the text in 350-26. This action will be considered by the Panel as a Public Comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
PANEL STATEMENT: The location of the section is correct per the 2002 NEC Draft.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #793)

8- 73 - (350-22(a)): Accept
SUBMITTER: David H. Kendall, Carlon
COMMENT ON PROPOSAL NO: 8-315
RECOMMENDATION: New paragraph in proposed Section 350.22(a):
Cables shall be permitted to be installed where such use is permitted by the respective cable articles. The number of cables shall not exceed the allowable percentage fill specified in Table 1, Chapter 9.
SUBSTANTIATION: This proposed text is to harmonize with the other raceway articles and allows cables to be installed in the raceway as long as the respective cable article permits it.
PANEL ACTION: Accept.
PANEL STATEMENT: The panel directs that the paragraph be arranged as a second paragraph to correlate with the same section in other articles.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #CC800)

8- 73a - (350-26): Accept
SUBMITTER: CMP 8
COMMENT ON PROPOSAL NO: 8-315
RECOMMENDATION: In the 2002 NEC Draft revise Section 350.26 as follows:
350.26 Bends-Number in One Run. There shall not be more than the equivalent of four quarter bends (360 degrees total) between pull points, e.g., conduit bodies and boxes.
Delete remainder of text in this section.
Amend the text in Proposal 8-315 to read:
350.24 Bends - How Made. Bends in conduit shall be made so that the conduit will not be damaged and the internal diameter of the conduit will not be effectively reduced. Bends shall be permitted to be made manually without auxiliary equipment. The radius of the curve to the centerline of any bend shall not be less than shown in Table 346.24 using the column "Other Bends".
SUBSTANTIATION: The panel action clarifies the location and content of Sections 350.24 and 350.26.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #959)

8- 74 - (350-30 Exception No. 4 (New)): Hold
SUBMITTER: Joseph A. Ross, Ross Electrical Assessments
COMMENT ON PROPOSAL NO: 8-315
RECOMMENDATION: Add new text as follows:
Exception No. 4: Lengths not exceeding 6-feet (1.83m) from an outlet for connection within an accessible ceiling to lighting fixtures or equipment.

SUBSTANTIATION: This revised exception is not to be considered new material. Note: The proper text presently appears in Sections 333-7(b)(3), 334-10(b), and 336-18 Exception No. 2. This Comment corrects an omission. See companion Comments for Sections 331-30(a) Exception and 3XX-30(a) Exception.

The omission must be corrected as 6 foot lengths (whips) are presently manufactured and listed and in common use today. Some inspectors have rejected their use.

The term "whip" is not defined in the NEC, but everyone knows what a "whip" is and takes for granted that flexible raceways and cables are permitted for this use. However, many misinterpret that Section 410-67(c) addresses "whips" and believe the method is covered. It is not.

Section 410-67(c) was introduced into the NEC to permit a transition from the hi-temp fixture wires of a recessed incandescent fixture to lo-temp branch-circuit wires. That is, a recessed incandescent fixture was provided with a 6 foot "tail" of flexible metal raceway or metal-sheathed cable containing hi-temp fixture wire for connection, within a field installed junction box, to lo-temp branch-circuit wiring. The 6 foot "tail" assured that the heat of the fixture would not be transmitted to the branch-circuit wiring.

This method provided for the fixture to be installed in a plastered or sheetrock (nonaccessible) ceiling cavity and the junction box being "placed" rather than rigidly supported and fastened. The unsupported "tail" and branch-circuit wiring assures that the box is accessible and may be retrieved (for any reason) through the fixture trim opening by removing the fixture.

A "whip" application is quite different, i.e., a "whip" is permitted to be unsupported, not more than 6-feet in length, and run from an accessible and rigidly supported and fastened outlet box for connection within an accessible ceiling to lighting fixtures or equipment.

PANEL ACTION: Hold.

PANEL STATEMENT: In accordance with Section 4-4.6.2.2(a) of the NFPA Regulations Governing Committee Projects this comment is held as the proposed exception introduces new material that has not had public review. There were no technical changes to the support requirements in Proposal 8-315.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:

AFFIRMATIVE: 14

(Log #377)

8- 75 - (350-30(a) Exception No. 4): Hold

SUBMITTER: Dan Leaf, Palmdale, CA

COMMENT ON PROPOSAL NO: 8-315

RECOMMENDATION: Accept in principle add the following: Exception No. 4: The support interval from terminations at luminaires or equipment in or on suspended ceilings shall be permitted to be increased where all the following conditions are met: (1) structural members (including support wires or rods and ceiling grid members, where permitted to be used) do not permit the support interval required by this section; (2) the nearest readily available support member is used; (3) the support interval does not exceed 1.4m (4 1/2 ft); and (4) the FMC is above the suspended ceiling.

SUBSTANTIATION: Similar relaxation of support requirements are provided for other wiring methods e.g., Type AC, MC, NMSC cables, RMC, IMC, EMT, which should be applicable to FMC. The proposal relaxes the 12 in. requirement only where no suitable support is available but requires fastening to suitable support that is available at less than 4 1/2 ft intervals, such as a structural ceiling or suspended ceiling assembly.

PANEL ACTION: Hold.

PANEL STATEMENT: In accordance with Section 4-4.6.2.2(a) of the NFPA Regulations Governing Committee Projects this comment is held as the proposed exception introduces new material that has not had public review. There were no technical changes to the support requirements in Proposal 8-315.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:

AFFIRMATIVE: 14

ARTICLE 351 — LIQUIDTIGHT FLEXIBLE METAL CONDUIT: TYPE LFMC

(Log #384)

8- 76 - (351-8 Exception No. 4): Hold

SUBMITTER: Dan Leaf, Palmdale, CA

COMMENT ON PROPOSAL NO: 8-329

RECOMMENDATION: Accept in principle, add the following: Exception No.4: The support interval from terminations at luminaires or equipment in or on suspended ceilings shall be permitted to be increased where all the following conditions are met: (1) structural members (including support wires or rods and ceiling grid members, where permitted to be used) do not permit the support interval required by this section; (2) the nearest readily available support member is used; (3) the support interval does not exceed 1.4 m (4 1/2 ft.); and (4) the LTFMC is above the suspended ceiling.

SUBSTANTIATION: Similar relaxation of support requirements are provided for other wiring methods e.g., Type AC, MC, NMSC cables, RMC, IMC, EMT. The proposal relaxes the 12 in. requirement only where no suitable support is available but requires fastening to suitable support that is available at less than 4 1/2 ft. intervals, such as a structural ceiling or suspended ceiling assembly.

If this proposal is accepted the panel may wish to provide something similar for LTFNMC.

PANEL ACTION: Hold.

PANEL STATEMENT: In accordance with Section 4-4.6.2.2(a) of the NFPA Regulations Governing Committee Projects this comment is held as the proposed exception introduces new material that has not had public review. There were no technical changes to the support requirements in Proposal 8-329.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:

AFFIRMATIVE: 14

(Log #99)

8- 77 - (351-12 (New)): Accept

SUBMITTER: Technical Correlating Committee National Electrical Code

COMMENT ON PROPOSAL NO: 8-339

RECOMMENDATION: It was the action of the Technical Correlating Committee that this Proposal be reconsidered and correlated with the action on Proposal 8-327. This action will be considered by the Panel as a Public Comment.

SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.

PANEL ACTION: Accept.

In the 2002 NEC Draft revise 3XX.26 as follows:

3XX.26 Bends-Number in One Run. There shall not be more than the equivalent of four quarter bends (360 degrees total) between pull points, e.g., conduit bodies and boxes.

Delete remainder of text in this section.

Amend the text in Proposals 8-339 and 8-327 to read:

3XX.24 Bends - How Made. Bends in conduit shall be made so that the conduit will not be damaged and the internal diameter of the conduit will not be effectively reduced. Bends shall be permitted to be made manually without auxiliary equipment. The radius of the curve to the centerline of any bend shall not be less than shown in Table 346.24 using the column "Other Bends".

PANEL STATEMENT: The panel action clarifies the location and content of 3XX.24 and 3XX.26.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:

AFFIRMATIVE: 14

(Log #100)

8- 78 - (351-28): Accept

SUBMITTER: Technical Correlating Committee National Electrical Code

COMMENT ON PROPOSAL NO: 8-356

RECOMMENDATION: It was the action of the Technical Correlating Committee that this Proposal be reconsidered and correlated with the action on Proposal 8-328. This action will be considered by the Panel as a Public Comment.

SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.

PANEL ACTION: Accept.
PANEL STATEMENT: The text as shown in the 2002 NEC Draft is correct.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #960)

8- 79 - (3XX-30(a), Exception No. 3): Hold
SUBMITTER: Joseph A. Ross, Ross Electrical Assessments
COMMENT ON PROPOSAL NO: 8-327
RECOMMENDATION: Revise Exception No. 3 as follows:
Exception No. 3: Lengths not exceeding 6 ft (1.83m) from an outlet for connection within an accessible ceiling to lighting fixtures or equipment.
SUBSTANTIATION: This revised exception is not to be considered new material. Note: The proper text presently appears in Sections 333-7(b)(3), 334-10(b), and 336-18 Exception No. 2. This Comment corrects an omission. The Exception is revised as it is very unlikely that LFMC would be permitted to contain hi-temp conductors as addressed by Section 410-67(c). See companion Comments for Sections 331-30(a) Exception, 350-30 Exception and 3XX(51)-30(a) Exception No. 4.

The omission must be corrected as 6 foot lengths (whips) are presently manufactured and listed and in common use today. Some inspectors have rejected their use.

The term "whip" is not defined in the NEC, but everyone knows what a "whip" is and takes for granted that flexible raceways and cables are permitted for this use. However, many misinterpret that Section 410-67(c) addresses "whips" and believe the method is covered. It is not.

Section 410-67(c) was introduced into the NEC to permit a transition from the hi-temp fixture wires of a recessed incandescent fixture to lo-temp branch-circuit wires. That is, a recessed incandescent fixture was provided with a 6 foot "tail" of flexible metal raceway or metal-sheathed cable containing hi-temp fixture wire for connection, within a field installed junction box, to lo-temp branch-circuit wiring. The 6 foot "tail" assured that the heat of the fixture would not be transmitted to the branch-circuit wiring.

This method provided for the fixture to be installed in a plastered or sheetrock (nonaccessible) ceiling cavity and the junction box being "placed" rather than rigidly supported and fastened. The unsupported "tail" and branch-circuit wiring assures that the box is accessible and may be retrieved (for any reason) through the fixture trim opening by removing the fixture.

A "whip" application is quite different, i.e., a "whip" is permitted to be unsupported, not more than 6 feet in length, and run from an accessible and rigidly supported and fastened outlet box for connection within an accessible ceiling to lighting fixtures or equipment.
PANEL ACTION: Hold.
PANEL STATEMENT: In accordance with Section 4-4.6.2.2(a) of the NFPA Regulations Governing Committee Projects this comment is held as the proposed exception introduces new material that has not had public review. There were no technical changes to the support requirements in Proposal 8-327.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #961)

8- 80 - (3YY-30(b)): Hold
SUBMITTER: Joseph A. Ross, Ross Electrical Assessments
COMMENT ON PROPOSAL NO: 8-328
RECOMMENDATION: Change 3YY.30(1) to 3YY.30(a) and revise the third phrase of (b) as follows:
..., or where installed in lengths not exceeding 6-feet (1.83m) from an outlet for connection within an accessible ceiling to lighting fixtures or equipment.
SUBSTANTIATION: This revised third phrase of (b) is not to be considered new material. Note: The proper text presently appears in Sections 333-7 (b)(3), 334-10(b), and 336-18 Exception No. 2. This Comment corrects an omission. The phrase is revised, as LFNC is not permitted to contain hi-temp conductors as addressed by Section 410-67(c). See companion Comments for Sections 331-30(a) Exception, 350-30 Exception and 3XX(51)-30(a) Exception No. 4.

The omission must be corrected as 6 foot lengths (whips) are presently manufactured and listed and in common use today. Some inspectors have rejected their use.

The term "whip" is not defined in the NEC, but everyone knows what a "whip" is and takes for granted that flexible raceways and cables are permitted for this use. However, many misinterpret that Section 410-67 (c) addresses "whips" and believe the method is covered. It is not.

Section 410-67(c) was introduced into the NEC to permit a transition from the hi-temp fixture wires of a recessed incandescent fixture to lo-temp branch-circuit wires. That is, a recessed incandescent fixture was provided with a 6 foot "tail" of flexible metal raceway or metal-sheathed cable containing hi-temp fixture wire for connection, within a field installed junction box, to lo-temp branch-circuit wiring. The 6 foot "tail" assured that the heat of the fixture would not be transmitted to the branch-circuit wiring.

This method provided for the fixture to be installed in a plastered or sheetrock (nonaccessible) ceiling cavity and the junction box being "placed" rather than rigidly supported and fastened. The unsupported "tail" and branch-circuit wiring assures that the box is accessible and may be retrieved (for any reason) through the fixture trim opening by removing the fixture.

A "whip" application is quite different, i.e., a "whip" is permitted to be unsupported, not more than 6 feet in length, and run from an accessible and rigidly supported and fastened outlet box for connection within an accessible ceiling to lighting fixtures or equipment.
PANEL ACTION: Hold.
PANEL STATEMENT: In accordance with Section 4-4.6.2.2(a) of the NFPA Regulations Governing Committee Projects this comment is held as the proposed exception introduces new material that has not had public review. There were no technical changes to the support requirements in Proposal 8-328.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #101)

8- 81 - (351-31 (New)): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 8-359
RECOMMENDATION: It was the action of the Technical Correlating Committee that this Proposal be reconsidered and correlated with the action on Proposal 8-328. This action will be considered by the Panel as a Public Comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
In the 2002 NEC Draft revise 3YY.26 as follows:
3YY.26 Bends-Number in One Run. There shall not be more than the equivalent of four quarter bends (360 degrees total) between pull points, e.g., conduit bodies and boxes.
Delete remainder of text in this section.
Amend the text in Proposals 8-359 and 8-328 to read:
3YY.24 Bends - How Made. Bends in conduit shall be made so that the conduit will not be damaged and the internal diameter of the conduit will not be effectively reduced. Bends shall be permitted to be made manually without auxiliary equipment. The radius of the curve to the centerline of any bend shall not be less than shown in Table 346.24 using the column "Other Bends".
PANEL STATEMENT: The panel action clarifies the location and content of 3YY.24 and 3YY.26.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #768)

8- 82 - (351-33 (New)): Reject
SUBMITTER: Richard E. Loyd, Perryville, AR
COMMENT ON PROPOSAL NO: 8-363
RECOMMENDATION: Reconsider and accept the proposal.
SUBSTANTIATION: The proponent of this proposal represents a manufacturer of this product and I agree with him that these construction requirements are useful tools for the installer. He can then makes a comparison of the product with similar products prior to selecting the safest and best product for the installation. It is consistent with other raceway articles to have construction requirements included.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel reaffirms its position as stated in the panel statement on Proposal 8-363

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #794)

8- 83 - (3XX-22(a)): Accept
Note: The Technical Correlating Committee directs that the title of 3XX.22 be revised to read: "Number of Conductors or Cables." to correlate with the acceptance of this Comment.
SUBMITTER: David H. Kendall, Carlon
COMMENT ON PROPOSAL NO: 8-327
RECOMMENDATION: New paragraph in proposed Section 3XX.22(a):
Cables shall be permitted to be installed where such use is permitted by the respective cable articles. The number of cables shall not exceed the allowable percentage fill specified in Table 1, Chapter 9.
SUBSTANTIATION: This proposed text is to harmonize with the other raceway articles and allows cables to be installed in the raceway as long as the respective cable article permits it.
PANEL ACTION: Accept.
PANEL STATEMENT: The panel directs that the paragraph be arranged as a second paragraph to correlate with the same section in other articles.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #795)

8- 84 - (3YY-22): Accept
SUBMITTER: David H. Kendall, Carlon
COMMENT ON PROPOSAL NO: 8-328
RECOMMENDATION: New paragraph in proposed Section 3YY.22:
Cables shall be permitted to be installed where such use is permitted by the respective cable articles. The number of cables shall not exceed the allowable percentage fill specified in Table 1, Chapter 9.
SUBSTANTIATION: This proposed text is to harmonize with the other raceway articles and allows cables to be installed in the raceway as long as the respective cable article permits it.
PANEL ACTION: Accept.
PANEL STATEMENT: The panel directs that the paragraph be arranged as a second paragraph to correlate with the same section in other articles.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

ARTICLE 352 — SURFACE METAL RACEWAYS AND SURFACE NONMETALLIC RACEWAYS

(Log #761)

8- 85 - (352-40): Accept in Principle
SUBMITTER: Richard E. Loyd, Perryville, AR
COMMENT ON PROPOSAL NO: 8-377
RECOMMENDATION: Reconsider and accept this proposal.
SUBSTANTIATION: The comments in the voting are correct. The term "organic" will now cover all organic coatings including enamel.
PANEL ACTION: Accept in Principle.
Revise 3VV.100(B) in the 2002 NEC Draft to read:
(B) Corrosion Protection. Steel raceways and accessories shall be protected against corrosion by galvanizing or an organic coating.
FPN: Enamel and PVC coatings are examples of organic coatings that provide corrosion protection.
PANEL STATEMENT: The panel action has addressed the submitter's concern and the revised text reflects current industry technology. The new Fine Print Note is intended to enhance understanding of this section.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
COMMENT ON AFFIRMATIVE:
BERMAN: In the panel statement, the word "technology" should be "terminology."

LILLY: I agree with Mr. Berman's comment on the affirmative vote. The word "technology" should be replaced with the word "terminology" in the panel statement.

(Log #796)

8- 86 - (3TT-22): Accept in Principle
SUBMITTER: David H. Kendall, Carlon
COMMENT ON PROPOSAL NO: 8-366
RECOMMENDATION: New paragraph in proposed Section 3TT.22:
Cables shall be permitted to be installed where such use is permitted by the respective cable articles. The number of cables shall not exceed the allowable percentage fill specified in Table 1, Chapter 9.
SUBSTANTIATION: This proposed text is to harmonize with the other raceway articles and allows cables to be installed in the raceway as long as the respective cable article permits it.
PANEL ACTION: Accept in Principle.
Revise 3TT.22 to add "or cables" after "conductors" in the title and in the first sentence.
Add a new second sentence in the first paragraph to read:
Cables shall be permitted to be installed where such use is permitted by the respective cable articles.
PANEL STATEMENT: The second sentence proposed in the comment was deleted because it is not applicable to this type of raceway. The title and first sentence were amended to correlate with the accepted language.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #797)

8- 87 - (3UU-22): Accept in Principle
SUBMITTER: David H. Kendall, Carlon
COMMENT ON PROPOSAL NO: 8-370
RECOMMENDATION: New paragraph in proposed Section 3UU.22:
Cables shall be permitted to be installed where such use is permitted by the respective cable articles. The number of cables shall not exceed the allowable percentage fill specified in Table 1, Chapter 9.
SUBSTANTIATION: This proposed text is to harmonize with the other raceway articles and allows cables to be installed in the raceway as long as the respective cable article permits it.
PANEL ACTION: Accept in Principle.
Revise 3UU.22 to add "or cables" after "conductors" in the title and in the first sentence.
Add a new second sentence in the first paragraph to read:
Cables shall be permitted to be installed where such use is permitted by the respective cable articles.
PANEL STATEMENT: The second sentence proposed in the comment was deleted because it is not applicable to this type of raceway. The title and first sentence were amended to correlate with the accepted language.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

ARTICLE 354 — UNDERFLOOR RACEWAYS

(Log #437)

8- 88 - (354-7): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
COMMENT ON PROPOSAL NO: 8-387
RECOMMENDATION: Accept proposal.
SUBSTANTIATION: What are the criteria for an abandoned or discontinued outlet? Who determines this? A period of nonuse should not justify removal of circuit conductors, since use may by resumed. A properly wired pedestal or box incurs no electrical hazard due to nonuse. As long as occupants do not deem an outlet to be a tripping hazard, they are unlikely to remove it and the supply conductors. This is a virtually unenforceable rule since inspections are not usually required when wiring is no longer in use and the authority having jurisdiction cannot monitor this condition.
PANEL ACTION: Reject.

PANEL STATEMENT: The panel reaffirms its position as stated in its statement on Proposal 8-387. A period of "nonuse" does not constitute an abandoned outlet.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

ARTICLE 356 — CELLULAR METAL FLOOR RACEWAYS

(Log #439)

8- 89 - (356-7): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
COMMENT ON PROPOSAL NO: 8-393
RECOMMENDATION: Accept proposal.
SUBSTANTIATION: What are the determinants of an abandoned or discontinued outlet? Who determines this? A period of nonuse should not justify removal of circuit conductors, since use may be resumed. A properly wired pedestal fitting or box incurs no electrical hazard due to nonuse. As long as occupants do not deem an outlet to be a tripping hazard, they are unlikely to remove it and the supply conductors. This is a virtually unenforceable rule since inspections are not usually required when wiring is no longer in use and the authority having jurisdiction cannot monitor this condition. The only other rule for removal of unused wiring is 305-3(d).
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Comment 8-88.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

ARTICLE 358 — CELLULAR CONCRETE FLOOR RACEWAYS

(Log #436)

8- 90 - (358-13): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
COMMENT ON PROPOSAL NO: 8-396
RECOMMENDATION: Accept proposal.
SUBSTANTIATION: What are the criteria for an abandoned or discontinued outlet? Who determines this? A period of nonuse should not justify removal of circuit conductors, since use may be resumed. A properly wired pedestal fitting or box incurs no electrical hazard due to nonuse. As long as occupants do not deem an outlet to be a tripping hazard they are unlikely to remove it and the supply conductors. This is a virtually unenforceable rule since inspections are not usually required when wiring is no longer in use and the authority having jurisdiction cannot monitor this condition. The only other rule for removal of wiring is 305-3(d).
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Comment 8-88.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

ARTICLE 362 — METAL WIREWAYS AND NONMETALLIC WIREWAYS

(Log #762)

8- 91 - (362-15(1)(2)): Accept in Principle
SUBMITTER: Richard E. Loyd, Perryville, AR
COMMENT ON PROPOSAL NO: 8-416
RECOMMENDATION: Reconsider and revise as per Mr. Berman's comment on his negative vote.
SUBSTANTIATION: I believe the panel statement is incorrect and misleads the public. PVC is an excellent material for many corrosive environments but not all!! I believe both Mr. Berman's and my comments on the voting should be considered and proposed wording revise.
Note: Supporting material is available for review at NFPA Headquarters.
PANEL ACTION: Accept in Principle.
In the 2002 NEC Draft:
The revision to 3BB.10(1) remains accepted as submitted in Proposal 8-416.
Revise Section 3BB.10(2) to read as follows:
"(2). Where subject to corrosive environments where identified for the use."
PANEL STATEMENT: The revised wording removes the incorrect conclusion that nonmetallic wireways are suitable for all corrosive environments.
The panel understands the submitter to be concerned with panel statement in Proposal 8-416. The panel has only provided permission to use nonmetallic wireway in corrosive environments, however, consideration must be given to the corrosive environmental effects on the wireway nonmetallic material.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #800)

8- 92 - (3BB-22): Reject
SUBMITTER: David H. Kendall, Carlon
COMMENT ON PROPOSAL NO: 8-414
RECOMMENDATION: New paragraph in proposed Section 3BB.22:
Cables shall be permitted to be installed where such use is permitted by the respective cable articles. The number of cables shall not exceed the allowable percentage fill specified in Table 1, Chapter 9.
SUBSTANTIATION: This proposed text is to harmonize with the other raceway articles and allows cables to be installed in the raceway as long as the respective cable article permits it.
PANEL ACTION: Reject.
PANEL STATEMENT: Chapter 1, Table 9 applies to conduit and tubing. The table is not applicable to nonmetallic wireway. Wireway fill is not calculated in the same manner as fill for conduit and tubing.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

ARTICLE 363 — FLAT CABLE ASSEMBLIES: TYPE FC

(Log #781)

7- 124 - (363-100 Construction): Accept
SUBMITTER: Edward Wesley, The Wiremold Co.
COMMENT ON PROPOSAL NO: 7-265a
RECOMMENDATION: Revise text to read as follows:
~~The f~~Flat cable assemblies shall consist of ~~either~~ two, three, ~~or~~ four or five conductors.
SUBSTANTIATION: Additional conductor will be used as an equipment grounding conductor.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

ARTICLE 364 — BUSWAYS

(Log #727)

8- 93 - (364-8(b)(2), Exception): Reject
SUBMITTER: W. Creighton Schwan, Hayward, CA
COMMENT ON PROPOSAL NO: 8-429
RECOMMENDATION: Reconsider, and Accept this proposal.
SUBSTANTIATION: The exception in the 1999 NEC is an invitation for installers to violate Section 400-8(1) which prohibits the use of flexible cords and cables as a substitute for the fixed wiring of a structure. Special permission is a reasonable requirement for exceeding the 6 ft horixontal limit for cord or cable extensions from busways.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel reaffirms its position as stated in its statement on Proposal 8-429. Section 364-8(b) pertains to portable equipment or stationary equipment to facilitate their interchange. The section requires compliance with Sections 400-7 and 400-8. As pointed out by the submitter, Section 400-8(1) prohibits the use of flexible cords and cables "As a substitute for the fixed wiring of a structure." An installation utilizing flexible cords and cables in a manner not in compliance with Section 364-8(b) is a violation of the Code.
A requirement for special permission is not needed as Section 364-8(b) currently provides the language necessary to prohibit the use of flexible cords and cables as a substitute for fixed wiring.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

ARTICLE 365 CABLEBUS

(Log #435)

8- 94 - (365-3(d)): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
COMMENT ON PROPOSAL NO: 8-433
RECOMMENDATION: Accept in principle revised:
365-3(d) Conductor supports. The insulators shall be supported on insulating blocks or other mounting means designed for the purpose.
(remainder unchanged)
SUBSTANTIATION: To specifically require supports to be of non-conducting material.
PANEL ACTION: Reject.
PANEL STATEMENT: The comment provided no substantiation to support the additional requirement. The panel understands that the comment is on Proposal 8-436.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

ARTICLE 370 — OUTLET DEVICE, PULL AND JUNCTION BOXES, CONDUIT BODIES AND FITTINGS

(Log #2048)

9- 3 - (370-3 Exception No. 1): Reject
SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc.
COMMENT ON PROPOSAL NO: 9-10
RECOMMENDATION: Accept the proposal in principle. Amend existing Exception No. 1 as follows:
"Exception No. 1: Where internal bonding means are provided between all entries, or for wiring not requiring grounding continuity by other provisions of this Code, nonmetallic boxes shall be permitted to be used with metal raceways or metal-armored cables."
SUBSTANTIATION: The submitter makes a valid point, although his proposal is incorrectly worded, and needlessly introduces a third exception. This section doesn't line up properly with allowances in Section 250.112(I).
PANEL ACTION: Reject.
PANEL STATEMENT: Section 250-21 refers to ungrounded systems. Section 250-30(4)(b) states that the equipment of an ungrounded system must be grounded as prescribed in other parts of the Code. Code-Making Panel 9 is concerned that a discontinuous raceway may be assumed to be continuous by future installers. As a result, Code-Making Panel 9 believes this requirement is essential to maintain consistency.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
COMMENT ON AFFIRMATIVE:
CROUSHORE: I agree with the panel action on the comment. However, I don't believe the first sentence of the panel statement addresses the situation described by the submitter. Section 370-3 deals with the issue of raceway bonding and not system or circuit grounding. Even though the circuit may not be grounded, the raceways should be bonded together to form a continuous metallic path through any nonmetallic boxes. The provisions in Section 250-112(i) require equipment cases that are used on grounded systems for power-limited remote-control, signaling, and fire alarm circuits to be grounded. Therefore, equipment cases on ungrounded systems for power-limited remote-control, signaling, and fire alarm circuits need not be grounded. However, this reference, as described by the submitter, does not vitiate the need to have continuity of the metallic raceway or metallic cable system supplying this equipment. Therefore, this comment should be rejected.

(Log #434)

9- 4 - (370-15(a)): Hold
SUBMITTER: Dan Leaf, Palmdale, CA
COMMENT ON PROPOSAL NO: 9-12
RECOMMENDATION: Accept in principle, revise Panel Action:
Add after first sentence: A surface mounted box installed outdoors in a location protected from the weather, or in other damp locations and containing a switch(es) or receptacle(s) shall be listed for wet locations.
SUBSTANTIATION: This section does not require a box in damp locations to be listed for wet locations, which is reasonable, and the proposal only requires this where the box contains switches or receptacles, in accordance with 380-4 and 410-57(a). The requirements of those sections is justified due to contact by persons. A requirement in this section would provide correlation and be user friendly.
PANEL ACTION: Hold.
PANEL STATEMENT: This comment addresses a subject that has not had public review.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #801)

9- 5 - (370-15(a)): Accept in Part
Note: The Technical Correlating Committee understands that by this action Proposal 9-12 is rejected and 370-15(A) remains unchanged from the 1999 NEC.
SUBMITTER: David H. Kendall, Carlon
COMMENT ON PROPOSAL NO: 9-12
RECOMMENDATION: Revise the current proposed text:
Junction boxes installed below finished grade in accordance with Section 270-29, Exception shall have an enclosure Type 6P rating.
to read as follows:
See 370-29 for Boxes and Conduit Bodies used in direct burial and concrete applications.
SUBSTANTIATION: This comment has a companion comment to add a new Exception to 370-29.
It is appropriate that 370-15 references 370-29 since Wet Locations include direct burial and concrete encasement applications. But the proposed Panel text now requires that all junction boxes maintain an enclosure rating for those applications described in the exception in 370-29. This was not the intent of the submitter. There is nothing wrong with using currently listed junction boxes in the applications described in the 370-29.
PANEL ACTION: Accept in Part.
1. The panel accepts the removal of the first sentence as recommended in the Comment.
2. The panel does not accept the second sentence as recommended in the Comment.
PANEL STATEMENT: After reconsideration, and also in light of the substantiation provided for this Comment and Comment 9-6, the panel now agrees that the action on Proposal 9-12 was too restrictive. The application for which the new language would apply has been rejected. See the panel action and statement on Comment 9-19. The effect of this action is to overturn the panel's previous acceptance of Proposal 9-12.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
COMMENT ON AFFIRMATIVE:
CROUSHORE: I agree with the action of "accept in part" on Comment 9-5. However, the panel action on this comment is confusing because it refers to a first and second sentence of the commenter. After reviewing the work of the panel, this statement doesn't seem to make sense.
Here is the explanation of the panel intent on the accept in part: During the comment stage, the members of Panel 9 agreed with the comment submitter to delete the sentence that was proposed by Panel 9 in the ROP panel action on Proposal 9-12. The panel did not accept the replacement phrase as indicated by the comment submitter. Therefore, the code text should not change and should remain the same as the language of the 1999 NEC. This intent is indicated in the last sentence of the panel statement on Comment 9-5.

(Log #1217)

9- 6 - (370-15(a)): Accept in Principle

Note: The Technical Correlating Committee understands that by this action Proposal 9-12 is rejected and 370-15(A) remains unchanged from the 1999 NEC.

SUBMITTER: Dann Strube, Lanesville, IN

COMMENT ON PROPOSAL NO: 9-12

RECOMMENDATION: Revise proposed wording as follows: Section 370-29, exception shall ~~have an enclosure Type 6P rating~~ be suitable for the use.

SUBSTANTIATION: The proposed wording is far too restrictive. Other enclosures covered by this section are not required to meet specific NEMA/UL design requirements.

PANEL ACTION: Accept in Principle.

PANEL STATEMENT: See panel action and statement on Comment 9-5.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #2049)

9- 7 - (370-15(a)): Reject

Note: The Technical Correlating Committee understands that by this action Proposal 9-12 is rejected and 370-15(A) remains unchanged from the 1999 NEC.

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

COMMENT ON PROPOSAL NO: 9-12

RECOMMENDATION: Revise the last sentence to read:

"Boxes installed below finished grade, as covered in Section 370-29, Exception, shall have an enclosure Type 6P rating."

SUBSTANTIATION: The panel action inadvertently begged the question of how a direct-buried box needs to be rated if it doesn't comply with 370.29 Exception. In addition, it omitted other smaller boxes more routinely buried, such as device and outlet boxes.

PANEL ACTION: Reject.

PANEL STATEMENT: See panel action and statement on Comment 9-5.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #2050)

9- 8 - (370-16(b)(1)): Reject

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

COMMENT ON PROPOSAL NO: 9-16

RECOMMENDATION: The proposal should have been accepted in principle. Revise as follows:

"(1) Conductor Fill. Each conductor that originates outside the box and terminates or is spliced within the box shall be counted once, and each conductor that passes <u>directly</u> through the box without splice or termination shall be counted once. <u>A looped, unbroken conductor not less than twice the minimum length required for free conductors in Section 300.14 shall be counted twice.</u> The conductor fill, in cubic inches, shall be computed using Table 370.16(B). A conductor, no part of which leaves the box, shall not be counted."

SUBSTANTIATION: This revision properly distinguishes between a small loop left to assist wire pulling and dressing, and a large loop left to allow cutting in the middle and then adding a splice or a device. For such cases, the original proposal substantiation was correct.

PANEL ACTION: Reject.

PANEL STATEMENT: The panel reaffirms their original action and statement on Proposal 9-16.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 8

NEGATIVE: 3

EXPLANATION OF NEGATIVE:

HARTWELL: This comment should have been accepted, and it will be resubmitted as a proposal for the 2005 NEC. A looped conductor in a box that is double the 300.14 length clearly impacts box fill, and should be counted for what it really is, a multiple conductor instance. If it were cut in the middle with the cut ends terminated on a device, it would be counted twice with zero marginal increase in occluded volume, not even the volume of a twist-on wire connector. The panel statement provides no technical basis for concluding that such an installation practice has less of an impact before the putative wire is cut and terminated.

HIDAKA: The comment should have been accepted. A looped conductor whose length is twice that required in Section 300.14 should be counted twice in order to properly determine the correct size of the box.

MONTUORI: The comment submitter provides adequate substantiation based on typical installation practice. This comment should have been accepted to properly size boxes for present and future use.

(Log #1116)

9- 9 - (370-22, FPN (New)): Reject

SUBMITTER: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education

COMMENT ON PROPOSAL NO: 9-22

RECOMMENDATION: Insert fine print note following Section 370-22, as follows:

Note that extension boxes, especially multiple extension boxes, can make it difficult to comply with 300-14, which requires that conductors entering the back or side of an ordinary box must be long enough, without splicing, to extend at least 76 mm (3 in.) out the front.

SUBSTANTIATION: Mr. Kaunzner is quite right that extension boxes can make it impossible to get at wiring. He has not provided substantiation for a new rule, but a heads-up is only reasonable, and a fine print note is the normal means for providing one. If conductors can be rendered accessible by pigtailing before, or at the time, the extension box is added, the problem has a great workaround. However, the wording I propose reflects the more restrictive interpretation of 300-14. If it is incorrect, the fine print note should not be adopted as proposed in this comment.

PANEL ACTION: Reject.

PANEL STATEMENT: The length of conductors is adequately covered in 300.14.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #1117)

9- 10 - (370-22, FPN (New)): Reject

SUBMITTER: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education

COMMENT ON PROPOSAL NO: 9-22

RECOMMENDATION: Insert the fine print note following Section 370-22 as follows:

Note that extension boxes, especially multiple extension boxes, can make it difficult to comply with 300-14, which requires that conductors entering the back or side of an ordinary box must be long enough, with any extensions spliced to them, to extend at least 76 mm (3 in.) out the front.

SUBSTANTIATION: Mr. Kaunzner is quite right that extension boxes can make it impossible to get at wiring. He has not provided substantiation for a new rule, but a heads-up is only reasonable, and a fine print note is the normal means for providing one. If conductors can be rendered accessible by pigtailing before, or at the time, the extension box is added, the problem has a great workaround. However, some propose a more-restrictive interpretation of 300-14. If counting pigtails is incorrect, the fine print note should not be adopted as proposed in this comment.

PANEL ACTION: Reject.

PANEL STATEMENT: See panel action and statement on Comment 9-9.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #1457)

9- 11 - (370-23(g)): Reject

SUBMITTER: Paul E. Guidry, Fluor Daniel, Inc.

COMMENT ON PROPOSAL NO: 9-34

RECOMMENDATION: This proposal should be accepted or the exception to Section 370-23(e) and Exception No. 1 to 370-23(f) should be clarified.

SUBSTANTIATION: The proposal was to allow oversized conduit bodies to be used for splices. For instance 3/4" in. conduit could be run for lighting circuits and 1-1/2 in. "T" fittings could be used to splice at the fixtures even though no 1-1/2 in. conduit is used.

The panel statement to this proposal was "The Code already allows what is proposed. See panel action and statement on Proposal 9-31."

There is much confusion based on the present wording of 370-23(e) Exception and 370-23(f) Exception No. 1. It is my impression based on the panel statement that oversized conduit bodies are allowed for all conduit runs even those where all conduits entering the conduit bodies are smaller trade sizes than that of the conduit body. This isn't what the exceptions say at this time. The exceptions start out saying that conduit shall be permitted to support a conduit body of any size but then it puts a stipulation by saying the conduit body can't be larger than the largest trade size of the conduit (or EMT on 370-23(e)). I assume that this stipulation is to be applied only to conduit bodies with one conduit entry based on the panel statement, which doesn't make sense either. What would be wrong with a 1 in. rigid conduit supporting an 1-1/2 in. conduit body with one conduit opening? The exceptions need to be clarified to allow oversized conduit bodies.

PANEL ACTION: Reject.

PANEL STATEMENT: The rule and permissive exception following it are clear. If you comply with the rule, a permissive exception is of purely academic interest, in this article and throughout the NEC. A 1 1/2 in. conduit body with 1 1/2 by 1/2 in. reducing bushings can be supported by rigid metal or intermediate metal conduit, provided its capacity doesn't exceed 100 cu. in. However, if the wiring method is of any other type, or if the conduit body exceeds 100 cu. in., you fail the rule and need to look at the exception. The exception allows other wiring methods to support their conduit bodies, or any wiring method to support an "E" fitting, but only where no larger than the largest trade size of the entering raceway. Taken as a whole, the rule and exception are intended to severely restrict the allowable wiring methods that can be used to exempt an enclosure from independent support, while not imposing an independent support rule on a conduit body used only to change the direction of a raceway. Where conduit bodies are used in lieu of boxes, they must meet the capacity and support rules for boxes.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #915)

9- 12 - (370-27, Exception): Accept in Principle

SUBMITTER: Thomas D. Knecht, Allied Moulded Products, Inc.

COMMENT ON PROPOSAL NO: 9-39

RECOMMENDATION: Reject proposal, revise text as follows:

Exception: A wall mounted fixture weighing not more than 6 lb. (2.72 KG) shall be permitted to be supported on other boxes and boxes with plaster rings, provided the fixture or its supporting yoke is secured to the box with no fewer than two No. 6 or larger screws.

SUBSTANTIATION: Proposal will allow unsafe installations.

Presently, those who enforce the Electrical Code can look at the installation in a ceiling and determine if a box has been tested for the application by its size and shape. Allowing flush device boxes to support fixtures in a ceiling will force the inspectors to look for fixture support marking. Not all flush device boxes will be tested and approved for the application. There will be fixtures weighing more than 15 pounds attached to flush device boxes not tested.

Substantiation of comment - fixtures are furnished with #8-32 screws to match the screw threads provided in outlet boxes. #6-32 screws would not be readily available for attaching fixtures to flush device boxes.

PANEL ACTION: Accept in Principle.

PANEL STATEMENT: See action on Comment 9-14 which meets the intent of the submitter.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #516)

9- 13 - (370-27(a), Exception): Accept in Principle

SUBMITTER: David A. Kerr, Jr., Friendsville, PA

COMMENT ON PROPOSAL NO: 9-39

RECOMMENDATION: Reject.

SUBSTANTIATION: Leave this section alone. 6-32 screws are pathetically weak. They are not suitable for hanging anything from a ceiling. Ceiling boxes use 8-32 screws for a reason. Ultimate breaking strength, pull out and shear often differ by a factor of ten.

PANEL ACTION: Accept in Principle.

PANEL STATEMENT: See action on Comment 9-14 which meets the intent of the submitter.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #843)

9- 14 - (370-27(a), Exception): Accept

Note: The Technical Correlating Committee directs that since the substantiation did not address the need for a "soft" conversion, the metric conversion in this section be "hard" as follows: "3kg (6 lbs.)".

SUBMITTER: Larry F. Miller, National Electrical Manufacturers Association (NEMA)

COMMENT ON PROPOSAL NO: 9-39

RECOMMENDATION: The panel should reject the proposal and based on the action on 9-38, the Exception should read as follows (proposed revised wording is underlined)

Exception: A wall mounted fixture weighing not more than 2.72kg (6 lbs) ~~6.80kg (15 lbs)~~ shall be permitted to be supported on other boxes or plaster rings that are secured to other boxes, provided the fixture or its supporting yoke is secured to the box with no fewer than two No. 6 or larger screws.

SUBSTANTIATION: The substantiation for this Proposal was based on a statement in UL's 1998 edition of the Electrical Construction Equipment Book (Green Book). The statement reads as follows: "Nonmetallic device boxes or nonmetallic device boxes intended to be installed in an existing structure have been investigated for the support of fixtures, smoke detectors, carbon monoxide detectors weighing not more than 15 lbs." This substantiation is flawed to the extent that the test methods were not defined and the results of these tests were not supplied for review by the Code-Making Panel.

When a fixture is installed on a device box in the ceiling, several safety issues must be addressed; issues such as the thermal effects of a ceiling mounted fixture on the box and the possibility of future homeowners overloading a box with a larger fixture. We question whether these safety issues were adequately addressed in the testing.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 10

NEGATIVE: 1

EXPLANATION OF NEGATIVE:

WEDEL: The limitation of "16 inches in. Dimension" of proposal 9-39 should have been included in the revised exception. Without the 16 in. limit, the center of gravity of the fixture could be an unspecified distance from the wall which would overstress the two No. 6 screws or the box material in which the screws are threaded. The wording should be revised to read as follows:

"Exception: A wall mounted fixture weighing not more than 2.72kg (6 lbs.) and not extending more than 16 in. (406 mm) from the wall shall be permitted to be supported on other boxes or plaster rings that are secured to other boxes, provided the fixture or its supporting yoke is secured to the box with no fewer than two No. 6 or larger screws."

(Log #843a)

18- 4 - (370-27(a), Exception): Accept

SUBMITTER: Larry F. Miller, National Electrical Manufacturers Association (NEMA)

COMMENT ON PROPOSAL NO: 9-39

RECOMMENDATION: The panel should reject the proposal and based on the action on 9-38, the Exception should read as follows (proposed revised wording is underlined)

Exception: A wall mounted fixture weighing not more than 2.72kg (6 lbs) ~~6.80kg (15 lbs)~~ shall be permitted to be supported on other boxes or plaster rings that are secured to other boxes, provided the fixture or its supporting yoke is secured to the box with no fewer than two No. 6 larger screws.

SUBSTANTIATION: The substantiation for this Proposal was based on a statement in UL's 1998 edition of the Electrical Construction Equipment Book (Green Book). The statement reads as follows: "Nonmetallic device boxes or nonmetallic device boxes intended to be installed in an existing structure have been investigated for the support of fixtures, smoke detectors, carbon monoxide detectors weighing not more than 15 lbs." This substantiation is flawed to the extent that the test methods were not

defined and the results of these tests were not supplied for review by the Code-Making Panel.

When a fixture is installed on a device box in the ceiling, several safety issues must be addressed; issues such as the thermal effects of a ceiling mounted fixture on the box and the possibility of future homeowners overloading a box with a larger fixture. We question whether these safety issues were adequately addressed in the testing.

PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 10
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10

(Log #876)

9- 15 - (370-27(a), Exception): Accept in Principle
SUBMITTER: David H. Kendall, Carlon
COMMENT ON PROPOSAL NO: 9-39
RECOMMENDATION: This proposal should be rejected.
SUBSTANTIATION: The submitter failed to supply the technical and physical substantiation that would support the use of a wall box as a fixture support in the ceiling. Those special old work boxes mentioned in the proposal are listed for 15 pounds and are intended to be used in the walls and have been evaluated as such. Section 370-17(c) Exception, currently allows single gang outlet boxes to be used in the ceiling for receptacles and smoke detectors.

The current language was added because it was a common use for the outlet box to support wall fixtures such as coach lights. UL determined that the boxes currently on the market were safe for these applications. UL did not determine that the same boxes were safe for supporting 15 pound light fixtures in a ceiling.

The submitter needs to supply the technical substantiation showing that these boxes are safe in this application prior to the code being changed.

PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See action on Comment 9-14 which meets the intent of the submitter.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #2051)

9- 16 - (370-27(c)): Accept in Principle
SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc.
COMMENT ON PROPOSAL NO: 9-40
RECOMMENDATION: The proposal should have been accepted in principle and in part. The panel action rejecting the universal placement of fan boxes was correct, but the editorial improvement still has merit. Revise as follows:

"Boxes used at suspended ceiling (paddle) fan outlets shall be listed for the purpose where used as the sole support of the fan. The installation shall comply with Section 422.18."

SUBSTANTIATION: This arrangement eliminates an exception through the appropriate use of positive language.
PANEL ACTION: Accept in Principle.
Revise the wording in the Comment to read as follows:

"Where a box is used as the sole support of a ceiling-suspended (paddle) fan, the box shall be listed for the application and for the weight of the fan to be supported. The installation shall comply with 422.18."

PANEL STATEMENT: Code-Making Panel 9 wants to assure that boxes used for fan support are suitable for the weight to be supported. 422.18(B) Exception recognizes a second classification of fan box which is eligible for listing for the support of fans up to 70 lbs. Installers need to be aware that unless so evaluated, boxes listed for fan support cannot support fans weighing more than 35 lbs.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #102)

9- 17 - (370-28): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 9-43
RECOMMENDATION: It was the action of the Technical Correlating Committee that further consideration be given to the comments expressed in the voting. This action will be considered by the panel as a public comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
PANEL STATEMENT: See panel action on Comment 9-18.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #2052)

9- 18 - (370-28): Accept
SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc.
COMMENT ON PROPOSAL NO: 9-43
RECOMMENDATION: The title should be reorganized to reflect the relative importance of terms, as follows: "Pull and Junction Boxes, and Conduit Bodies."
SUBSTANTIATION: Editorial, and to respond to the Technical Correlating Committee note.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #802)

9- 19 - (370-29 Exception No. 2 (New)): Reject
SUBMITTER: David H. Kendall, Carlon
COMMENT ON PROPOSAL NO: 9-12
RECOMMENDATION: Add text to read as follows:

Exception 1: Listed boxes shall be permitted where covered by gravel, light aggregate, or noncohesive granulated soil if their location is effectively identified and accessible for excavation.

Exception 2: Listed junction boxes that maintain a Type 6P Rating shall be permitted for direct burial or concrete applications where servicing is not required.

SUBSTANTIATION: This comment has a companion comment to revise the text in 370-15(a).

Junction Boxes are not used strictly for servicing after the installation. Junction boxes are used underground (and aboveground) to change direction of the conduit system and/or for multiple conduit runs. System may have one conduit entering a junction box and several conduits leaving the box. This is common in parking lot applications. The 6P rating is a requirement for those junction boxes permanently installed.
PANEL ACTION: Reject.
PANEL STATEMENT: This comment would sanction a practice that Code-Making Panel 9 specifically rejected in its action on Proposal 9-47. Code-Making Panel 9 reaffirms its action on that proposal.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #103)

1- 175 - (370-60 (New)): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 9-51
RECOMMENDATION: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 1 for action in Article 110, Part C. This action will be considered by Panel 1 as a Public Comment. The Technical Correlating Committee further directs that this Proposal be forwarded to CMP-13 for information.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
PANEL STATEMENT: The panel accepts the instructions of the Technical Correlating Committee for consideration of Proposal 9-51 and accepts the recommendation to relocate the wording in the Proposal 9-51 to new Section 110-31(A) and renumber remainder of section accordingly.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #1357)

9- 20 - (370-60 (New)): Reject
SUBMITTER: David P. Brown, Baltimore Gas and Electric Co/EEI
COMMENT ON PROPOSAL NO: 9-51
RECOMMENDATION: Reject the Panel's action and accept the proposal as written.
SUBSTANTIATION: This proposal should have been accepted as originally submitted. This proposal contains good information for constructing manholes and electrical vaults. The EL&P Task Group believes these are design issues rather than work space requirements and should remain in Panel 9.

The title of Article 370 Part D should include the word "Vaults". The word "vaults" appears in four out of the ten sections of Part D.

As pointed out in the NEC Handbook (page 371), "Part D of Article 370 covers manholes and other electrical enclosures intended for personnel entry. However, general electrical equipment installation requirements within the manhole or large enclosure are still covered by Article 110." Based on this information, construction details should be included in Article 370 versus Article 110. The proposal helps define what a vault is. By keeping details of vault construction in Article 370 Part D, the Code is more user friendly.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel reaffirms its panel statement on Proposal 9-51, and agrees with the technical merits of that proposal.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
CROUSHORE: I agree with the substantiation of the submitter. This comment should have been accepted. Vault construction requirements belong in Article 370 and not in Article 110.

(Log #1612)

9- 21 - (370-60 (New)): Reject
SUBMITTER: Robert Molde, Xeel Energy
COMMENT ON PROPOSAL NO: 9-51
RECOMMENDATION: The original proposal should have been accepted.
SUBSTANTIATION: The title of Article 370 Part D should include the words "Vaults". The word "vaults" appears in four out of the ten sections of Part D.

As pointed out in the NEC Handbook (page 371), "Part D of Article 370 covers manholes and other electrical enclosures intended for personnel entry. However, general electrical equipment installation requirements within the manhole or large enclosure are still covered by Article 110." Based on this information, construction details should be included in Article 370 versus Article 110.

The proposal helps define what a vault is. By keeping details of vault construction in Article 370 Part D, the Code is more user friendly.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Comment 9-20.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
CROUSHORE: I agree with the substantiation of the submitter. This comment should have been accepted. Vault construction requirements belong in Article 370 and not in Article 110.

ARTICLE 373 — CABINETS, CUTOUT BOXES, AND METER SOCKET ENCLOSURES

(Log #CC901)

9- 21a - (373-4): Accept
Note: The Technical Correlating Committee understands that the Panel Action on Comment 9-21a deletes 370-18 and 373-4. See Comment 1-123 for incorporation of these requirements into 110-12(A).
SUBMITTER: CMP 9
COMMENT ON PROPOSAL NO: 9-56
RECOMMENDATION: By this comment Code-Making Panel 9 deletes 370.18, contingent on Code Making Panel 1's acceptance of Comment 1-123. In its place insert the following note:
"FPN: See 110.12(A) for requirements on closing unused cable and raceway knockout openings."
SUBSTANTIATION: Code-Making Panel 9 endorses the substantiation presented in Comment 1-123. Code-Making Panel 9 advises that Comment 1-123 is the product of a Code-Making Panel 9 Task Group formed pursuant to the Technical Correlating Committee instruction on Proposal 1-215.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #2053)

9- 22 - (373-4 (New)):
Note: The Technical Correlating Committee directs that this Comment be reported as "Reject" because less than two-thirds of the members eligible to vote have voted in the affirmative.
SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc.
COMMENT ON PROPOSAL NO: 9-57
RECOMMENDATION: Assuming Proposal 9-56 is eventually accepted, this section number will become vacant. Otherwise, renumber the article accordingly, but add the following requirement:
"373-4. Meter Socket Enclosures. Meter socket enclosures shall be completed by the installation of a meter, or by a closure assembly identified for use with the meter socket enclosure employed."
SUBSTANTIATION: In all my years in the trade, and in all the seminars I have given across the country, I have never found an electrician who would think to apply this section to a vacant meter socket. The universal trade practice is to cover the jaws with part of the carton and hope it holds up in the rain until the utility gets there to set a meter. Many utilities, including my own, allow for hot-work cut and reconnects. If an old A-base meter is being replaced, that means the socket will be energized in this condition for some period of time.

This section has to do with omitted knock-out sections, and the coordinate responsibility to provide knock-out seals of equivalent heft to that of the enclosure. Furthermore, in the 1996 cycle Code-Making Panel 9 amended the correlating section in Article 370 (370.18) to explicitly call out cable and conduit knockouts, precisely because it was being misapplied. If the Code-Making Panel 9 comment to Code-Making Panel 1 stands, that general section will incorporate the restriction to conduit and cable knockouts. This language avoids the problem in the original proposal, which would prohibit meter socket closure assemblies added to ring-type meter sockets.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 7
NEGATIVE: 4
EXPLANATION OF NEGATIVE:
CROUSHORE: I believe that this comment should be rejected. As currently worded, this new code text will require the electrician or electrical contractor to provide a meter socket closure plate or an electric meter for all installed meter sockets regardless if the socket is energized or not. I agree that the meter hole in the meter socket should not be left open if the socket is energized. However, in most locations, this is not a problem because the serving utility either installs a meter or installs a cover plate when the service is connected and energized. If accepted, this new section will require the meter or cover plate even if the service is not energized. This new section is not practical and forces the electrician to purchase and carry additional equipment for an unsubstantiated problem. If the meter socket is not energized, there is no hazard. Therefore,

requiring a meter socket closure plate for a de-energized meter socket is unnecessary.

KAEMMERLEN: I believe this comment should be rejected. The panel has not received specific substantiation of injuries received from an energized meter socket, which is temporarily protected until the utility installs a meter.

From a practical point of view, an installer in the field would have difficulty locating an "identified closure assembly" for older meter sockets. The utility usually is very prompt in installing a meter.

In addition, approval of this comment would require covering of all nonenergized meter sockets where no safety issue exists.

MONTUORI: I believe that this comment should be rejected. As currently worded, this new code text will require the electrician or contractor to provide a meter socket closure plate or an electric meter for all installed meter sockets regardless if the socket is energized or not. I agree that the meter hole in the meter socket should not be left open if the socket is energized. However, in most locations, this is not a problem because the serving utility either installs a meter or installs a cover plate when the service is connected and energized. If accepted, this new section will require the meter or cover plate even if the service is not energized. This new section is not practical and forces the electrician to purchase and carry additional equipment for an unsubstantiated problem. If the meter socket is not energized, there is no hazard. Therefore requiring a meter socket closure plate for a de-energized meter socket is unnecessary.

WELNAK: I believe that this comment should be rejected. As currently worded, this new code text will require the electrician or contractor to provide a meter socket closure plate or an electric meter for all installed meter sockets regardless if the socket is energized or not. I agree that the meter hole in the meter socket should not be left open if the socket is energized. However, in most locations, this is not a problem because the serving utility either installs a meter or installs a cover plate when the service is connected and energized. If accepted, this new section will require the meter or cover plate even if the service is not energized. This new section is not practical and forces the electrician to purchase and carry additional equipment for an unsubstantiated problem. If the meter socket is not energized, there is no hazard. Therefore, requiring a meter socket closure plate for a de-energized meter socket is unnecessary.

COMMENT ON AFFIRMATIVE:

HARTWELL: The requirement to complete the meter socket enclosure with a plate or meter applies when the NEC applies to the meter base, namely, when it is connected to a supply of electricity. As such it is analogous to the acceptability of dry location wiring methods in temporarily wet locations when a building is under construction. No one expects such wiring to be made weatherproof during construction, although some protection from deterioration must be in place. Similarly, no inspector worthy of the name will ask for a closure plate on a socket that the utility will set a meter in when they energize the wiring. The rule does, however, provide the inspector with an enforceable basis for rejecting closures made of cardboard when the socket is hot with no meter in place, nothing more.

(Log #1667)

9- 23 - (373-4(b) (New)):

Note: Based on the Technical Correlating Committee action on Comment 9-22, the Technical Correlating Committee directs that Comment 9-23 be reported as "Reject".

SUBMITTER: John M. O'Connor, North American Technologies, Inc.

COMMENT ON PROPOSAL NO: 9-58

RECOMMENDATION: 373-4. Unused Openings. Unused openings in enclosures within the scope of this article shall be effectively closed to afford protection substantially equivalent to that of the enclosures within the scope of this article.

(a) Nonmetallic. Where metal plugs or plates are used with nonmetallic cabinets or cutout boxes, they shall be recessed at least 1/4 in. (6.35 mm) from the outer surface.

(b) Meter Socket Enclosures. Meter sockets shall be effectively closed by a closure which is integral to the meter socket when a meter is not installed in the socket.

SUBSTANTIATION: The enclosure of a meter socket is UL listed only when a meter is installed in a socket. The service which is energized without a meter being installed does not meet Section 111-27 Guarding of Live Parts. In many instances meters are bypassed, often by non-code approved means, in order to provide temporary power on construction jobsites. The protection of these live parts may or may not exist, depending on the installer and when or if a meter is installed.

These hazardous situations are occurring at new homes, offices, construction sites and at temporary classrooms (which are usually located on school playgrounds) while they are waiting to have meters installed. Utility deregulation may also cause increased incidence of these situations.

The addition of an integral closure to a meter socket would protect workers, children and others from a potentially dangerous situation, one that is preventable. Listed metering assemblies with integral socket closures are already commercially available.

NOTE: This is a companion proposal to my proposal on Section 230-62.

PANEL ACTION: Accept in Principle.

PANEL STATEMENT: See action on Comment 9-22 which meets the submitter's concern regarding meter socket closure.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 10

NEGATIVE: 1

EXPLANATION OF NEGATIVE:

CROUSHORE: I believe this comment should have been rejected. See my explanation of negative on Comment 9-22.

(Log #733)

9- 24 - (373-5(c)): Reject

SUBMITTER: Thomas J. LeMay, LeMay Electric, Inc.

COMMENT ON PROPOSAL NO: 9-62

RECOMMENDATION: Accept Proposal 9-62 as submitted.

SUBSTANTIATION: The submitter of the original proposal addresses a reasonable solution to an installation problem. Allowing a 12 in. length of raceway will prevent debris from entering the enclosure and will serve to support cables.

PANEL ACTION: Reject.

PANEL STATEMENT: The submitter did not provide any technical substantiation to reduce the length from 18 in. to 12 in.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #104)

9- 25 - (Table 373-6(a)): Accept

SUBMITTER: Technical Correlating Committee National Electrical Code

COMMENT ON PROPOSAL NO: 9-64

RECOMMENDATION: The Technical Correlating Committee understands that Title of the Table is as stated in the Recommendation of the Proposal. The Technical Correlating Committee directs the Panel to clarify their action relative to the Notes to the Table. This action will be considered by the Panel as a Public Comment.

SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.

PANEL ACTION: Accept.

PANEL STATEMENT: Code-Making Panel 9 advises that it only intended to revise the body of the table. The title and note of the table remain as submitted in the proposal.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #105)

9- 26 - (Table 373-6(b)): Accept

SUBMITTER: Technical Correlating Committee National Electrical Code

COMMENT ON PROPOSAL NO: 9-65

RECOMMENDATION: The Technical Correlating Committee understands that Title of the Table is as stated in the Recommendation of the Proposal. The Technical Correlating Committee directs the Panel to clarify their action relative to the Notes to the Table. This action will be considered by the Panel as a Public Comment.

SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.

PANEL ACTION: Accept.

PANEL STATEMENT: See panel action and statement on Comment 9-27.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #106)

9- 27 - (Table 373-6(b)): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 9-66
RECOMMENDATION: It was the action of the Technical Correlating Committee that this Proposal be reconsidered and correlated with the action on Proposal 9-65. This action will be considered by the Panel as a Public Comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
1. Use the title as proposed in Proposal 9-65.
2. Use the table values as accepted by the panel action on Proposal 9-65.
3. Insert the additional column in the location as proposed by Proposal 9-66.
4. Add the notes as presented in Proposal 9-66, except delete Note 1 as suggested in Proposal 9-65. Renumber the remaining notes accordingly, using the order given in Proposal 9-66. Correct the reference in the new column from "Note 4" to "Note 3".

PANEL STATEMENT: Code-Making Panel 9 advises that Note 3, as it appears in Proposal 9-66, is unchanged from the 1999 NEC.
The panel believes that this action clarifies the panel's intent which addresses the Technical Correlating Committee's question.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #798)

8- 95 - (3VV-22): Reject
SUBMITTER: David H. Kendall, Carlon
COMMENT ON PROPOSAL NO: 8-376
RECOMMENDATION: New paragraph in proposed Section 3VV.22:
Cables shall be permitted to be installed where such use is permitted by the respective cable articles. The number of cables shall not exceed the allowable percentage fill specified in Table 1, Chapter 9.
SUBSTANTIATION: This proposed text is to harmonize with the other raceway articles and allows cables to be installed in the raceway as long as the respective cable article permits it.
PANEL ACTION: Reject.
PANEL STATEMENT: Table 3VV-22 is used to determine the fill requirements for conductors in Strut-Type Channel Raceway. Insufficient substantiation is provided to warrant the fill requirements of Table 1, Chapter 9 being utilized to determine the cable fill of Strut-Type Channel Raceway.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

ARTICLE 380 — SWITCHES

(Log #107)

9- 28 - (380-2(a)): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 9-70
RECOMMENDATION: The Technical Correlating Committee notes that the action on this Proposal received less than the two-thirds affirmative vote. It was the action of the Technical Correlating Committee that this action be reconsidered based on the comments expressed in the voting. This action will be considered by the Panel as a Public Comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
Code-Making Panel 9 accepts the direction of the Technical Correlating Committee to reconsider their action based on the comments expressed in the voting.
PANEL STATEMENT: See panel action on Comment 9-30.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
COMMENT ON AFFIRMATIVE:
CROUSHORE: I agree with the reject of Comment 9-28. However, I disagree with the action on Comment 9-30. See my Explanation of Negative on Comment 9-30.
LEMAY: The Technical Correlating Committee is correct in the request for Code-Making Panel 9 to revisit the issue of providing an insulated grounded circuit conductor on single pole and 3-way switch loops in residential and commercial installations when wiring with cable systems.

(Log #732)

9- 29 - (380-2(a)): Reject
SUBMITTER: Thomas J. LeMay, LeMay Electric, Inc.
COMMENT ON PROPOSAL NO: 9-70
RECOMMENDATION: Accept Proposal 9-70 as revised:
An insulated grounded circuit conductor shall be routed from the controlled outlet to the first control point when employing switch loop wiring methods using cable systems.
SUBSTANTIATION: Article 90-1(b) specifically states that hazards can occur by not providing for increased uses in electricity. There are many installations in place where the electrician used a bare equipment ground to facilitate operation of a control requiring a grounded circuit conductor or additional control wires such as a paddle fan with a light kit.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action on Comment 9-30.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
LEMAY: I vote negative with the following comment. This proposal should be accepted as it provides for the reduction of a hazard introduced when a homeowner, business owner, maintenance person or electrician installs a control device requiring a grounded circuit conductor or an additional control conductor at a switch point that has been wired using a switch loop wiring method with cable.
Section 90-1(b) specifically states that hazards can occur by not providing for increased uses in electricity.
Installing control devices requiring either an insulated grounded circuit conductor or additional control conductor(s) with none present temps the device installer to resort to use of the equipment grounding conductor as a means to an end. This is a hazard I have seen many times while in the field.
COMMENT ON AFFIRMATIVE:
CROUSHORE: I agree with the reject of Comment 9-29. However, I disagree with the action on Comment 9-30. See my explanation of negative on Comment 9-30.

(Log #842)

9- 30 - (380-2(a)):
Note: The Technical Correlating Committee directs that this Comment be reported as "Reject" because less than two-thirds of the members eligible to vote have voted in the affirmative.
SUBMITTER: Larry F. Miller, National Electrical Manufacturers Association (NEMA)
COMMENT ON PROPOSAL NO: 9-70
RECOMMENDATION: The panel should accept this proposal.
SUBSTANTIATION: The panel action does not address the safety concerns regarding the absence of grounded circuit conductors in single pole and three-way switch loops. Products such as programmable controllers, timers, home automation switches and occupancy sensors are currently in widespread use and are often installed after the initial switch installation.
In many instances the installation of the products mentioned are dependent upon the presence of a grounded circuit conductor. IF the grounded circuit conductor is not available, improper installations of these products will occur, creating safety hazards. Examples of improper installations are incorrect retrofitting of a grounded circuit conductor or the use of the grounding circuit conductor in place of the grounded circuit conductors.

The safe installation of the products mentioned would be significantly enhanced by the requirement of a grounded circuit conductor in all single pole and three-way switch loops.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 3
NEGATIVE: 8
EXPLANATION OF NEGATIVE:
CROUSHORE: Comment 9-30 should have been rejected. The submitter did not provide adequate technical substantiation to make a change in the code. Specifically, this change is not necessary because of a number of reasons. Here is a list of these reasons that need to be addressed by any proposal or comment before this change should take place.
1. There is nothing in the code to prohibit installing a grounded conductor at the locations indicated by the submitter. However, providing wiring for a possible future application is not the intent of the NEC. Should the installed device installed require a grounded conductor, a grounded conductor should be installed to meet the current code. However, a grounded conductor should not have to be present for a future unplanned addition of an automation-type device.
2. The submitter did not address how an unused grounded conductor should be terminated in a box where the grounded conductor is not needed for the switch loop. The submitter also did not address any box fill requirements for this new conductor and termination.
3. The submitter does not acknowledge devices on the market that accomplish the switching task without needing a grounded conductor. Currently, there are devices manufactured that can safely accomplish the desired switching automation as mentioned by the submitter without the use of a grounded conductor.
4. The installation of the grounded conductor as proposed will add cost to the wiring installation without any documented improvement in safety. Persons connecting an equipment-grounding conductor to the retrofit device that requires a grounded conductor are violating the current code. Poor wiring practice and willful violation of the manufacturer's instructions as well as the NEC are not reasons to change the current requirements.

DEMING: After the panel meeting on Public Comments, I voted affirmated to accept Comment 9-30. Now, after reading the Panel Members' comments circulated with their negative votes, I find their logic to sound to be ignored.

HARTWELL: The wording accepted under this comment is substantially better than that rejected three years ago, but numerous issues remain. First, nothing in the panel wording requires the grounded circuit conductor of the same circuit as the one supplying the ungrounded conductor(s). Second, the wording extends beyond the scope of its subsection, in that it covers single pole snap switches in a set of provisions that only address three-way and four-way snap switches.

This is, frankly, a fan-box proposal for switches. The present code rules are adequate if they are followed. The problem appears to be one of widespread noncompliance. Three years ago I asked for much more detailed substantiation in two areas. First, we needed objective reports covering the actual prevalence of noncompliance arranged by occupancy. We also needed much more detail about the actual product standards; what devices are allowed to do, and what warning information must be included in the installation directions. That substantiation has not been provided.

It may be possible to adequately address the substantiation in this and the related comments through revisions to the product standards. Specifically, for the benefit of unqualified personnel, the installation directions should carry a bold-print explanation of how to distinguish between an equipment grounding conductor and a grounded circuit conductor, and warning never to connect to the former. Following the fan box example, we should also put a label on the outside of the package saying: "Product requires grounded (white) conductor; switch box may need to be rewired. Consult a qualified electrician if in doubt."

I am not yet persuaded that we should impose the significant costs involved in implementing this change to accommodate untrained persons who will undoubtedly create many other infractions of the NEC in the process of installing such controls. This practice involves wiring complexities that exceed, by an order of magnitude, those involved in changing a faceplate. At some point we have to draw a line and remember that electrical safety depends on electrical inspection and coordinated actions within product standards just as much as the NEC. Untrained persons can and will endanger themselves and others, but that is an argument for licensure or other means of establishing accountability for poor work, not for amending the code.

KAMMERLEN: I believe this comment should be rejected. Providing a spare grounded conductor would possibly serve as a convenience in the future, but potentially create a serious safety hazard should an installer choose to use the spare grounded conductor along with the grounding conductor to provide an additional circuit.

This section, as currently written in the code, provides "practically safeguarding" and "adequacy" as described in the code.

90-1(A) Practical Safeguarding. The purpose of this code is the practical safeguarding of persons and property from hazards arising from the use of electricity.

90-1(B) Adequacy. This code contains provisions that are considered necessary for safety. Compliance therewith and proper maintenance will result in an installation that is essentially free from hazard but not necessarily efficient, convenient, or adequate for good service or future expansion of electrical use.

MONTUORI: The comment should have been rejected. This type of device should only be installed where the grounded conductors are available. Providing a grounded conductor to all switch locations does not provide additional safety, when this type of device is used.

SENGUPTA: The recommended requirement of a grounded circuit conductor in every switch box is a good engineering practice, but is more of a convenience issue for installing a new product that requires a grounded circuit; however, the total safety issue, as described in the substantiation, is compromised.

Some of these new products require more room than is available in most existing switch boxes. The probability of creating a hazardous installation is increased, as a result of forcing a new switch that is larger than a standard switch into an existing standard size box. The available space for wiring of a new switch may not be adequate; and in some cases the heat dissipation problem during operation of an electronic switch, due to shortage of space, may also cause a safety hazard.

Availability of an insulated grounded circuit conductor in a box may give the installer a false impression that it is totally safe to replace an old switch with a new generation switch.

It is imperative that the whole safety issue be looked at.

WEDEL: There is nothing in the existing code preventing this practice. Requiring a grounded conductor at all single pole and 3-way switch loops will disallow an established method that has performed without problem. The commentor has not provided any statistical justification of a problem. To accept this proposal will penalize most installations for the benefit of only a few.

WELNAK: The acceptance of this proposal assumes that future use of the spare white wire will be for a grounded circuit conductor. There is also a danger that a person would illegally use it for an ungrounded conductor and use the equipment ground for a grounded conductor. I also question the availability of 4-wire cable in all areas, which would be necessary in some installations.

The purpose of the NEC states in 90-1(a): "The purpose of this code is the practical safeguarding of persons and property from hazards arising from the use of electricity."

Also in the NEC, 90-1(c) states in part: "This code is not intended as a design specification...".
COMMENT ON AFFIRMATIVE:
LEMAY: See my explanation of negative vote on Comment 9-29.

(Log #315)

9- 31 - (380-2(a), Exception (New)): Reject
SUBMITTER: Russell LeBlanc, Peterson School of Engineering
COMMENT ON PROPOSAL NO: 9-70
RECOMMENDATION: Add an exception to read as follows:
Exception: Switch loops shall not require a grounded conductor, unless required for the operation of the switch.
SUBSTANTIATION: The proposal to always require the grounded conductor be brought to switch loops is very far reaching and unnecessary. It also makes the assumption that installers are going to wire things improperly. My proposed wording addresses the concern of the original proposal and makes this a safety concern instead of a design consideration.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action on Comment 9-30.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

COMMENT ON AFFIRMATIVE:
CROUSHORE: I agree with the reject of Comment 9-31. However, I disagree with the action on Comment 9-30. See my explanation of negative on Comment 9-30.
LEMAY: See my explanation of negative vote on comment 9-29.

(Log #453)

9- 32 - (380-6(c)): Accept in Principle
SUBMITTER: Douglas P. Ball, Mac Products Inc.
COMMENT ON PROPOSAL NO: 9-75
RECOMMENDATION: Revise to read as follows:
Single-throw knife switches and bolted pressure contact switches shall be connected so that the blades are de-energized when the switch is open or be constructed such that the blades are fully barriered to prevent anything from coming in contact with the blades and shall be connected so that the terminals feeding the load and the fuse terminals are de-energized when the switch is open.
SUBSTANTIATION: A knife switch, or more specifically a bolted pressure contact switch with fully barriered contacts, is no less protected than molded case or butt contact switches. The proposed change in section 380-6(c) would eliminate bottom feed bolted pressure contact switches causing switch and fuse type switchboards to double in size and increase in cost.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Comment 9-41 which meets the submitter's intent.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #618)

9- 33 - (380-6(c)): Accept in Principle
SUBMITTER: James A. Erickson, Boltswitch, Inc.
COMMENT ON PROPOSAL NO: 9-75
RECOMMENDATION: Revise as follows:
Single throw knife switches, bolted pressure contact switches, and switches with butt contacts shall be connected in accordance with the manufacturer's specifications, typically identified by the markings "line" and "load". If there are no specifications, then these products shall be connected so that the blades are de-energized when the switch is in the open position. Single throw knife switches, bolted pressure contact switches, molded case switches, switches with butt contacts, and circuit breakers used as switches shall be connected so that the terminals supplying the load are de-energized when the switch is in the open position.
SUBSTANTIATION: Bottom-feed bolted pressure contact switches typically have energized blades when the switch is in the open position. This is by design, as switch manufacturers may feel it is more practical than having switch blades pivot at the top and open against gravity. Switch manufacturers provide barriers around the switch blades that remain energized to prevent accidental contact and labels to warn that the switch blades may be energized when the switch is open. These safety features are generally required by design standards and third party listing agencies. Bottom-feed bolted pressure contact switches with energized blades (when open) have been in existence for over 25 years, and tens of thousands are installed. Adoption of Proposal 9-75 as originally submitted would make many bottom-feed bolted pressure contact switch designs obsolete, and many existing installations would no longer comply with the code.
Transfer switches also typically have switch blades that remain energized when the blades are in the open position. The blades are energized by reverse feed through the load side bus ties.
The reason for Section 380-6(c) in the code should be to ensure that switches are connected in accordance with how the products are designed, tested, and labeled, and to prevent the connection of these products backwards. It should not be the intent of this article to dictate how products are designed. A switch, after all, will have energized parts at one end and de-energized parts at the other end. This is the definition of a switch. It should be allowable by design to have any part of a switch energized when in the off position, as long as the energized part is reasonably protected from inadvertent contact.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Comment 9-41 which meets the submitter's intent.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #844)

9- 34 - (380-6(c) Connection of Switches): Reject
SUBMITTER: Larry F. Miller, National Electrical Manufacturers Association (NEMA)
COMMENT ON PROPOSAL NO: 9-75
RECOMMENDATION: The panel should reject this proposal.
SUBSTANTIATION: The inclusion of the proposed wording would effectively eliminate bottom-fed bolted pressure contact switches. The design of these switches provides for a tamper-proof barrier that encloses the blades, in accordance with UL 977.
PANEL ACTION: Reject.
PANEL STATEMENT: The comment would overturn positive aspects of the proposal that can be retained without compromising existing product listings. See the panel action and statement on Comment 9-41.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #872)

9- 35 - (380-6(c)): Reject
SUBMITTER: Ronnie Ridgeway, Siemens Energy & Automation
COMMENT ON PROPOSAL NO: 9-75
RECOMMENDATION: Proposal should be rejected. Return to the existing wording as follows:
(c) Connection of Switches. Single-throw knife switches, ~~bolted pressure contact switches,~~ and switches with butt contacts shall be connected so that the blades are de-energized when the switch is in the open position. Single-throw knife switches, bolted pressure contact switches, molded-case switches, switches with butt contacts, and circuit breakers used as switches shall be connected so that the terminals supplying the load are de-energized when the switch is in the open position.
SUBSTANTIATION: If bolted pressure contact switches are included in the wording, bottom feed switches would no longer be allowed. These bottom feed switches have barriers with block contact with blades when accessing fuses or load lugs. These switches have been used safely for many years and are designed to meet the requirements of UL 977.
PANEL ACTION: Reject.
PANEL STATEMENT: The comment would overturn positive aspects of the proposal that can be retained without compromising existing product listings. See the panel action and statement on Comment 9-41.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #877)

9- 36 - (380-6(c)): Reject
SUBMITTER: Peter Calabrese, Delta Metal Products Co. Inc.
COMMENT ON PROPOSAL NO: 9-75
RECOMMENDATION: Delete all text with reference to "bolted pressure contact switches."
SUBSTANTIATION: 1) From a safety point of view, these units have been around for 25 years with an excellent safety record. They are UL listed and have sufficient barriers and marking to indicate the blades are energized when the switch is off.
2) The elimination of the bolted pressure contact switch with energized blades (bottom feed) will have a dramatic effect on the size and therefore the cost of switchboards as manufactured today.
PANEL ACTION: Reject.
PANEL STATEMENT: The comment would overturn positive aspects of the proposal that can be retained without compromising existing product listings. See the panel action and statement on Comment 9-41.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #914)

9- 37 - (380-6(c)): Reject
SUBMITTER: Bob G. Newton, Pringle Electric Mfg. Co.
COMMENT ON PROPOSAL NO: 9-75
RECOMMENDATION: Reject this proposal to add "bolted pressure contact switches."
SUBSTANTIATION: This proposal would eliminate the use of bottom feed bolted pressure contact switch design. This would cover disconnects and tie-switches. This design type cover about 30% of the installations. Bottom feed designs have the blades energized in the open position, but they are covered. The bottom feed design has been used for the past 40 years as standard in the industry and they are UL listed. There have been no reported problems with this design.

Neither top or bottom feed bolted pressure contact switches have a butt contact design. It is believed that the intent of the proposal was not to eliminate the bottom feed design, top feed switches are already de-energized in open the position.
PANEL ACTION: Reject.
PANEL STATEMENT: The comment would overturn positive aspects of the proposal that can be retained without compromising existing product listings. See the panel action and statement on Comment 9-41.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1056)

9- 38 - (380-6(c)): Reject
SUBMITTER: Lanny McMahill, Rep. IAEI SW Section
COMMENT ON PROPOSAL NO: 9-75
RECOMMENDATION: Delete the addition of "bolted pressure contact switches."
SUBSTANTIATION: The bottom fuel design has been used for bolted pressure contact switches for over forty years. There have been no reported problems with this design. Excluding bolted pressure contact switches appears to be an oversight.
PANEL ACTION: Reject.
PANEL STATEMENT: The comment would overturn positive aspects of the proposal that can be retained without compromising existing product listings. See the panel action and statement on Comment 9-41.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1532)

9- 39 - (380-6(c)): Reject
SUBMITTER: Michael J. Johnston, International Association of Electrical Inspectors
COMMENT ON PROPOSAL NO: 9-75
RECOMMENDATION: Original Proposal read:

Connection of Switches. Single-throw knife switches and bolted pressure contact switches with butt contacts shall be connected so that the blades are de-energized when the switch is in the open position. Single-throw knife switches, molded-case switches, switches with butt contacts, and circuit breakers used as switches shall be connected so that the terminals supplying the load are de-energized when the switch is in the open position.

Revise the wording of the proposal to read as follows:

Single-throw knife switches, bolted pressure contact switches, and switches with butt contacts shall be connected so that the blades are de-energized when the switch is in the open position. Single-throw knife switches, bolted pressure contact switches, molded case switches, switches with butt contacts, and circuit breakers used as switches shall be connected so that the terminals supplying the load are de-energized when the switch is in the open position."
SUBSTANTIATION: Comment to recommend deleting the addition of "bolted pressure contact switches." The bottom feed design has been used for bolted pressure contact switches for 40 years. There have been no reported problems with this design.

Inclusion of bolted pressure contact switches appears to be an oversight.
PANEL ACTION: Reject.
PANEL STATEMENT: The comment would overturn positive aspects of the proposal that can be retained without compromising existing product listings. See the panel action and statement on Comment 9-41.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1869)

9- 40 - (380-6(c)): Reject
SUBMITTER: Timothy M. Croushore, Allegheny Power
COMMENT ON PROPOSAL NO: 9-75
RECOMMENDATION: Code Making Panel 9 should reject Proposal 9-75.
SUBSTANTIATION: The panel should have rejected this proposal. There are listed pressure bolted safety switches manufactured by Pringle that have energized, guarded blades when the switch is in the open position. Acceptance of the action on the proposal will cause a listed, safe piece of equipment to not be permitted by the Code.
PANEL ACTION: Reject.
PANEL STATEMENT: The comment would overturn positive aspects of the proposal that can be retained without compromising existing product listings. See the panel action and statement on Comment 9-41.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #2374)

9- 41 - (380-6(c)): Accept in Principle
SUBMITTER: G. Erich Heberlein, Jr., Rockwell Automation/Allen-Bradley Co.
COMMENT ON PROPOSAL NO: 9-75
RECOMMENDATION: Revise the wording of the proposal to read as follows:

"Single-throw knife switches and switches with butt contacts shall be connected so that their blades are de-energized when the switch is in the open position. Bolted pressure contact switches and molded case switches shall be listed and connected in accordance with their "line" and "load" markings. Single-throw knife switches, bolted pressure contact switches, molded case switches, switches with butt contacts and circuit breakers used as switches shall be connected so that the terminals supplying the load are de-energized when the switch is in the open position."
SUBSTANTIATION: With the proposal, the change would effect many bottom entry designs and could lead to technical problems. On bottom entry applications in MCCs, switchboards, etc., listed devices such as bolted pressure contact switches, molded case switches, switches with butt contacts and circuit breakers are bottom fed. Thus, the entry cabling is connected directly to the device without any "loop-a-round" cabling connections. This straight in connection to the device is important as the short circuit forces due the "loop-a-round" connection are now eliminated to the cabling and cable connections. In addition, most of these applications are large capacities with multiple cable connection per each phase and the field short circuit cable bracing is simplified with the straight in connection. Finally, these listed devices are marked for their connection, e.g, "line" and "load."
PANEL ACTION: Accept in Principle.
Revise the second sentence of the wording in the Comment to read as follows: "Bolted pressure contact switches shall have barriers that prevent inadvertent contact with energized blades." The panel accepts the balance of the comment as submitted.
PANEL STATEMENT: Code-Making Panel 9 wants to be sure that energized blades do not present a safety issue. The panel acknowledges that it never intended to interfere with existing listed bolted pressure contact switch designs.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1531)

9- 42 - (380-14(e)): Accept

Note: The Technical Correlating Committee understands that the term "luminaires" will be inserted before "(lighting fixtures)" in the revised wording.

SUBMITTER: Michael J. Johnston, International Association of Electrical Inspectors

COMMENT ON PROPOSAL NO: 9-88

RECOMMENDATION: Change accepted in principle and adjusted by the panel as follows:

(e) Dimmer Switches. General use dimmer switches shall only be used to control permanently installed incandescent lighting fixtures unless listed for the control of other loads, and installed accordingly.

SUBSTANTIATION: Recommendation that the Technical Correlating Committee consider a similar section to be included in the new Article 406 where the requirement for receptacles have been relocated to. This new article should include the limitations on what devices may be used or are not permitted to be used to control receptacles unless listed otherwise.

PANEL ACTION: Accept.

PANEL STATEMENT: Code-Making Panel 9 notes that the recommendation does not differ from the panel action on Proposal 9-88. The panel also notes that Article 406 is out of its jurisdiction.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 10

NEGATIVE: 1

EXPLANATION OF NEGATIVE:

CROUSHORE: See my explanation of negative on Comment 9-43.

(Log #1870)

9- 43 - (380-14(e) (New)): Reject

SUBMITTER: Timothy M. Croushore, Allegheny Power

COMMENT ON PROPOSAL NO: 9-88

RECOMMENDATION: Code Making Panel 9 should reject Proposal 9-88.

SUBSTANTIATION: The panel should gave rejected this proposal. The submitter did not provide any technical substantiation of a problem existing in the field, nor did the submitter identify any problem. The panel is writing new code to attempt to fix a non-existent problem. This new restriction will eliminate the receptacle-controlled table lamp on a dimmer switch. There is no safety problem with applying dimmers to table lamps.

PANEL ACTION: Reject.

PANEL STATEMENT: The listing restriction is largely unknown in the field. The receptacle supplying a table light with an incandescent lamp today may have an incompatible appliance plugged into the other half of the same duplex receptacle, and the homeowner would be completely unaware of the safety issue.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 10

NEGATIVE: 1

EXPLANATION OF NEGATIVE:

CROUSHORE: This comment should have been accepted. The restriction as mentioned in the panel statement is not an actual restriction. The text of the UL White Book gives an indication of the intended product use. Also, this indication is only applicable to Dimmers, General Use Switch. This intention does not apply to Commercial Dimmers or Theater Dimmers that can be used for fluorescent lighting and portable lighting. Reference page 20 of the Underwriters laboratories, Inc., General Information for Electrical Equipment (White Book). The submitter of the original proposal did not provide any technical substantiation of a problem existing in the field. A dimmer switch controlled receptacle can safely supply energy to an incandescent table or a floor lamp.

(Log #1923)

9- 44 - (380-15): Accept

SUBMITTER: Michael I. Callanan, International Brotherhood of Electrical Workers

COMMENT ON PROPOSAL NO: 9-88a

RECOMMENDATION: Continue to Accept this proposal.

SUBSTANTIATION: The acceptance of this proposal is extremely important to the safety of any person working on these devices or equipment served by occupancy devices. Presently, devices exist where voltage is still present even when placed in the off position. This change clearly requires that, where an OFF position is included on a switching device, it truly will require that all of the ungrounded conductors must be disconnected. CMP-9 is to be congratulated for recognizing the safety needs of electrical workers.

This comment represents the official position of the International Brotherhood of Electrical Workers Codes & Standards Committee.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

ARTICLE 384 — SWITCHBOARDS AND PANELBOARDS

(Log #CC900)

9- 44a - (384-3(E)): Accept

Note: The Technical Correlating Committee directs that the Fine Print Note be located at the end of the present 384-3(F).

SUBMITTER: CMP 9

COMMENT ON PROPOSAL NO: 9-92

RECOMMENDATION: By this comment, Code-Making Panel 9 deletes 384.3(E), contingent on Code-Making Panel 1's acceptance of Comment 1-136.

In its place insert the following Note:

"FPN: See 110.15 for requirements on marking the busbar or phase conductor having the higher voltage to ground where supplied from a 4-wire delta-connected system."

SUBSTANTIATION: Code-Making Panel 9 endorses the substantiation presented in Comment 1-136. Code-Making Panel 9 advises that Comment 1-136 is the product of a Code-Making Panel 9 Task Group formed pursuant to the Technical Correlating Committee instruction on Proposal 1-233.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #2054)

9- 45 - (384-11): Reject

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

COMMENT ON PROPOSAL NO: 9-99

RECOMMENDATION: The proposal should have been accepted in principle, revised to use comparable wording as presently exists in Section 384.13 for panelboards, as follows:

"Switchboards shall have a rating not less than the minimum feeder capacity required for the load computed in accordance with Part II or III of Article 220."

SUBSTANTIATION: The submitter correctly points to a gap in code coverage. The panel should remember that motor control centers are essentially a form of switchboard, and 430.94 requires not just a board rating but actual overcurrent protection based on the common power bus.

PANEL ACTION: Reject.

PANEL STATEMENT: The present code adequately covers the requirements for switchboards.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 10

NEGATIVE: 1

EXPLANATION OF NEGATIVE:

HARTWELL: This comment should have been accepted, and it will be resubmitted as a proposal for the 2005 NEC. This article needs enforceable language comparable to panelboard and motor control center requirements.

(Log #1962)

9- 46 - (384-20, Exception): Reject

SUBMITTER: Phil Simmons, Simmons Electrical Services

COMMENT ON PROPOSAL NO: 9-112

RECOMMENDATION: Revise the existing text of the Code text as follows:

384.20 Grounding of Panelboards. Panelboard cabinets and panelboard frames, if of metal, shall be in physical contact with each other and shall be grounded. Where the panelboard is used with nonmetallic raceway or cable or where separate grounding

conductors are provided, a terminal bar for the grounding conductors shall be secured inside the cabinet. The terminal bar shall be bonded to the cabinet and panelboard frame, if of metal, otherwise it shall be connected to the grounding conductor that is run with the conductors feeding the panelboard.

Exception: Where an isolated equipment grounding conductor is provided as permitted by Section 250-146(d), the insulated equipment grounding conductor that is run with the circuit conductors shall be permitted to pass through the panelboard without being connected to the panelboard's equipment grounding terminal bar unless

(1) The grounded conductor of a separately derived system is bonded to the panelboard enclosure,

(2) The panelboard is used as the building or structure disconnecting means, or

(3) The panelboard is the service equipment.

Equipment grounding conductors shall not be connected to a terminal bar provided for grounded conductors (may be a neutral) unless the bar is identified for the purpose and is located where interconnection between equipment grounding conductors and grounded circuit conductors is permitted or required by Article 250.

SUBSTANTIATION: Including the additional information on where an insulated equipment grounding conductor is not permitted to pass through a panelboard without being bonded to the enclosure is important to the clarity of this section. The opening phrase of the exception does not require compliance with Section 250.46(D) but simply indicates "where an isolated equipment grounding conductor is provided...".

Adding this additional wording will make this section and exception much more "User Friendly."

PANEL ACTION: Reject.

PANEL STATEMENT: The panel reaffirms its action and statement on Proposal 9-112. The submitter has provided no new information.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #799)

8- 96 - (3AA-22): Reject

SUBMITTER: David H. Kendall, Carlon

COMMENT ON PROPOSAL NO: 8-398

RECOMMENDATION: New paragraph in proposed Section 3AA.22:

Cables shall be permitted to be installed where such use is permitted by the respective cable articles. The number of cables shall not exceed the allowable percentage fill specified in Table 1, Chapter 9.

SUBSTANTIATION: This proposed text is to harmonize with the other raceway articles and allows cables to be installed in the raceway as long as the respective cable article permits it.

PANEL ACTION: Reject.

PANEL STATEMENT: Chapter 1, Table 9 applies to conduit and tubing. The table is not applicable to metallic wireway. Wireway fill is not calculated in the same manner as fill for conduit and tubing.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:

AFFIRMATIVE: 14

ARTICLE 400 — FLEXIBLE CORDS AND CABLES

(Log #71)

1- 176 - (400 and 402): Accept

SUBMITTER: Technical Correlating Committee National Electrical Code

COMMENT ON PROPOSAL NO: 6-147

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

The Technical Correlating Committee refers this Proposal to Code-Making Panels 1 and 18 for action on Items (b) and (c) of the Recommendation. This action will be considered by Panels 1 and 18 as a Public Comment.

SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.

PANEL ACTION: Accept.

PANEL STATEMENT: The panel accepts the direction of the Technical Correlating Committee as described in the recommendation of this comment. The panel concludes that the definition of "luminaire" as accepted in Proposal 1-165 is preferred.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13

VOTE ON PANEL ACTION:

AFFIRMATIVE: 13

(Log #71a)

18- 5 - (400 and 402): Accept

Note: It was the action of the Technical Correlating Committee that the 410-1 FPN be deleted to correlate with the addition of the definition in Article 100 by Proposal 1-165.

SUBMITTER: Technical Correlating Committee National Electrical Code

COMMENT ON PROPOSAL NO: 6-147

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

The Technical Correlating Committee refers this Proposal to Code-Making Panels 1 and 18 for action on Items (b) and (c) of the Recommendation. This action will be considered by Panels 1 and 18 as a Public Comment.

SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 10

VOTE ON PANEL ACTION:

AFFIRMATIVE: 10

(Log #251)

6- 63 - (Table 400-4): Accept in Principle

SUBMITTER: Siegfried A. Schauffele, American Insulated Wire Corp.

COMMENT ON PROPOSAL NO: 6-148

RECOMMENDATION: Add text as follows:

For Type G-GC change the description under heading "No. of Conductors" to:

3-6 plus grounding conductors and 1 ground-check conductor.

Editorial: Change heading for size to:

AWG or kcmil

This needs to be done in the 4th and 7th columns.

SUBSTANTIATION: This reflects the action taken by the panel on Proposal 6-148.

PANEL ACTION: Accept in Principle.

For clarification in Table 400-4:

1. Delete the word "Size" and change "(AWG)" to "AWG or kcmil" in the title of column 4 in the Preprint and column 3 in the 1999 Code.

2. Change "AWG" to "AWG or kcmil" in the title of column 7 in the preprint and column 6 in the 1999 Code.

3. Editorially remove "kcmil" in the body of Table 400-4.

PANEL STATEMENT: Editorial for clarification.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 10

NOT RETURNED: 1 Ferrell

(Log #252)

6- 64 - (Table 400-4): Accept in Principle

SUBMITTER: Siegfried A. Schauffele, American Insulated Wire Corp.

COMMENT ON PROPOSAL NO: 6-149

RECOMMENDATION: Change panel action to "accept in principle," and make changes to Type W in Table 400-4 as follows:

In 4th column add: "501-1000 kcmil," single conductor only."

In 7th column add: "501-1000 kcmil".

In 8th column add: "110."

SUBSTANTIATION: This reflects the intent of the submitter of Proposal 6-149, who inadvertently omitted the data on insulation thickness for sizes 501-1000 kcmil.

PANEL ACTION: Accept in Principle.
Revise Table 400-4 as follows:

Portable power-cable	W	2000	8-500	1-6	Thermoset	8-2 1-4/0 250-500	1.52 2.03 2.41	60 80 95		Oil-resistant thermoset	Portable, extra hard usage
			501-1000	1		501-1000	2.80	110			

PANEL STATEMENT: The panel has deleted the word "kcmil" in the body of the table to correlate with the action taken on Comment 6-63.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Ferrell

(Log #835)

6- 65 - (Table 400-4 and 400-5(B)): Accept
SUBMITTER: Larry F. Miller, National Electrical Manufacturers Association (NEMA)
COMMENT ON PROPOSAL NO: 6-155
RECOMMENDATION: The Panel should Accept this proposal with the following revisions:
(tables shown on following pages)
(Note: Submitter has provided selected pages of Table 400-4)
SUBSTANTIATION: Wall thickness for 10 AWG and 12 AWG types W, G, G-GC, and PPE are based on CSA Std. No. 96 and respective ampacities are based on CEC Tables 12A and 12C which are in agreement with NEC Table 400-5(B) for other sizes also.The original proposal included types W and G. Types PPE and G-GC, which are cables intended for the same application as types W and G, were inadvertently omitted from the original proposal. Therefore, this does not present new material.
PANEL ACTION: Accept.
PANEL STATEMENT: Panel action on Comment 6-63 modifies this action.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Ferrell

(Log #836)

6- 66 - (Table 400-4): Accept
SUBMITTER: Larry F. Miller, National Electrical Manufacturers Association (NEMA)
COMMENT ON PROPOSAL NO: 6-156, 6-160
RECOMMENDATION: The Panel should Accept the proposal with the following revisions: (table shown opposite)
Revise 400-6(a) as follows:
400-6. Markings.
(a) Standard Markings. Flexible cords and cables shall be marked by means of a printed tag attached to the coil reel or carton. The tag shall contain the information required in Section 310-11(a). Types S, SC, SCE, SCT, SE, SEO, SEOO, SJ, SJE, SJEO, SJEOO, SJO, SJT SJTO, SJTOO, SO, SOO, ST, STO, STOO, SEW, SEOW, SEOOW, SJEW, SJEOW, SJEOOW, SJOW, SJTW, SJTOW, SJTOOW, SOW, SOOW, STW, STOW, and STOOW flexible cords and G, G-GC, PPE, and W flexible cables shall be durably marked on the surface at intervals not exceeding 24 in. (610 mm) with the type designation, size, and number of conductors.
Revise 400-11 as follows:
400-11. In Show Windows and Show Cases. Flexible cords used in show windows and show cases shall be Type S, SE, SEO, SEOO, SJ, SJE, SJEO, SJEOO, SJO, SJOO, SJT, SJTO, SJTOO, SO, SOO, ST, STO, STOO,SEW, SEOW, SEOOW, SJEW, SJEOW, SJEOOW, SJOW, SJOOW, SJTW, SJTOW, SJTOOW, SOW, SOOW, STW, STOW, STOOW,
SUBSTANTIATION: Panel requested that Table 400-4 include the cable types with the "W" suffix rather than a footnote to the table. When doing so, however, changes to table 400-(5)A and sections 400-6 and 400-11 must also be made.
Note: Supporting Material is available for review at NFPA Headquarters.

Table 400-5(A) Allowable Ampacity for Flexible Cords and Cables [Based on Ambient Temperature of 30°C (86°F). See Section 400-13 and Table 400-4.]

Size (AWG)	Thermoset Type TS	Thermoset Types C, E, EO, PD, S, SJ, SJO, SJOO, SO, SOO, SP-1, SP-2, SP-3, SRD SV, SVO, SVOO, SJOW, SJOOW, SOW, SOOW		
	Thermoplastic Types TPT, TST	Thermoplastic Types ET, ETLB, ETP, ETT, SE, SEO, SJE, SJEO, SJT, SJTO, SJTOO, SPE-1, SPE-2, SPE-3, SPT-1, SPT-2, SPT-3, ST, SRDE, SRDT, STO, STOO, SVE, SVEO, SVT, SVTO, SVTOO, SEW, SEOW, SEOOW, SJEW, SJEOW, SJEOOW, SJTW, SJTOW, SJTOOW, STOW, STOOW, SPT-1W, SPT-2W,		Types HPD, HPN, HS, HSJ, HSO, HSJO, HSOO HSJOO
		A†	B†	
27*	0.5	5**		
20	—			
18	—	7	10	10
17	—		12	
16	—	10	13	15
15	—			17
14	—	15	18	20
12	—	20	25	30
10	—	25	30	35
8	—	35	40	
6	—	45	55	
4	—	60	70	
2	—	80	95	

*Tinsel cord
**Elevator cables only
***7 amperes for elevator cables only; 2 amperes for other types
†The allowable currents under subheading A apply to 3-conductor cords and other multiconductor cords connected to utilization equipment so that only 3 conductors are current-carrying. The allowable currents under subheading B apply to 2-conductor cords a other multiconductor cords connected to utilization equipment so tl only 2 conductors are current carrying.

PANEL ACTION: Accept.
PANEL STATEMENT: Panel action on Comment 6-63 modifies this action.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Ferrell

Table 400-4.

Trade Name	Type Letter	Size AWG	No. of Conductors	Insulation	Nominal Insulation Thickness[1]		Braid on Each Conductor	Outer Covering	Use		
					AWG	Mils					
Elevator Cable	ET See Note 5. See Note 10.	20-2	2 or More	Thermoplastic	20-16 14-12 12-10 8-2	20 30 45 60	Rayon	Three Cotton or equivalent, Outer one Flame-	Nonhazardous Locations		
	ETLB See Note 5. See Note 10.						None	Retardant & Moisture-Resistant See Note 3.			
	ETP See Note 5. See Note 10.						Rayon	Thermoplastic	Hazardous (Classified) Locations		
	ETT See Note 5. See Note 10.						None	One Cotton or equivalent and a Ther-moplastic Jacket			
Portable Power Cable	G	12-500 kcmil	2-6 plus Grounding Conductor(s)	Thermoset	12-2 1-4/0 250 kcmil--500 kcmil	60 80 95		Oil Resistant Thermoset	Portable and Extra Hard Usage		
	G-GC	12-500 kcmil	3 plus 2 grounding Conductors and 1 ground check conductor	Thermoset	12-2 1-4/0 250 kcmil 500 kcmil	60 80 95		Oil Resistant Thermoset			
Heater Cord	HPD	18-12	2, 3, or 4	Thermoset	18-16 14-12	15 30	None	Cotton or Rayon	Portable Heaters	Dry Locations	Not Hard Usage
Parallel Heater Cord	HPN See Note 6.	18-12	2 or 3	Oil Resistant Thermoset	18-16 14 12	45 60 95	None	Oil Resistant Thermoset	Portable	Damp Locations	Not Hard Usage

Table 400-4. (continued)

Trade Name	Type Letter	Size AWG	No. of Conductors	Insulation	Nominal Insulation Thickness[1]		Braid on Each Conductor	Outer Covering	Use		
					AWG	Mils					
Thermoset Jacketed Heater Cords	HS	14-12	2, 3, or 4	Thermoset	18-16	30	None	Cotton and Thermoset	Portable or Portable Heater	Damp	Extra Hard Usage
	HSJ	18-12									Hard Usage
	HSO	14-12						Cotton and Oil-Resistant Thermoset			Extra Hard Usage
	HSJO	18-12		Oil-Resistant Thermoset	14-12	45					Hard Usage
	HSOO	14-12									Extra Hard Usage
	HSJOO	18-12									Hard Usage
Twisted Portable Cord	PD	18-10	2 or More	Thermoset or Thermoplastic	18-16 14-10	30 45	Cotton	Cotton or Rayon	Pendant or Portable	Dry Locations	Not Hard Usage
Portable Power Cable	PPE	12-500 kcmil	1-6 plus Optional Grounding Conductor(s)	Thermoplastic Elastomer	12-2 1-4/0 250 kcmil-500 kcmil	60 80 95		Oil-Resistant Thermoplastic Elastomer	Portable, Extra Hard Usage		
Hard Service Cord	S See Note 4.	18-12	2 or More	Thermoset	18-16 14-10 8-2	30 45 60	None	Thermoset	Pendant or Portable	Damp Locations	Extra Hard Usage
Flexible Stage and Lighting Power Cable	SC	8-250 kcmil	1 or More		8-2 1-4/0 250 kcmil	60 80 95		Thermoset[2]	Portable, Extra Hard Usage		
	SCE			Thermoplastic Elastomer				Thermoplastic Elastomer[2]			
	SCT			Thermoplastic				Thermoplastic[2]			
Hard Service Cord	SE See Note 4.	18-2	2 or More	Thermoplastic Elastomer	18-16 14-10 8-2	30 45 60	None	Thermoplastic Elastomer	Pendant or Portable	Damp Locations	Extra Hard Usage
	SEO See Note 4.							Oil-Resistant Thermoplastic Elastomer			
	SEOO See Note 4.			Oil-Resistant Thermoplastic Elastomer							

Table 400-4. (continued)

Trade Name	Type Letter	Size AWG	No. of Conductors	Insulation	Nominal Insulation Thickness [1]		Braid on Each Conductor	Outer Covering	Use		
					AWG	Mils					
Junior Hard Service Cord	SJ	18-10	2, 3, 4, or 5	Thermoset	18-12	30	None	Thermoset	Pendant or Portable	Damp Locations	Hard Usage
	SJE			Thermoplastic Elastomer				Thermoplastic Elastomer			
	SJEO							Oil-Resistant Thermoplastic Elastomer			
	SJEOO			Oil-Resistant Thermoplastic Elastomer							
	SJO			Thermoset				Oil-Resistant Thermoset			
	SJOO			Oil-Resistant Thermoset				Oil-Resistant Thermoset			
	SJT			Thermoplastic	10	45		Thermoplastic			
Vacuum cleaner cord	SVTO See Note 6	18-16	2 or 3	Thermoplastic	18-16	15	None	Oil-resistant thermoplastic	Pendant or portable	Damp locations	Not hard usage
	SVTOO			Oil-resistant Thermoplastic							

Table 400-4. (continued)

Trade Name	Type Letter	Size AWG	No. of Conductors	Insulation	Nominal Insulation Thickness[1]		Braid on Each Conductor	Outer Covering	Use		
					AWG	Mils					
Parallel Tinsel Cord	TPT See Note 2.	27	2	Thermoplastic	27	30	None	Thermoplastic	Attached to an Appliance	Damp Locations	Not Hard Usage
Jacketed Tinsel Cord	TS See Note 2.	27	2	Thermoset	27	15	None	Thermoset	Attached to an Appliance	Damp Locations	Not Hard Usage
	TST See Note 2.			Thermoplastic				Thermoplastic			
Portable Power Cable	W	12-500 kcmil	1-6	Thermoset	12-2 1-4/0 250 kcmil-500 kcmil	60 80 95		Oil-Resistant Thermoset	Portable, Extra Hard Usage		
Electric Vehicle Cable	EV	18-500 kcmil See Note 11.	2 or more plus Grounding Conductor(s), plus optional hybrid data, signal, communications, and optical fiber cables	Thermoset with optional nylon See Note 12.	18-16 14-10 8-2 1-4/0 250 kcmil-500 kcmil	30 (20) 45 (30) 60 (45) 80 (60) 95 (75) See Note 12.	Optional	Thermoset	Electric Vehicle Charging	Wet Locations	Extra Hard Usage
	EVJ	18-12 See Note 11.			18-12	30 (20) See Note 12.					Hard Usage
	EVE	18-500 kcmil See Note 11.		Thermoplastic Elastomer with optional nylon See Note 12.	18-16 14-10 8-2 1-4/0 250 kcmil-500 kcmil	30 (20) 45 (30) 60 (45) 80 (60) 95 (75) See Note 12.		Thermoplastic Elastomer			Extra Hard Usage
	EVJE	18-12 See Note 11.			18-12	30 (20) See Note 12.					Hard Usage

(Log #835)

Table 400-5(B). Ampacity of Cable Types SC, SCE, SCT, PPE, G, G-GC, and W. [Based on Ambient Temperature of 30°C (86°F). See Table 400-4]

Size (AWG or kmcil)	Temperature Rating of Cable								
	60°C (140°F)			75°C (167°F)			90°C (194°F)		
	D[1]	E[2]	F[3]	D[1]	E[2]	F[3]	D[1]	E[2]	F[3]
12	—	31	26	—	37	31	—	42	35
10	—	44	37	—	52	43	—	59	49
8	60	55	48	70	65	57	80	74	65
6	80	72	63	95	88	77	105	99	87
4	105	96	84	125	115	101	140	130	114
3	120	113	99	145	135	118	165	152	133
2	140	128	112	170	152	133	190	174	152
1	165	150	131	195	178	156	220	202	177
1/0	195	173	151	230	207	181	260	234	205
2/0	225	199	174	265	238	208	300	271	237
3/0	260	230	201	310	275	241	350	313	274
4/0	300	265	232	360	317	277	405	361	316
250	340	296	259	405	354	310	455	402	352
300	375	330	289	445	395	346	505	449	393
350	420	363	318	505	435	381	570	495	433
400	455	392	343	545	469	410	615	535	468
500	515	448	392	620	537	470	700	613	536

[1]The ampacities under subheading D shall be permitted for single-conductor Types SC, SCE, SCT, PPE, and W cable only where the individual conductors are not installed in raceways and are not in physical contact with each other except in lengths not to exceed 24 in. (610 mm) where passing through the wall of an enclosure.

[2]The ampacities under subheading E apply to two-conductor cables and other multiconductor cables connected to utilization equipment so that only two conductors are current carrying.

[3]The ampacities under subheading F apply to three-conductor cables and other multiconductor cables connected to utilization equipment so that only three conductors are current carrying.

(Log #1376)

6- 67 - (Table 400-4): Accept
SUBMITTER: Kari Barrett, American Chemistry Council
COMMENT ON PROPOSAL NO: 6-151
RECOMMENDATION: The Panel should Accept this proposal as submitted.
SUBSTANTIATION: This issue needs to be revisited in light of the fact that Panel 14 has Accepted in Principle proposal 14-8 (an identically worded proposal), and has also Accepted proposal 14-2 (revised Article 500) in which the term "unclassified location" has been defined. The term "nonhazardous" implies locations which are not required to be evaluated, whereas "unclassified" means that the area has been evaluated as to Class, Division, and Zone and determined that none of those classifications apply. "Unclassified" most clearly states that the area is safe for general-purpose equipment without implying that other, nonelectrical, hazards do not exist.
PANEL ACTION: Accept.
PANEL STATEMENT: See panel action and submitter's substantiation on Comment 6-68.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Ferrell

(Log #2174)

6- 68 - (Table 400-4): Accept
SUBMITTER: Donald R. Cook, Shelby County Building Inspections
COMMENT ON PROPOSAL NO: 6-151
RECOMMENDATION: Code-Making Panel 14 recommends the Code-Making Panel 6 accept Proposal 6-151.
SUBSTANTIATION: Although Code-Making Panel 14 included definitions to both terms "nonhazardous" and "unclassified" in the proposed Section 500-2 in the ROP, a recent poll of Code-Making Panel 14 members indicates that most members prefer only one term and that term "unclassified". The panel was not balloted and positions could change with discussion at the ROC meeting.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Ferrell

(Log #2184)

6- 69 - (Table 400-4): Accept
SUBMITTER: Mark Goodman, BP (ARCO)
COMMENT ON PROPOSAL NO: 6-151
RECOMMENDATION: Replace "nonhazardous" with "unclassified" in two places within the table.
SUBSTANTIATION: This comment is in support of the original proposal, substantiation and Explanation of Negatives by Mr. McClung and Mr. Pettigrew.
This proposal should have been "Accept". The Panel Action correctly identified this as a code wide issue requesting guidance from the Technical Correlating Committee. This proposal is a companion proposal to several others intended to remove the term "nonhazardous" and replace it with the more technically correct "unclassified". This change should be supported throughout the code to provide consistency and to avoid confusion and misapplication.
PANEL ACTION: Accept.
PANEL STATEMENT: See panel action and submitter's substantiation on Comment 6-68.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Ferrell

(Log #253)

6- 70 - (Table 400-5(B)): Accept
SUBMITTER: Siegfried A. Schauffele, American Insulated Wire Corp.
COMMENT ON PROPOSAL NO: 6-169
RECOMMENDATION: Change panel action to "accept" and add the following ampacities to column D of Table 400-5(B):

Size	60°C	75°C	90°C
600	575	690	780
700	630	755	855
750	655	785	885
800	680	815	920
900	730	870	985
1000	780	935	1055

SUBSTANTIATION: This comment reflects the intent of the submitter of Proposal 6-169 and supplements my comment on Proposal 6-149.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Ferrell

(Log #1377)

6- 71 - (400-7(a)(6)): Accept in Principle
SUBMITTER: Kari Barrett, American Chemistry Council
COMMENT ON PROPOSAL NO: 6-176
RECOMMENDATION: The panel should Accept the proposal as submitted.
SUBSTANTIATION: The current wording in the NEC is a contradiction in terms. The word stationary does not mean it is subject to being changed. The word stationary means "fixed, unchanging". The wording in NEC implies that stationary equipment will be frequently changed out. This is the root of the confusion in the field. The current wording also implies that all stationary equipment can utilize this wiring method. This is in direct conflict with the intent described in the panel statement. The equipment described in the proposal substantiation is not considered in the field as stationary equipment but is considered as portable or mobile equipment. Because of this field understanding, it is sometimes not allowed to utilize this wiring method. The proposed wording would clarify the panel intent.
PANEL ACTION: Accept in Principle.
Revise 400-7(a)(6) to read as follows:
(6) Connection of utilization equipment to facilitate frequent interchange.
PANEL STATEMENT: The revised text eliminates the contradiction between "stationary" and "frequent interchange".
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Ferrell

(Log #2038)

6- 72 - (400-8(4)): Reject
SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc.
COMMENT ON PROPOSAL NO: 6-183
RECOMMENDATION: Accept the proposal.
SUBSTANTIATION: The present rule removed an allowance that has been done for generations, without adequate substantiation. Any electrician with field experience will attest to the numbers of cord drops that emerge from many overhead sources, busways being relatively unusual among them. As a member of Code-Making Panel 9, I can assure Code-Making Panel 6 that the cords supporting boxes per 370.23(H)(1) originate somewhere, and only some of the time from busway. A requirement so routinely subject to local amendment or simply ignored without adverse consequence tends to discredit public confidence in the process.
PANEL ACTION: Reject.
PANEL STATEMENT: No new technical substantion was provided by the submitter to support the recommendation.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Ferrell

(Log #1124)

6- 73 - (400-8(5)): Accept in Principle
SUBMITTER: Paul Dobrowsky, Holley, NY
COMMENT ON PROPOSAL NO: 6-186
RECOMMENDATION: Accept the proposal as submitted.
SUBSTANTIATION: The definition of concealed (in Article 100) indicates that flexible cords above ceilings, having removable panels, are <u>not</u> concealed because the "structure or finish" does <u>not</u> render them inaccessible.

100-Concealed. Rendered inaccessible by the structure or finish of the building. Wires in concealed raceways are considered concealed, even though they may become accessible by withdrawing them.

The definition of exposed (in Article 100) does not help because where panels are "designed to allow access" a flexible cord above the panel would still be considered exposed. I realize that flexible cords are not a wiring method but this definition is commonly used to describe the space above a suspended ceiling.

100-Exposed. On or attached to the surface or <u>behind panels designed to allow access.</u>

Many well respected NEC authorities such as the submitter of Proposal 6-185 agree that the language is confusing. Changing the word "concealed" to "located" will clearly state the requirement and remove confusion.
PANEL ACTION: Accept in Principle.
Revise 400-8(5) to read:
(5) Where concealed by walls, floors or ceilings; or located above suspended or dropped ceilings.
PANEL STATEMENT: This addresses the submitter's recommendation. Editorially revised for clarification.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Ferrell

(Log #2234)

6- 74 - (400-8(5)): Accept in Principle
SUBMITTER: Andre R. Cartal, Bldg Dept., Princeton Borough, NJ
COMMENT ON PROPOSAL NO: 6-185
RECOMMENDATION: Please reconsider the proposal.
SUBSTANTIATION: The present code wording is not in conflict, but is subject to various interpretations. If it read "flexible cords and cables shall not be used WHERE CONCEALED" period, then the Article 100 definition is enforced, but the code does not say that, the words are "Flexible cords and cables shall NOT be used (5) where concealed behind building walls, etc. Now "concealed" looses its Article 100 definition because its use in this sentence has to be based Webster's Dictionary and this is confirmed by the present code wording. You can't read it any other way. Acceptance of the proposal will eliminate any confusion.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Comment 6-73.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Ferrell

(Log #2039)

6- 75 - (400-8(6)): Reject
SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc.
COMMENT ON PROPOSAL NO: 6-187
RECOMMENDATION: Accept the proposal.
SUBSTANTIATION: The proposed exception allows for a limited use of flexible cord in a manner consistent with other NEC precedents. It avoids wiring method transition splices and additional enclosures, which cause far more problems than a short length of flexible cord would ever cause. Remember that in instances where flexibility is required, cord may be used on a permanent basis. This proposal is a practical and modest method of addressing a field problem.
PANEL ACTION: Reject.
PANEL STATEMENT: No new technical substantiation was provided to change the present requirement in the Code that prohibits the use of flexible cord for permanent wiring.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Ferrell

(Log #72)

18- 6 - (400-8(d)(4)): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 6-188
RECOMMENDATION: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 18 for action in Article 410. This action will be considered by Code-Making Panel 18 as a Public Comment

SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
PANEL STATEMENT: The panel accepts Proposal 6-188. The panel recognizes that the code reference in Proposal 6-188 should be Section 410-8(D)(4).
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 10
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10

(Log #1175)

6- 76 - (400-9): Reject
SUBMITTER: Gregory P. Bierals, Electrical Design Inst.
COMMENT ON PROPOSAL NO: 6-190
RECOMMENDATION: Revise text to read as follows:
The repair of hard-service and junior hard-service cord No. 12 and larger shall be permitted.
SUBSTANTIATION: OSHA 29 CFR Part 1910.305(g) requires splices made in flexible cord to be No. 12 AWG or larger. It is not the use of flexible cord in smaller sizes that is the issue here, it the splicing of the flexible cord.
PANEL ACTION: Reject.
PANEL STATEMENT: There are uses for 14 AWG where splices are permitted.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Ferrell

(Log #1371)

6- 77 - (400-25): Accept
SUBMITTER: Kari Barrett, American Chemistry Council
COMMENT ON PROPOSAL NO: 6-197
RECOMMENDATION: The Panel should Reject this proposal.
SUBSTANTIATION: The substantiation provided by the submitter does not offer any fire experience data related to this issue. The presence of flexible cords and cables would not be expected to add significant fuel to an existing fire situation. Flame retardant cords and cables should only be required in critical applications such as equipment safety shutdown circuits or UPS power supply cords. Flexible cords and cables are often used over and over in the field, and this proposal could result in substantial replacement costs to the owners with no increase in the level of operational safety.
PANEL ACTION: Accept.
PANEL STATEMENT: The panel does not necessarily agree with the submitter's substantiation. See panel action and submitter's substantiation on Comment 6-78.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Ferrell

(Log #1557)

6- 78 - (400-25): Accept
SUBMITTER: Ravindra H. Ganatra, Alcan Cable
COMMENT ON PROPOSAL NO: 6-197
RECOMMENDATION: Recommend that this proposal be rejected.
SUBSTANTIATION: Reasons for this recommendation are:
1. Submitter does not identify each specific type of flexible cords and cables.
2. Mr. Galan's comment with his vote suggests that a change in the wording is necessary.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Ferrell

(Log #73)

6- 79 - (400-37 (New)): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 6-199
RECOMMENDATION: The Technical Correlating Committee directs the panel to add a title to the new section 400-37 in accordance with the Style Manual. This action will be considered by the Panel as a Public Comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
PANEL STATEMENT: See panel action on Comment 6-80.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Ferrell

(Log #1378)

6- 80 - (400-37 (New)): Accept
SUBMITTER: Kari Barrett, American Chemistry Council
COMMENT ON PROPOSAL NO: 6-199
RECOMMENDATION: The Panel should Reject this proposal.
SUBSTANTIATION: The substantiation provided by the submitter does not offer any fire experience data related to this issue. The presence of portable cables would not be expected to add significant fuel to an existing fire situation. Flame retardant portable cables should only be required in critical applications such as equipment safety shutdown circuits or UPS power supply cords. Portable cables are often used over and over in the field, and this proposal could result in substantial replacement costs to the owners with no increase in the level of operational safety.
PANEL ACTION: Accept.
PANEL STATEMENT: The panel does not necessarily agree with the submitter's substantiation.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Ferrell

Note: The sequence no. 6-81 was not used.

ARTICLE 402 — FIXTURE WIRES

(Log #74)

8- 97 - (Table 402-3): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 6-202
RECOMMENDATION: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 8 for correlation in its respective articles and annexes.
This action will be considered by the Panel as a Public Comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
Per the CMP-6 action on Appendix C, delete Type AF from the following:
1. Table C1, Fixture Wires, 3 places.
2. Table C2, Fixture Wires, 4 places.
3. Table C3, Fixture Wires, 4 places.
4. Table C4, Fixture Wires, 3 places.
5. Table C5, Fixture Wires, 4 places.
6. Table C6, Fixture Wires, 4 places.
7. Table C7, Fixture Wires, 4 places.
8. Table C8, Fixture Wires, 4 places.
9. Table C9, Fixture Wires, 4 places.
10. Table C10, Fixture Wires, 4 places.
11. Table C11, Fixture Wires, 4 places.
12. Table 350-12 (350.22 2002 NEC Draft), 1 place
In addition, Type AX should be deleted from Table C1 and C4, Fixture Wires. It is the Panel's understanding that AX is a typographical error.

PANEL STATEMENT: The panel understands that Type AF wire is being deleted in its entirety and have reviewed and made the appropriate changes to the tables and sections under the jurisdiction of CMP-8.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #2021)

3- 84 - (406-6(c) (New)):

Note: The Technical Correlating Committee directs that the Panel Action on Comment 3-84 be reported as "Hold" consistent with Section 4-4.6.2.2 of the NFPA Regulations Governing Committee Projects. This Comment will become a Proposal for Code-Making Panel 18 during the next code cycle.

SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc.
COMMENT ON PROPOSAL NO: 3-119
RECOMMENDATION: Place the energized flanged inlet restriction in the new receptacle article, as a new 406.6(C), and then reletter existing (C) as (D), as follows:

(C) Flanged Inlets. Flanged or motor-base inlet plugs shall be installed so their prongs, blades, or pins are not energized unless inserted into an energized receptacle cord body.

SUBSTANTIATION: The hazard identified in the proposal is real regardless of whether the wiring is a temporary connection. This material belongs with its companion material under Code-Making Panel 18's jurisdiction.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: The Technical Correlating Committee should send this to CMP-15 and CMP-18 for action on this comment since the Technical Correlating Committee sent Proposals 3-119 and 3-120 to CMP-15 for action and this deals with similar information.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #2021a)

15- 9 - (406-6(c) (New)):

Note: The Technical Correlating Committee directs that the Panel Action on Comment 15-9 be reported as "Hold" and forwarded to Code-Making Panel 18 for action during the next code cycle.

SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc.
COMMENT ON PROPOSAL NO: 3-119
RECOMMENDATION: Place the energized flanged inlet restriction in the new receptacle article, as a new 406.6(C), and then reletter existing (C) as (D), as follows:

(C) Flanged Inlets. Flanged or motor-base inlet plugs shall be installed so their prongs, blades, or pins are not energized unless inserted into an energized receptacle cord body.

SUBSTANTIATION: The hazard identified in the proposal is real regardless of whether the wiring is a temporary connection. This material belongs with its companion material under Code-Making Panel 18's jurisdiction.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Agree that this particular type of connection belongs in CMP-18's jurisdiction.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 18
VOTE ON PANEL ACTION:
AFFIRMATIVE: 18

ARTICLE 410 — LIGHTING FIXTURES, LAMPHOLDERS, LAMPS, AND RECEPTACLES

(Log #1806)

18- 7 - (410): Accept in Principle
SUBMITTER: Jim Evanisko, National Cathode Corp.
COMMENT ON PROPOSAL NO: 18-58
RECOMMENDATION: Revise as follows:

Q. Special Provisions for Electric-Discharge Lighting Systems of More than 1000 Volts

410-80. General.

(a) ~~Open-Circuit Voltage Exceeding 1000 Volts~~ Listing. ~~Equipment for use with~~ Electric-discharge lighting systems ~~and designed for~~ with an open-circuit voltage exceeding 1000 volts shall be ~~of a type intended for such service~~ listed and installed in conformance with that listing.

(b) Dwelling Occupancies. Equipment that has an open-circuit voltage exceeding 1000 volts shall not be installed in or on dwelling occupancies.

(c) Live Parts. The terminal of an electric-discharge lamp shall be considered as a live part ~~where any lamp terminal is connected to a circuit of over 300 volts.~~

(d) Additional Requirements. In addition to complying with the general requirements for lighting fixtures, such equipment shall comply with Part Q of this article.

FPN: For signs and outline lighting, see Article 600.

410-81. Control.

(a) Disconnection. Fixtures or lamp installation shall be controlled either singly or in groups by an externally operable switch or circuit breaker that opens all ungrounded primary conductors.

(b) Within Sight or Locked Type. The switch or circuit breaker shall be located within sight from the fixtures or lamps, or it shall be permitted elsewhere if it is provided with a means for locking in the open position.

410-82. Lamp Terminals and Lampholders. Parts that must be removed for lamp replacement shall be hinged or held captive. Lamps or lampholders will be designed so that there shall be no exposed live parts when lamps are being inserted or are being removed.

410-83. Transformers ~~Ratings Transformers and ballasts shall have a secondary open-circuit voltage of not over 15,000 volts with an allowance on test of 1000 volts additional. The secondary current rating shall not be more than 120 milliamperes if the open-circuit voltage is over 7500 volts, and not more than 240 milliamperes if the open-circuit voltage is 7500 volts or less.~~

~~410-84. Transformer Type. Transformers shall be enclosed and listed.~~

~~410-84. Transformers and Secondary~~

~~410-85. Transformers and Secondary Connections. the high voltage windings of transformers shall not be connected in series or parallel.~~

(a) Type. Transformers shall be enclosed, identified for the use and listed.

(b) Voltage. Secondary-circuit voltage shall not exceed 15,000 volts, nominal, under any load condition. The voltage to ground of any output terminals of the secondary circuit shall not exceed 7500 volts, under any load conditions.

(c) Rating. Transformers shall have a secondary short-circuit current rating of not more than 150 mA if the open-circuit voltage is over 7500 volts, and not more than 300 mA, if the open-circuit voltage rating is 7500 volts or less.

(d) Secondary Connections. Secondary circuit outputs shall not be connected in parallel or in series.

410-~~86~~4. Transformer Locations.

(a) Accessible. Transformers shall be accessible after installation.

(b) Secondary Conductors. Transformers shall be installed as near to the lamps as practicable to keep the secondary conductors as short as possible.

(c) Adjacent to Combustible Materials. Transformers shall be located so that adjacent combustible materials will not be subjected to temperatures in excess of 90°C (194°F).

410-~~87~~5. Transformer Loading. The lamps connected to any transformer shall be of such length and characteristics so as not to cause a condition of continuous overvoltage on the transformer.

410-~~88~~6. Wiring Method — Secondary Conductors. Conductors shall be installed in accordance with Section 600-32.

410-~~89~~7. Lamp Supports. Lamps shall be adequately supported as required in Section 600-41.

410-~~90~~88. Exposure to Damage. Lamps shall not be located where normally exposed to physical damage.

410-~~91~~89. Marking. Each fixture or each secondary circuit of tubing having an open-circuit voltage of over 1000 volts shall have a clearly legible marking in letters not less than 1/4 in. (6.35 mm) high reading: "Caution ...volts." The voltage indicated shall be the rated open-circuit voltage.

410-~~92~~90. Switches. Snap switches shall comply with Section 380-14.

SUBSTANTIATION: Cold Cathode Lighting systems over 1000 volts can be listed. To the best of our knowledge all manufacturers of such systems are listed by UL. It is appropriate that the NEC require listing, rather than relying upon the knowledge of an authority having jurisdiction to inspect each installation in accordance with the applicable standards.

The phrase "where any lamp terminal is connected to a circuit of over 300 volts" is deleted as this phrase has no application to Part Q which covers installations of over 1000 volts.

The transformers sections have been restructured to provide

consistency with the format and terminology used in 600-23 because transformers for Cold Cathode lighting systems and Neon Signs are very similar. They are both manufactured under a single ANSI standard, UL 2161.

The current rating changes are presented to more readily accomplish manufacturing and rating of Cold Cathode transformers and to introduce consistency with Article 600. Article 410 has historically been interpreted to be referencing operating current ratings. Article 600 has always referenced short-circuit current ratings. A transformer manufacturer cannot accurately control operating current. They design cold cathode transformers to operate at approximately 80 percent of the short-circuit current, however operating current is also controlled by the actual load of tubing as well as the wiring of each circuit at the installation location. The NEC should specify maximum short-circuit current ratings in 410, as is done in 600, to provide controllable limits for the ANSI standard which regulates the manufacturing of transformers.

PANEL ACTION: Accept in Principle.

Revise text to read as follows:

"Q. Special Provisions for Electric-Discharge Lighting Systems of More than 1000 Volts

410-80. General.

(a) Listing. Electric-discharge lighting systems with an open-circuit voltage exceeding 1000 volts shall be listed and installed in conformance with that listing.

(b) Dwelling Occupancies. Equipment that has an open-circuit voltage exceeding 1000 volts shall not be installed in or on dwelling occupancies.

(c) Live Parts. The terminal of an electric-discharge lamp shall be considered as a live part .

(d) Additional Requirements. In addition to complying with the general requirements for lighting fixtures, such equipment shall comply with Part Q of this article.

FPN: For signs and outline lighting, see Article 600.

410-81. Control.

(a) Disconnection. Fixtures or lamp installation shall be controlled either singly or in groups by an externally operable switch or circuit breaker that opens all ungrounded primary conductors.

(b) Within Sight or Locked Type. The switch or circuit breaker shall be located within sight from the fixtures or lamps, or it shall be permitted elsewhere if it is provided with a means for locking in the open position.

410-82. Lamp Terminals and Lampholders. Parts that must be removed for lamp replacement shall be hinged or held captive. Lamps or lampholders shall be designed so that there are no exposed live parts when lamps are being inserted or removed.

410-83. Transformers

(a) Type. Transformers shall be enclosed, identified for the use and listed.

(b) Voltage. The secondary-circuit voltage shall not exceed 15,000 volts, nominal, under any load condition. The voltage to ground of any output terminals of the secondary circuit shall not exceed 7500 volts, under any load conditions.

(c) Rating. Transformers shall have a secondary short-circuit current rating of not more than 150 mA if the open-circuit voltage is over 7500 volts, and not more than 300 mA, if the open-circuit voltage rating is 7500 volts or less.

(d) Secondary Connections. Secondary circuit outputs shall not be connected in parallel or in series.

410-84. Transformer Locations.

(a) Accessible. Transformers shall be accessible after installation.

(b) Secondary Conductors. Transformers shall be installed as near to the lamps as practicable to keep the secondary conductors as short as possible.

(c) Adjacent to Combustible Materials. Transformers shall be located so that adjacent combustible materials will not be subjected to temperatures in excess of 90°C (194°F).

410-85. Exposure to Damage. Lamps shall not be located where normally exposed to physical damage.

410-86. Marking. Each fixture or each secondary circuit of tubing having an open-circuit voltage of over 1000 volts shall have a clearly legible marking in letters not less than 6.35 mm (1/4 in.) high reading: "Caution ...volts." The voltage indicated shall be the rated open-circuit voltage.

410-87. Switches. Snap switches shall comply with Section 380-14."

PANEL STATEMENT: The panel deleted Sections 410-87, 410-88, and 410-89 of the current NEC. With the acceptance of the listing requirement in the submitter's comment these sections are no longer required.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #865)

18- 8 - (410-14(a),(b)): Accept
SUBMITTER: Larry F. Miller, National Electrical Manufacturers Association (NEMA)
COMMENT ON PROPOSAL NO: 18-19
RECOMMENDATION: The Panel should reject the proposal and retain the original verbiage of Section 410-14(a) and (b) as it appears in the 1999 NEC.
SUBSTANTIATION: The Panel Action to remove "Electric Discharge" from the heading and the body of the text would disallow the use of many incandescent fixtures such as: chandeliers, swag lamps, and alike, that are too heavy to be supported by the outlet box alone, or by design require independent mounting means. Many of these fixtures have been in use for decades without a problem. Neither the Panel nor the submitter have shown any substantiation that shows that incandescent fixtures have been a problem when used in this manner.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #883)

18- 9 - (410-14(a) (b)): Accept
SUBMITTER: Tony Paone, Progress Lighting
COMMENT ON PROPOSAL NO: 18-19
RECOMMENDATION: Recommend leaving the "electric discharge" wording in.
SUBSTANTIATION: The intent of the proposal is to require a suitable method of connecting a surface mounted fixture, supported independent of a junction box, to the junction box. This interpretation makes sense, as it would eliminate fixture wires or extension cords as a means of connecting the fixture. However, the problem with the change is that it would also affect chain hung chandeliers and similar fixtures. If an installer wanted to swag a chandelier, so that it is supported independently from the unction box, the change would require that the fixture cord be routed through raceway. According to the negative vote explanations, this was the reason that the phrase "electric discharge" was included in the first place.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1364)

18- 10 - (410-14(a) (b)): Accept
SUBMITTER: David P. Brown, Baltimore Gas and Electric Co/EEI
COMMENT ON PROPOSAL NO: 18-19
RECOMMENDATION: This Proposal should be Rejected.
SUBSTANTIATION: There was no technical substantiation submitted supporting this proposed change. EEI originally voted with the Panel to accept this proposal in part. We have changed our position after giving further consideration to the negative vote comments on the Proposal which were submitted by Messieurs Kempel and Mezger. The important issues expressed in their comments were not discussed during panel deliberations. We totally agree with their analyses and believe that the Proposal should be rejected.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #2263)

18- 11 - (410-14(a), (b)): Accept
SUBMITTER: Don Miletich, Cooper Lighting Div.
COMMENT ON PROPOSAL NO: 18-19
RECOMMENDATION: Retain the original verbiage of Sections 410-14(a) and (b) as it appears in the 1999 edition of NEC.
SUBSTANTIATION: The panel action to remove "electric discharge" from the heading and the body of the text will prohibit the use of the cord connected incandescent luminaires, such as chandeliers, swag lamps and alike. These luminaires are either too heavy to be supported directly from the outlet box or by design are intended to be mounted away from the outlet box. These types of luminaires are common and have been in use for decades without a problem. Changing the requirement will represent unnecessary hardship on both manufacturers and the user communities for no apparent reason. Neither the panel nor the submitter has shown any substantiation that shows that incandescent luminaires have been a problem when used in this manner.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #440)

18- 12 - (410-14(a)b): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
COMMENT ON PROPOSAL NO: 18-19
RECOMMENDATION: Accept (b) of proposal.
SUBSTANTIATION: The proposal is innocuous and merely clarifies that the inference that boxes may be concealed is incorrect. See 370-29.
PANEL ACTION: Reject.
PANEL STATEMENT: Section 370-29 does not prohibit boxes from being concealed. It requires the wiring in boxes to be accessible. This is exactly the reason that Section 410-14(b) is worded the way it is.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #208)

18- 13 - (410-16(a)): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 18-26
RECOMMENDATION: The Technical Correlating Committee directs the Panel to "Accept" this Proposal to correlate with the Panel Action on Proposal 9-36. The responsibility for outlet boxes is with Code-Making Panel 9. This action will be considered by the Panel as a Public Comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1451)

18- 14 - (410-18(b)): Hold
SUBMITTER: Eric Stromberg, The Dow Chemical Company
COMMENT ON PROPOSAL NO: 18-28
RECOMMENDATION: 410-18(b)(1) Where this circuit is supplied by a GFCI, fixtures with exposed metal parts shall be allowed.
SUBSTANTIATION: Currently, the code (410-18(b)) only allows nonmetallic (no exposed conductive parts) lighting fixtures to be used when supplied by an ungrounded two-wire circuit. 210-7(d)(3)(e), however, allows the use of a grounded receptacle on an ungrounded two-wire circuit when the receptacle is fed by a GFCI and is labeled accordingly. It is the opinion of the author that the spirit of Article 210 should be applied to article 410-18 and thereby allow the use of metallic light fixtures on a two-wire system when the circuit is protected by a GFCI.
PANEL ACTION: Hold.
PANEL STATEMENT: This is new material and is being held in accordance with Section 4-6.2.2 of the Regulations Governing Committee Projects. The panel will hold Comment 18-14.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #209)

18- 15 - (410-18(b), Exception (New)): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 18-28
RECOMMENDATION: The Techncial Correlating Committee directs the Code-Making Panel to review the Proposal relative to the word "when". The Techncial Correlating Committee directs this proposal be sent to Code-Making Panel 5 for information. This action will be considered by the Panel as a public comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
Revise the text to read as follows:
410.18(B) Exception: Replacement luminaires (fixtures) shall be permitted to connect to an equipment grounding conductor from the outlet in compliance with Section 250.130(C). The luminaire (fixture) shall then be grounded in accordance with 410.18(A).
PANEL STATEMENT: The committee accepts the recommendation of the Technical Correlating Committee and replaced the word "When" with the above rewording.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1195)

18- 16 - (410-31): Accept in Principle
SUBMITTER: James Hospodarsky, Lithonia Lighting
COMMENT ON PROPOSAL NO: 18-30
RECOMMENDATION: Revise the proposed paragraph 410-32 as follows:
410-32 Wiring Supplying Fixtures Connected Together. Fixtures designed for end-to-end connection to form a continuous assembly, or fixtures connected together by recognized wiring methods shall be permitted to contain the conductors of 2-wire <u>branch</u> circuits, or one multiwire branch circuit supplying the connected fixtures <u>and need not be listed as raceway.</u> One additional 2-wire branch circuit separately supplying one or more of the connected fixtures shall also be permitted.
SUBSTANTIATION: 410-31, Exception 2 has clearly stated fixtures carrying branch circuits supplying the fixtures need not be listed as raceway and has been an accepted installation method for many years. The proposal to break 410-31 into three distinct sections loses this clarity. As proposed, the new 410-31 may be taken as a stand-alone requirement and applied to continuous row fixtures carrying branch circuits supplying the fixtures in the row. Adding the revised wording to the proposed 410-32 will reestablish the intent of Exception 2 to 410-31.
PANEL ACTION: Accept in Principle.
Revise the proposed paragraph 410-32 as follows:
410.32 Wiring Supplying Luminaires (Fixtures) Connected Together. Luminaires (Fixtures) designed for end-to-end connection to form a continuous assembly, or fixtures connected together by recognized wiring methods shall be permitted to contain the conductors of a 2-wire branch circuit, or one multiwire branch circuit supplying the connected luminaires (fixtures) and need not be listed as a raceway. One additional 2-wire branch circuit separately supplying one or more of the connected luminaires (fixtures) shall also be permitted.
PANEL STATEMENT: The panel made editorial changes to the text.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #2062)

18- 17 - (410-31, 410.33): Accept
SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc.
COMMENT ON PROPOSAL NO: 18-30
RECOMMENDATION: Change the word "identified" to "marked" in both sections.
SUBSTANTIATION: This use of the term identified varies from its proper application as covered in the Article 100 definition. Identified means generally recognizable as suitable, not marked, and as such any listed product is also identified if applied within the listing, however, not all identified products are necessarily listed. Misuse of the term identified is becoming a major issue, especially in Code-Making Panel 14. The intent in this case seems to be that the fixture be listed, and that the raceway acceptability and temperature suitabilities be obvious through a factory-applied marking. The proper terminology for this is listed and marked.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #878)

18- 18 - (410-33 (New)): Reject
SUBMITTER: George W. Flach, New Orleans, LA
COMMENT ON PROPOSAL NO: 18-31
RECOMMENDATION: Revise as follows:
In lighting fixtures with medium base screw shell lampholders the lamp, or lampholder, or both shall be constructed to prevent a lamp with a higher wattage from being energized when inserted in a lampholder constructed for a lower wattage lamp.
SUBSTANTIATION: This is a continuing problem that should be corrected. Maximum lamp wattage labels may not exist, are charred, or discolored. A simple design change will correct this problem.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Comment 18-19.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #2075)

18- 19 - (410-33): Reject
SUBMITTER: Phil Simmons, Simmons Electrical Services
COMMENT ON PROPOSAL NO: 18-31
RECOMMENDATION: The proposal should have been accepted in principle with the following ways permitted to prevent excessive and dangerous temperatures from being created in junction boxes where connections are made to lighting fixtures:
(1) The design of the screw shell shall be such that it cannot accept a lamp of a higher wattage than the luminaire (fixture) is designed, listed and marked for.
(2) Thermal protection shall be provided that will interrupt the supply to the lampholder(s) where the temperature for which the branch circuit supply conductors are rated is exceeded.
(3) Design and listing of the luminaire (fixture) so the maximum temperature of branch circuit supply connections is not exceeded with the maximum wattage lamp that can be installed in the luminaire (fixture).
SUBSTANTIATION: There is a serious safety problem with many lighting fixtures that are being installed as indicated in the substantiation. No practical means has been provided to prevent dangerous overlamping of these fixtures. Sorry, homeowners simply do not read and follow the lamping instructions. While a product cannot be made so it is impossible to install it in an unsafe manner, products can certainly be made so it is more likely than not to have a product that is safe.
Many, many electricians see the kind of problem expressed in the substantiation for the Proposal on almost a daily basis. Unfortunately, there is not a repository for incident data from which reliable statistics can be produced. IAEI announced their intention at the Northwestern Section meeting in Anchorage this year to develop such a database. We hope not too many lives will be lost and property destroyed while we are waiting for the data to be assembled.
Perhaps a task force of industry leaders should be assembled to address this serious problem. Maybe an interim solution, such as revising product safety standards, can be accomplished without waiting more than three years for the next NEC revision cycle.
PANEL ACTION: Reject.
PANEL STATEMENT: No data has been provided to identify overlamping to be a cause of fires. Wiring degradation may be due to multiple causes. The anecdotal example given in Proposal 18-31 did not provide indication of the age of the wiring or the luminiare involved. Both the NEC and product standards have addressed the effect of luminaire overlamping. Minimum allowable thermal rating of branch circuit wiring has increased twice, from 60°C to 75°C and then in 1985 to 90°C. Luminaire product standards have also been revised to better address outlet box heating. Product listing temperature measurement methods have been refined and qualification tests conducted on insulated test ceilings; resulting in that addition of thermal insulation pads to the majority of outlet box mounted luminaires. Product standards also impose minimum thresholds for luminaire wattage ratings to reduce the likelihood that end users will overlamp. Proposal 18-31 requests a drastic product change that may cause existing luminaries to become incompatible with replacement lamps. The proposal would not correct wire degradation in older installations.
This comment does not add any additional information to enable the panel to determine whether the problem of overheating is associated with old fixtures and old wiring or with new luminaires and wiring meeting the current code and standards. To impose a change of this magnitude without this information would be inappropriate. If the problem is with old luminaires and old wiring this proposed change would have minimal effect.
The panel encourages the data base being developed by IAEI and referred to in the submitters substantiation include the age of the luminaire, the age of the wiring, and wattage of the lamp.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #2272)

18- 20 - (410-33 (New)): Reject
SUBMITTER: Curtis Chapel, Resistance Electric
COMMENT ON PROPOSAL NO: 18-31
RECOMMENDATION: Same as original proposal #18-31.
SUBSTANTIATION: Electrical Manufacturers have neglected to protect the public by failing, so far, to design Surface Mounted Lighting Fixtures and associated equipment to prevent dangerous overlamping. Instead, it has tried to shift its responsibility to the untrained public to notice a small warning, which many of them don't see, don't notice, don't heed, and/or don't remember the next time someone/anyone changes a light bulb to a larger size because they need more light and assume, because it will fit, it is safe and intended for such use. I believe this constitutes deadly (criminal?) negligence on the manufacturers' part, as it has and will continue to result in too many fires and deaths each and every year this situation continues unchanged, with the continuing real possibility that the numbers of those fires will increase as more fixtures enter "the market", more residences are built with them, and the longer time existing installations will have to continue to deteriorate.
In order to attempt to save innocent lives continuing to be undeniably lost year after year due to current lack of prevention on the NEC's part at this point in time, I will respond to the (Panel Statement) sentence by sentence:
(The data provided is not specific enough to identify overlamping as a cause.)
In conversations I have had with fire investigators of the Fire Marshal's offices in my city and state, they have made it abundantly clear that there is no way for them to determine specifically that overlamping was a cause. Upon investigation after a fire, the temperature extremes exploded the bulb, and completely obliterated any markings on it or its fixture; besides which there is no known way to document, after the fact, how many bulbs of whatever higher wattage were installed for what length of time previous (months, years, decades) contributing to the final failure and resulting fire - and - in too many cases - deaths. This is why I submitted my own personal observation of a situation just prior to a fire, that proves undeniably that overlamping causes overheating causes insulation failure leading to an irrefutable proportion of at least one of the 23,200 fires and 180 civilian deaths that occurred in 1996 alone. That one death should have been enough to warrant this committee to act, let alone the substantial proportion of 5,200 fires probably caused by "light fixtures". (See original substantiation and supporting material.)
(This proposal is a product requirement that is difficult if not impossible for an Authority Having Jurisdiction to enforce).

Electrical Inspectors and other Authorities Having Jurisdiction (fire officials +) inspect for Listed and Labeled equipment all the time. If they can't see the marking, who's to say an untrained homeowner or occupant will, and then follow it, which is in fact part of the problem. It is not impossible to enforce, harder to determine requirements already in code are being enforced every day.

(Also, as written, it is a prescriptive requirement that provides only one way to accomplish its purpose.)

This in not prescriptive in that it does not prescribe only one way to accomplish its purpose to prevent overlamping. I, and I am not a light fixture designer by profession, can think of more than one way to accomplish the purpose. Some examples: 1) vary the length of the screwshell according to maximum wattage; 2) vary the length or depth of the small contacting tip or tab; 3) vary the length of the insulating screwshell cover to contact, or not, with the bulge in the glass portion of the bulb, as the degree of bulge and its location changes as wattage increases; 4) install a non-heat conducting barrier to limit the overall length of the bulb because currently the length of the bulb increase; and 5) etc., etc., etc. Where there is a will, created by a Mandate, there will be found a way (and so far, apparently, with no Mandate, no will or way has been found).

(Section 90-2 clearly states that the NEC covers the installation of electric conductors and equipment.)

In only this instance do I agree with the panel: It is undeniably within the purpose 90-1(a) "... practical safeguarding of persons and property from the hazards arising from the use of electricity." And Scope 90-2(a)(2) "Installations of conductors and equipment that connect to the supply of electricity." This panel failed in that it did not "Accept in Principle" this proposal, and then come up with a solution itself, as it and other panels have in so many other cases where no loss of life or property was documented as it has been in this case. See the "supporting material" available for review at NFPA headquarters.

(Since lamps of varying wattages have a common base and envelope, there is no physical means for the lampholder to reject the lamp based on wattage.)

This is relatively true, especially in the case of 60, 75, and 100 watt "A" or "Medium Base" type light bulbs as currently manufactured are concerned, and this is not the only place although I have found it is majorly where most of the problem is found. But maybe the panel has stumbled onto a hereto unaddressed discrepancy: light bulbs and lamps are a part even though replaceable, of electrical equipment: they do "... connect to the supply of electricity" 90-2(a)(2)! Maybe (just maybe: I am not attempting to "prescribe" "only one way here") lamps should be listed and labeled, with specific dimensions to accomplish this (and other i.e. heat dissipation?) purposes. But again, this is only one of many possible solutions, should a Mandate be secured.

When I joined NFPA almost 20 years ago I was told that a proposal documenting life and/or fire loss would definitely have to be resolved by NFPA action because of our purpose and scope. Why didn't this happen in this case? I know you are very very very very busy which is why I have submitted only one proposal, this one, in all the time I have been a member, and only after irrefutable documentation of a major major problem that no one refutes is a problem that its still killing innocent and unsuspecting people yet still today.

I have noticed that Panel 18 is comprised of four (4) "Manufacturer", and two (2) "Research/Testing" Laboratories, who arguably derive their living under the shadow of the Manufacturers, which pay for their services. Was/Is this a conflict of personal/professional self-interest on this panel in this case? The "User" member in this case appears to be an engineer, who in his daily duties probably would not know of or see this situation routinely if in fact at all. The same might also be true for the "Utility" member, whose employer is an Institute? So far this is a majority of the panel. Only the "IM" "E" and "L" members might routinely have seen this situation. If they are personally/professionally aware - were they too intimidated by the rest of the committee? or - too lazy to write a dissenting opinion against the majority, with whom they must work? And last but not least please notice the striking absence of an "Insurance" representative: whose employer must pay for these fires, a "Consumer" the ultimate purchaser who may be "consumed" in the fire that follows, or a Special Expert whom I suggest in this case could be a fire inspector/Marshal. Who will uphold the Scope and Purpose of the NFPA? If not Panel 18 - Who? If not now - When? There are people (figuratively and literally) dying to know that today.

Note: Supporting Material available for review at NFPA Headquarters.

PANEL ACTION: Reject.

PANEL STATEMENT: See panel statement on Comment 18-19.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #892)

18- 21 - (410-56(b)): Reject

SUBMITTER: Joel A. Rencsok, Scottsdale, AZ

COMMENT ON PROPOSAL NO: 18-36

RECOMMENDATION: This proposal should have been "accept in principle" and the panel should have added a second sentence to read as follows:

"Receptacles rated more than 20 amperes and designed for direct connection of aluminum conductors shall be marked AL/CU."

SUBSTANTIATION: There presently is no requirement to mark receptacles rated greater than 20 amperes and this allows aluminum conductors to connect to any type of receptacle greater than 20 amperes.

This addition will also make the code more user friendly.

PANEL ACTION: Reject.

PANEL STATEMENT: Section 110-14(a) requires terminals used to connect aluminum to be so identified. The product standards have for many years defined the appropriate marking. Typically the marking is "AL/CU". This is applicable for receptacles of higher current ratings, for circuit breakers and other device terminals. A number of years ago, UL revised the performance requirements for 15- and 20-ampere receptacle terminals suitable for connecting copper or aluminum conductors. Prior to this the "AL/CU" marking was used for these devices as well. The "R" in "CO/ALR" stands for "revised". To emphasize this change, the current wording was added in Section 410-56(b). Adding additional marking requirements is not necessary.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #2264)

18- 22 - (410-56(e)): Reject

SUBMITTER: Michael Shotey, TayMac

COMMENT ON PROPOSAL NO: 18-38

RECOMMENDATION: None provided.

SUBSTANTIATION: The Panel Statement indicates that there are "significant questions" about the investigation by the listing agency relating to engagement of the attachment plug blades in the receptacle contacts. This was, in fact, investigated (by testing), and this can and should be attested to by the listing agency.

The third and fourth sentences of the second paragraph of the Panel Statement do not address the proposal.

With respect to the first four sentences of the third paragraph of the Panel Statement, it is the purpose of the proposal to permit the Faceplates listed for the purpose. It is inappropriate for the Panel to argue that the proposed exception should not be accepted because it, in effect, would permit a violation of what is now in the Code.

Examination of Faceplates, that obviously inhibit to some limited degree the extent of insertion of attachment plug blades into the receptacle contacts, does not substitute for actual testing to determine whether or not this constitutes a hazard.

PANEL ACTION: Reject.

PANEL STATEMENT: See panel statement on Comment 18-23.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 10

NEGATIVE: 1

EXPLANATION OF NEGATIVE:

WELLS: After abstaining at the ROC meeting I have considered carefully the presentation of the proponents and the concerns expressed by Panel 18 members. My conclusion is that while the proposed wording leaves something to be desired, it is appropriate to recognize the products and trust that the certification organization will exercise sufficient controls until better wording of the proposed exception can be acted on during the next cycle.

Concerns expressed by various panel members with whom I concur are:

1. A detailed study has not been conducted to determine the "worst case" dimension from the receptacle contacts to the attachment plug blades. It is clear that some combination of

receptacle, attachment plug, and coverplate will prevent safe engagement of the attachment plug..
2. The cover plates can be used to cover damaged receptacles.
3. It is insufficient for the plates to be packaged with instructions directing the installer to use them only with certain manufacturer's receptacles.

Comments by the proponent with which I concur are:
1. The covers can be safely installed with specific receptacles and will not interfere with proper plug engagement.
2. Failure to recognize such covers will limit the convenience of providing protection for children from accidental insertion of foreign objects into receptacle contacts.

My conclusion is that such plates should be permitted by the Code and absent a comprehensive analysis to determine "worst case" (including old receptacles installed in the existing infrastructure) that the standard and certification organization should:
1. Evaluate the product with specific receptacles and attachment plugs with minimum blade length.
2. Require the plates and receptacle to be packaged and sold as kit or assembly.
3. Require instructions to direct the installer to replace both the plate and receptacle.

(Log #2295)

18- 23 - (410-56(e), Exception): Reject
SUBMITTER: Joel A. Rencsok, Scottsdale, AZ
COMMENT ON PROPOSAL NO: 18-38
RECOMMENDATION: This proposal should have been accepted.
SUBSTANTIATION: The requirement for listed products negates the panel statement that there is a problem with the blade of the attachment plug engagement with the receptacle. The pullout test would have shown this problem. The panel statement that this product was not listed for installations to comply with the NEC does not make sense. There would be no violation to Section 410-56(e) if the proposal is accepted.
PANEL ACTION: Reject.
PANEL STATEMENT: While faceplates with insulating material that cover the receptacle face have been tested by certification organizations, significant questions remain regarding the use of such faceplates. It is understood that such devices are listed for use with specific manufacturer's receptacles. However, removal of the existing faceplate may not reveal the identity of the installed receptacle. The consumer may be reluctant to further remove the receptacle to attempt to identify it as one being suitable for use with the replacement faceplate and thus use the faceplate anyway resulting in an untested combination.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
WELLS: See my Explanation of Negative on Comment 18-22.

(Log #891)

18- 24 - (410-57(b)(2)): Reject
SUBMITTER: Joel A. Rencsok, Scottsdale, AZ
COMMENT ON PROPOSAL NO: 18-44
RECOMMENDATION: This proposal should have been accepted.
SUBSTANTIATION: See also Proposal 18-45 substantiation. There is no need to allow weatherproof covers to be installed where an attendant needs to standby to unplug the utilization equipment today. Many companies are now manufacturing weatherproof receptacle covers to meet the intent of the code. You can not verify which receptacle is being installed for use only where attended. As technology changes so must the NEC keep abreast of changes.
PANEL ACTION: Reject.
PANEL STATEMENT: Proposal 18-44 would have required "in use" covers in wet locations. In accepting Proposal 18-43 the panel accepted a more limited application of such covers. As noted in the panel statement in Proposal 18-43 there are some applications where an "in use" cover is not desired. The substantiation with this comment does not dispute any of the limitations the panel adopted on Proposal 18-43.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #890)

18- 25 - (410-57(f) (New)): Reject
SUBMITTER: Joel A. Rencsok, Scottsdale, AZ
COMMENT ON PROPOSAL NO: 18-51
RECOMMENDATION: This proposal should have been accepted.
SUBSTANTIATION: I disagree with the panel's statement.
If the panel statement is true then the panel needs to delete 410-57(f) as this reasoning is redundant to Section 410-57(a) and (b). Receptacle covers are not designed to be installed without some means of providing a weather tight or weatherproof means be inserted between the faceplate and the enclosure or box. The panel statement enforces deletion of Section 410-57(f).
PANEL ACTION: Reject.
PANEL STATEMENT: The panel in its statement on Proposal 18-51 indicated that the requirements in Section 410-57 (A) and (B) apply equally to surface and flush mounted receptacle installations. Further, Section 410-57(E) deals with flush mounting. The substantiation for this comment provides no rationale why the reasons in the original panel statement are not correct.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1181)

18- 26 - (410-58): Reject
SUBMITTER: Frank Martucci, Fort Lee, NJ
COMMENT ON PROPOSAL NO: 18-52
RECOMMENDATION: Please accept this proposal.
After existing material add:
(c) Warning tags. Replacement cord connectors, and attachment plugs, shall be permanently tagged with warnings that improper use of this product can cause fiery death, shock, or electrocution.
SUBSTANTIATION: For the past thirteen years I have submitted proposals for the 1990, 1993, 1996, 1999, and the forthcoming 2002 National Electrical code that will prevent thousands of electricians and fiery deaths each and every year. Yet, despite my serious admonitions and allegations, code panels continue to reject my proposals sight unseen, without any demonstrations or testing whatsoever.
It boggles my mind that members of code making panels, most with no cord expertise whatsoever, can display such an indifference to human life. What if my system works? Don't they have any fear of being liable for thousands of deaths these past 13 years? Don't they have any fear of being liable for the loss of hundreds of thousands of homes each and every year?
I, for one, would demand extensive tests before I rejected a system that may indeed save thousands of lives each and every year.
However, I will continue to send in my proposals because I know I am right and lives are being needlessly lost because of our ill-conceived grounding system.
Article 250-95 in the original code document, written under the influence of insurance companies, states "the equipment grounding conductor shall be copper, copper clad, or aluminum."
However, when the National Fire Protection Association took over the code making process in 1911, members of the electrical industrial complex established exceptions to the code, permitting inappropriate outlet mounting screws, metal raceways, outlet boxes, and raceway connectors to be used as the grounding conductor.
This may be adequate for the short time it takes to clear ground faults, but what are the consequences if excessive current from a hotplate, heater, or air conditioner should flow through inappropriate, corrosive steel screws, 100 feet of metal raceways, and up to 16 raceway outlet box connectors for lengthy periods of time?
During heater and hotplate current tests, I was horrified to find the temperatures of outlet mounting screws exceeded the 250 degree limit of my electronic thermometer. In addition, the metal raceway temperature measured 150 degrees.
The temperatures were taken in open air and should be considerably higher inside sealed walls and ceilings, where the outlet mounting screws, and raceways, are located.

At times the outlet mounting screws were glowing at the threads of the outlet box and tissue paper smoldered or ignited when placed on them.

The consequences are quite obvious. Should excessive current ever flow for lengthy periods of time through this ill-conceived grounding system, "unseen" fires could develop and rage inside the walls and ceilings; fires that flashover into rooms and incinerate occupants and contents within seconds.

And excessive current can be made to flow through inappropriate screws and metal raceways if an appliance cord, or extension cord, is inadvertently wired with reversed green and white conductors; a wiring error especially possible when repairing the cords flooding our nation without any color coding whatsoever. The white, black, and green conductors are similarly colored black, gray, yellow, or brown.

There is no doubt in my mind that the sudden inferno that killed three students at (name deleted) was caused by our ill-conceived grounding system. What else could explain the sudden flashover that incinerated two students at the very same time the smoke alarms sounded and an extreme amount of smoke and heat poured down the corridors.

Prosecutors, inspectors, and grand juries have failed to find the cause because they are not electrical experts.

Here is a scenario of what really caused the tragedy at (name deleted).

Since a party was going on prior to the inferno, coffee, tea, or hot food had to be served and one, or more, hotplates were being used in one, or more rooms.

A hotplate cord, or an extension cord, inadvertently wired with reversed green and white conductors was being used. Or, a repaired extension cord without color coding was being used. Since the green, white, and black conductors in these cords are the same color, the student had to hit and miss wire a replacement plug until it worked.

In either case, the hotplate operated perfectly but its' current flowed through inappropriate outlet mounting screws and a hundred feet, or more, of flexible metal raceway that lace the walls and ceilings, of the lounge.

An outlet mounting screw, excessive raceway heat, or poorly made raceway connector, caused an "unseen" fire to start, rage and superheat, the interior of the walls, and possibly the ceiling, until it caused a 2000 degree flashover that incinerated everything and everyone in the lounge within seconds.

But code panels don't believe in scenarios and the carnage will continue.

And since cord components, as deadly as a gun, are being sold without background checks, instructions, or wiring safeguards, at least have the decency to warn people that four of six ways to wire this product can cause shock, electrocution, or fiery death. And also warnings to not install the product on cords without color coding unless highly qualified.

Not that highly qualified people could make a difference because highly qualified people caused the electrocution of a patient on March 15, 1956.

The patient died because the plug on the surgical device was wired with reversed green and white conductors by a well supervised, and qualified, (name deleted) factory worker.

And the patient dies because a well supervised, and qualified, (name deleted) electrician installed an outlet with reversed white and black conductors.

If experienced and well supervised workers can make mistakes that kill, what about the people with no experience whatsoever.

The code panel openly admits that most electrical equipment if improperly installed will cause electrocution or fires, yet refuses to install warning tags to warn the unsuspecting public about the danger. They state that "Code requirement are written to clearly define how to install electrical equipment."

What does that mean to the guy who knows nothing about Code requirement? He only wants to repair his extension cord and without background checks to see if he understands the "code requirements" or instructions, or warnings of dire consequences, he will hit and miss wire an extension cord without color coding until it works.

And the insidious nature of the system is that a reversal of the grounded conductors will cause an appliance to operate properly. However, the current will be flowing through inappropriate screws and raceways causing raging undetectable fires inside the walls.

Since code panels adamantly refuse to correct the design defects in cord components at least have the decency to install tags with warnings that four of six ways to wire this product can cause an electrocution or fiery death.

PANEL ACTION: Reject.

PANEL STATEMENT: The submitter provided no additional technical data to support his recommendation. See panel statements on Proposal 18-52 and Proposal 18-53.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #1178)

18- 27 - (410-58(a)): Reject

SUBMITTER: Frank Martucci, Fort Lee, NJ

COMMENT ON PROPOSAL NO: 18-53

RECOMMENDATION: Please accept this proposal.

Add after first sentence:

"Each grounding pole for cord connectors, and attachment plugs, shall have two wiring sites. The cord connectors, and attachment plugs, shall be designed so that only the grounding poles can be wired with two conductors."

SUBSTANTIATION: For the past thirteen years I have submitted proposals for the 1990, 1993, 1996, 1999, and the forthcoming 2002 National Electrical code that will prevent thousands of electricians and fiery deaths each and every year. Yet, despite my serious admonitions and allegations, code panels continue to rejectt my proposals sight unseen, without any demonstrations or testing whatsoever.

It boggles my mind that code making panels would reject proposals involving human lives without thoroughly exploring the possibility that may indeed save lives.

However, I will continue to send in my proposals because I know I am right and lives are being needlessly lost because of our ill-conceived grounding system.

Article 250-95 in the original code document, written under the influence of insurance companies, states "the equipment grounding conductor shall be copper, copper clad, or aluminum."

However, when the National Fire Protection Association took over the code making process in 1911, members of the electrical industrial complex established exceptions to the code, permitting inappropriate outlet mounting screws, metal raceways, outlet boxes, outlet connectors, and raceways connectors, to be used as the grounding conductor.

This may be adequate for the short time it takes to clear ground faults, but what are the consequences if excessive current from a hotplate, heater, or air conditioner should flow through inappropriate, corrosive steel screws, 100 feet of metal raceways, and up to 16 raceway outlet box connectors for lengthy periods of time?

During heater and hotplate current tests, I was horrified to find the temperatures of outlet mounting screws exceeded the 250 degree limit of my electronic thermometer. In addition, the metal raceway temperature measured 150 degrees.

The temperatures were taken in open air and should be considerably higher inside sealed walls and ceilings, where the outlet mounting screws, and raceways, are located.

At times the outlet mounting screws were glowing at the threads of the outlet box and tissue paper smoldered or ignited when placed on them.

The consequences are quite obvious. Should excessive current ever flow for lengthy periods of time through this ill-conceived grounding system, "unseen" fires could develop and rage inside the walls and ceilings; fires that flashover into rooms and incinerate occupants and contents within seconds.

And excessive current can be made to flow through inappropriate screws and metal raceways if an appliance cord, or extension cord, is inadvertently wired with reversed green and white conductors; a wiring error especially possible when repairing the cords flooding our nation without any color coding whatsoever. The white, black, and green conductors are similarly colored black, gray, yellow, or brown.

There is no doubt in my mind that the sudden inferno that killed three students at (name deleted) was caused by our ill-conceived grounding system. What else could explain the sudden flashover that incinerated two students at the very same time the smoke alarms sounded and an extreme amount of smoke and heat poured down the corridors.

But panels don't believe in scenarios or theories and the carnage will continue unless they accept my proposal that prevents fires inside walls.

Panels reject my proposals because they think it will necessitate drastic changes in cord components. This is simply not true. And if they would only ask for a demonstration I can prove it to them.

They reject my proposal because they think GFCIs and assured grounded programs are more effective than a wiring safeguard or a second, redundant ground. This, despite the fact that over a hundred workers were electrocuted on construction sites in 1992 where GFCIs and assured grounding programs are extensively used.

They just don't see the merits of the redundancy employed to every other federal agency whenever lives are at stake.

I urge the panels to adopt the use of redundancy every responsible engineer resorts to when lives are at stake. If our lives must be protected with an undersized, rarely tested, equipment grounding conductor, than at least provide two of them.

And please mandate the slight no cost change to cord components as described in this proposal to provide a wiring safeguard that prevents electrocutions and fiery deaths due to miswiring of components; especially when wiring components to the molded cords flooding our nation without any color coding whatsoever.

To answer specific reasons for rejection:

A credible source of the allegations made by Ralph Nader can be found in the 1987 issue of the Federal Registar where the FDA investigated allegations that doctors electrocuted 5000 patients in 1970.

And that was at a time when there were no more than a few hundred electrical devices used on patients. Now that the use of electrical devices has exploded 10 fold or more we can assume the deaths are proportionately higher since no changes have been made in our cord and plug grounding system.

You no longer hear of electrocutions in hospitals since the advent of defibrillators and cardiac arrest teams. Patients are simply zapped back to life when electrocutions occur; an extremely painful procedure according to patients fortunate to survive.

The panel accuses me of having a lack of understanding of proven electrical safety precepts. The same panel that condones the use of corrosive steel screws, metal raceways, metal outlet boxes and their raceway connectors to act as a conductor of electricity inside the walls of practically every dwelling in our nation. Is this the safety precept the panel was referring to?

The same panel that rejects the use of redundancy as a concept whenever lives are at stake. Is reducing the life protecting conductor up to 60% the safey precept the panel is referring to?

And the panel accuses me of being disingenuous?

On March 15, 1956 a patient was electrocuted when an attendant moved a Bovie surgical device from one outlet to another during an operation.

The patient died because the plug on the surgical device was wired with reversed green and white conductors by a well supervised experienced (name deleted) factory worker.

And the patient died because a well supervised experienced (name delete) electrician installed an outlet with reversed white and black conductors.

If experienced and well supervised workers can make mistakes that kill, am I being disingenuous trying to have our nation adopt a wiring safeguard that will prevent electrocutions and fiery deaths due to miswiring?

I strongly urge the panel to finally accept a proposal that will correct the design defects in cord design responsible for thousands of electrocutions and fiery deaths each and every year.

PANEL ACTION: Reject.

PANEL STATEMENT: The submitter provided no additional technical data to support his recommendation. See panel statements on Proposal 18-52 and Proposal 18-53.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #393)

18- 28 - (410-67(c)): Reject

SUBMITTER: Dan Leaf, Palmdale, CA

COMMENT ON PROPOSAL NO: 18-4

RECOMMENDATION: Accept in Principle revised as follows:

Delete present text for 410-67(c) and substitute:

(c) TAP CONDUCTORS for luminaries that require supply conductors with an insulation temperature rating higher than the branch-circuit conductors, tap conductors of a type suitable for the temperature encountered shall be permitted to run from the luminaire terminal connections to an outlet box or other connection point to the branch-circuit conductors not less than 305 mm (1 ft) from the luminaire. Where the tap conductors are of a type other than fixture wires and have an ampacity less than the branch-circuit conductors they shall be in accordance with 210-19(d). Where the tap conductors are fixture wires they shall be in accordance with 240-4(b) and enclosed in a suitable raceway or cable.

SUBSTANTIATION: A similar version of this section has been in the Code for many years from a time when the majority of branch-circuit conductors were rated 60°C or 75°C and some fixtures required 75°C or higher rated supply conductors. Tap conductors were commonly a fixture wire such as Type AF.

Taps (splices) can be made with conductors that are still considered branch-circuit conductors and this section should not apply to those as the are covered by (b). All taps are not defined by 240-3(e). This section literally applies to the conductors of (b) if they are taps and invokes the mandatory last sentence re: distance and wiring methods.

It is more fitting to apply those conditions to other than branch-circuit type tap conductors and delete the 6 ft requirement for suitable raceways or cables with fixture wire taps, to correlate with 240-4(b)(2). A tap conductor longer than 6 ft would allow for better heat dissipation.

Connection to only an outlet box is too restrictive; for example, if a tap is made to knob-and-tube wiring or open wiring on insulators a fitting is suitable and may be required by 300-16(a).

PANEL ACTION: Reject.

PANEL STATEMENT: This comment offers no comment on the changes in Proposal 18-54 but rather introduces a number of new changes to Section 410-67(C). The submitter provided no technical substantiation to eliminate the minimum and maximum dimensions.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #2063)

18- 29 - (410-67(c)): Reject

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

COMMENT ON PROPOSAL NO: 18-55

RECOMMENDATION: Change the subsection title to "Field-Wired Tap Conductors."

SUBSTANTIATION: This rule is widely understood to apply to the connection between a branch-circuit outlet box and the splice box on a prewired fixture housing, which is not the case. This rule only applies to the more unusual condition where the cold lead from the fixture terminal connection point to the outlet is field wired. Changing the title should clarify that this rule has no applicability to the conventional prewired recessed fixture.

PANEL ACTION: Reject.

PANEL STATEMENT: Section 410.67(C) addresses conventional pre-wired recessed luminaires and field wired tap conductors.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #469)

18- 30 - (410-80 through 410-92): Accept in Principle

SUBMITTER: Jim Evanisko, National Cathode Corp.

COMMENT ON PROPOSAL NO: 18-58, 18-59, 18-60, 18-61, 18-62, 18-63

RECOMMENDATION: Revise as follows:

Q. Special Provisions for Electric-Discharge Lighting Systems of More than 1000 Volts

410-80. General.

(a) ~~Open Circuit Voltage Exceeding 1000 Volts~~ Listing. ~~Equipment for use with~~ Electric-discharge lighting systems ~~and designed for~~ with an open-circuit voltage exceeding 1000 volts shall be ~~of a type intended for such service~~ listed and installed in conformance with that listing.

(b) Dwelling Occupancies. Equipment that has an open-circuit voltage exceeding 1000 volts shall not be installed in or on dwelling occupancies.

(c) Live Parts. The terminal of an electric-discharge lamp shall be considered as a live part ~~where any lamp terminal is connected to a circuit of over 300 volts.~~

(d) Additional Requirements. In addition to complying with the general requirements for lighting fixtures, such equipment shall comply with Part Q of this article.

FPN: For signs and outline lighting, see Article 600.

410-81. Control.

(a) Disconnection. Fixtures or lamp installations shall be controlled either singly or in groups by an externally operable

switch or circuit breaker that opens all ungrounded primary conductors.

(b) Within Sight or Locked Type. The switch or circuit breaker shall be located within sight from the fixtures or lamps, or it shall be permitted elsewhere if it is provided with a means for locking in the open position.

410-82. Lamp Terminals and Lampholders. Parts that must be removed for lamp replacement shall be hinged or held captive. Lamps or lampholders will be designed so that there shall be no exposed live parts when lamps are being inserted or are being removed.

410-83. Transformers ~~Ratings. Transformers and ballasts shall have a secondary open-circuit voltage of not over 15,000 volts with an allowance on test of 1000 volts additional. The secondary current rating shall not be more than 120 milliamperes if the open-circuit voltage is over 7500 volts, and not more than 240 milliamperes if the open-circuit voltage is 7500 volts or less.~~

~~410-84. Transformer Type. Transformers shall be enclosed and listed.~~

~~410-85. Transformers and Secondary Connections. The high voltage windings of transformers shall not be connected in series or parallel.~~

(a) Type. Transformers shall be enclosed, identified for the use and listed.

(b) Voltage. Secondary-circuit voltage shall not exceed 15,000 volts, nominal, under any load condition. The voltage to ground of any output terminals of the secondary circuit shall not exceed 7500 volts, under any load conditions.

(c) Rating. Transformers shall have a secondary short-circuit current rating of not more than 150 mA if the open-circuit voltage is over 7500 volts, and not more than 300 mA, if the open-circuit voltage rating is 7500 volts or less.

(d) Secondary Connections. Secondary circuit outputs shall not be connected in parallel or in series.

410-8~~6~~4. Transformer Locations.

(a) Accessible. Transformers shall be accessible after installation.

(b) Secondary Conductors. Transformers shall be installed as near to the lamps as practicable to keep the secondary conductors as short as possible.

(c) Adjacent to Combustible Materials. Transformers shall be located so that adjacent combustible materials will not be subjected to temperatures in excess of 90°C (194°F).

410-8~~7~~5. Transformer Loading. The lamps connected to any transformer shall be of such length and characteristics so as not to cause a condition of continuous overvoltage on the transformer.

410-8~~8~~6. Wiring Method -- Secondary Conductors. Conductors shall be installed in accordance with Section 600-32.

410-8~~9~~7. Lamp Supports. Lamps shall be adequately supported as required in Section 600-41.

410-~~90~~8. Exposure to Damage. Lamp shall not be located where normally exposed to physical damage.

410-~~89~~~~1~~89. Marking. Each fixture or each secondary circuit of tubing having an open-circuit voltage of over 1000 volts shall have a clearly legible marking in letters not less than 1/4 in. (6.35 mm) high reading: "Caution ... volts" The voltage indicated shall be the rated open-circuit voltage.

410-~~92~~90. Switches. Snap switches shall comply with Section 380-14.

SUBSTANTIATION: Cold Cathode Lighting systems over 1000 volts can be listed. To the best of our knowledge all manufacturers of such systems are listed by UL. It is appropriate that the NEC require listing, rather than relying upon the knowledge of an Authority Having Jurisdiction to inspect each installation in accordance with the applicable standards.

The phrase "where any lamp terminal is connected to a circuit of over 300 volts" is deleted as this phrase has no application to Part Q which covers installations of over 1000 volts.

The transformers sections have been restructured to provide consistency with the format and terminology used in 600-23 because transformers for Cold Cathode lighting systems and Neon Signs are very similar. They are both manufactured under a single ANSI standard, UL 2161.

The current rating changes are presented to more readily accomplish manufacturing and rating of Cold Cathode transformers and to introduce consistency with Article 600. Article 410 has historically been interpreted to be referencing operating current ratings. Article 600 has always referenced short-circuit current ratings. A transformer manufacturer cannot accurately control operating current. They design cold cathode transformers to operate at approximately 80 % of the short-circuit current, however operating current is also controlled by the actual load of tubing as well as the wiring of each circuit at the installation location. The NEC should specify maximum short-circuit current ratings in 410, as is done in 600, to provide controllable limits for the ANSI Standard which regulations the manufacturing of transformers.

PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Refer to panel action and statement for Comment 18-7.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #210)

18- 31 - (410-82): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 18-59a
RECOMMENDATION: The Technical Correlating Committee directs that the Action on this Proposal be rewritten to comply with the NEC Style Manual relative to the words "will be". This action will be considered by the Panel as a Public Comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
PANEL STATEMENT: See panel statement on Comment 18-7.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1547)

18- 32 - (410-84(a)and B(1) and (2) and Exception): Reject
SUBMITTER: Michael J. Johnston, International Association of Electrical Inspectors
COMMENT ON PROPOSAL NO: 18-64
RECOMMENDATION: Revise Section 410-84 as follows:

410-84 Transformer Type(s). Transformers shall be of the enclosed type or shall be installed in suitable enclosures.

(a) Type. Transformers shall be identified for the use and shall be listed.

(b) Secondary-Circuit Ground-Fault Protection. Transformers and electronic power supplies other than the following shall have secondary-circuit ground-fault protection:

1. Transformers with isolated secondaries and with a maximum open circuit voltage of 7500 volts or less.

2. Transformers with integral porcelain or glass secondary housing for the neon tubing and requiring no field wiring of the secondary circuit.

Exception: Listed assemblies that require no field installed high voltage secondary circuit conductors.

SUBSTANTIATION: The panel should reconsider the action taken on the original proposal. In the panel statement to the original proposal, Panel 18 indicated that the substantiation did not clearly state what the hazard is with electric discharge lighting systems. I agree, the original substantiation of the original proposal was not specific to the types of installations the proposed changes were addressing. I'll try to clarify what systems specifically the proposal is intended to address. Many cold-cathode electric discharge systems are listed systems, that's a given. However, there are cold-cathode electric discharge systems that are not listed systems, but field assembled components installed in identical fashion to field installed skeleton neon tubing installations. Example: 15,000 volt transformer installed in an enclosure, supplied by a 120 volt primary branch circuit. There are secondary GTO cables (15kv) installed in a wiring method in accordance with Section 600-32 as required by Section 410-88. The tubing is required to be supported by the same type of tubing supports required for neon tubing and there is a reference from 410-89 to Section 600-41 for lamp support. I totally agree that listed cold-cathode lighting systems falling under the requirements of Part Q in Article 410 should not be required to employ secondary circuit ground-fault protection transformers. However, the field installed cold-cathode systems which are usually installed by the same contractor that would install a field-installed neon tubing installation should require the same type of secondary circuit ground-fault protection. The same problems exist with the field-

installed cold-cathode high voltage secondary circuit that are present in the field-installed neon tubing secondary circuit. Same transformer and voltage output levels, often times higher, same field installed GTO (15 kv) secondary circuit conductor (without length limitation), same capacitance, same corona, and same ozone. The type of protection afforded for neon secondary circuits should not be more restrictive than field installed cold-cathode high voltage secondary circuits. The problems are the same. The panel may wish to consider accepting the comment in principle and adjusting the wording to fit the needs.

Another approach looking to the future would be to incorporate the field-installed high voltage cold-cathode systems in Article 600 and leave the lower voltage cold-cathode and other listed electric discharge lighting systems to be covered by Article 410, Part Q. This adjustment would make sense from a user friendly aspect also because there are a few references to Article 600 from Part Q of Article 410. Those references are there because the characteristics of the high voltage secondary circuit and the wiring of it, need to be treated the same. The same SCGFP protection should be provided. There is work to be done in this section to address this issue.

PANEL ACTION: Reject.

PANEL STATEMENT: With the panel action on Comment 18-7 all cold cathode systems are required to be listed, including field installed components. See panel action and statement on Comment 18-7.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #391)

18- 33 - (410-104): Hold

SUBMITTER: Dan Leaf, Palmdale, CA

COMMENT ON PROPOSAL NO: 18-4

RECOMMENDATION: Accept in Principle revise last sentence of 410-104:

Unless identified for supports at greater intervals, (1) a single section ~~4 ft (1.22 m) or shorter in length~~ shall have not less than two supports and, (2) a support shall be provided for each 1.22 m (4 ft) of length or major fraction thereof. ~~Where installed in a continuous row, each individual section of not more than 4 ft (1.22 m) in length shall have an additional support.~~

SUBSTANTIATION: Present wording is confusing. It only addresses individual sections of track 4 ft or less in length with no specifics for longer lengths. Manufacturers instructions re: mounting holes and clips indicating greater support intervals are covered by the first paragraph of the section.

PANEL ACTION: Hold.

PANEL STATEMENT: The panel considered no proposals pertaining to Section 410-104 at the 2002 NEC ROP meeting. This comment introduces new material. The panel will hold Comment 18-33.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #1489)

18- 34 - (410PartQ): Accept in Principle

SUBMITTER: Jim Evanisko, National Cathode Corp.

COMMENT ON PROPOSAL NO: 18-58

RECOMMENDATION: Revise 410 Part Q as follows:

Q. Special Provisions for Electric-Discharge Lighting Systems of More than 1000 Volts.

410-80. General

(a) ~~Open-Circuit Voltage Exceeding 1000 Volts~~ Listing ~~Equipment for use with~~ Electric-discharge lighting systems ~~and designed for~~ with an open-circuit voltage exceeding 1000 volts shall be ~~of a type intended for such service~~ listed and installed in conformance with that listing.

(b) Dwelling Occupancies. Equipment that has an open-circuit voltage exceeding 1000 volts shall not be installed in or on dwelling occupancies.

(c) Live Parts. The terminal of an electric-discharge lamp shall be considered as a live part ~~where any lamp terminal is connected to a circuit of over 300 volts~~.

(d) Additional Requirements. In addition to complying with the general requirements for lighting fixtures, such equipment shall comply with Part Q of this article.

FPN: For signs and outline lighting, See Article 600.

410-81. Control

(a) Disconnection. Fixtures or lamp installations shall be controlled either singly or in groups by an externally operable switch or circuit breaker that opens all ungrounded primary conductors.

(b) Within Sight or Locked Type. The switch or circuit breaker shall be located within sight from the fixtures or lamps, or it shall be permitted elsewhere if it is provided with a means for locking in the open position.

410-82. Lamp Terminals and Lampholders

Parts that must be removed for lamp replacement shall be hinged or held captive. Lamps or lampholders will be designed so that there shall be no exposed live parts when lamps are being inserted or are being removed.

410-83. Transformers ~~Ratings~~

~~Transformers and ballasts shall have a secondary open-circuit voltage of not over 15,000 volts with an allowance on test of 1000 volts additional. The secondary current rating shall not be more than 120 miliamperes if the open circuit voltage is over 7500 volts, and not more than 240 miliamperes if the open circuit voltage is 7500 volts or less.~~

~~410-84. Transformer Type.~~

~~Transformers shall be enclosed and listed.~~

~~410.85 Transformer and Secondary Connections~~

~~The high voltage windings of transformers shall not be connected in series or parallel.~~

(a) Type. Transformers shall be enclosed, identified for the use and listed.

(b) Voltage. Secondary-circuit voltage shall not exceed 15,000 volts, nominal, under any load condition. The voltage to ground of any output terminals of the secondary circuit shall not exceed 7500 volts, under any load condition.

(c) Rating. Transformers shall have a secondary short-circuit current rating of not more than 150 mA if the open-circuit voltage is over 7500 volts, and not more than 300 mA, if the open-circuit voltage rating is 7500 volts or less.

(d) Secondary Connections. Secondary circuit outputs shall not be connected in parallel or in series.

410-8~~6~~4. Transformer Locations

(a) Accessible. Transformers shall be accessible after installation.

(b) Secondary Conductors. Transformers shall be installed as near to the lamps as practicable to keep the secondary conductors as short as possible.

(c) Adjacent to Combustible Materials. Transformers shall be located so that adjacent combustible materials will not be subjected to temperatures in excess of 90°C (194°F).

410-8~~7~~5. Transformer Loading

The lamps connected to any transformer shall be of such length and characteristics so as not to cause a condition of continuous overvoltage on the transformer.

410-8~~8~~6. Wiring Method - Secondary Conductors

Conductors shall be installed in accordance with Section 600-32.

410-8~~9~~7. Lamp Supports

Lamps shall be adequately supported as required in Section 600-41.

410-~~90~~88. Exposure to Damage

Lamps shall not be located where normally exposed to physical damage.

410-~~91~~89. Marking

Each fixture or each secondary circuit of tubing having an open-circuit voltage of over 1000 volts shall have a clearly legible marking in letters not less than 1/4 in. (6.35 mm) high reading:

"Caution ...volts." The voltage indicated shall be the rated open-circuit voltage.

410-~~92~~90. Switches

Snap switches shall comply with Section 380-14.

SUBSTANTIATION: In accordance with the Panel Statement in 18-58 the proposed changes to Part Q are submitted.

Cold Cathode Lighting systems over 1000 volts can be listed. To the best of our knowledge, all manufacturers of such systems are listed by UL. It is appropriate that the NEC require listing, rather than relying upon the knowledge of an authority having jurisdiction to inspect each installation in accordance with the applicable standards.

The phrase "where any lamp terminal is connected to a circuit of over 300 volts" is deleted as this phrase has no application to Part Q which covers installations of over 1000 volts.

The transformers sections have been restructured to provide consistency with the format and terminology used in 600-23 because transformers for Cold Cathode lighting systems and Neon Signs are very similar. They are both manufactured under a single ANSI standard, UL 2161.

The current rating changes are presented to more readily accomplish manufacturing and rating of Cold Cathode transformers and to introduce consistency with Article 600. Article 410 has historically been interpreted to be referencing operating current ratings. Article 600 has always referenced short-circuit current ratings. A transformer manufacturer cannot accurately control operating current. They design cold cathode transformers to operate at approximately 80% of the short-circuit current, however operating current is also controlled by the actual load of tubing as well as the wiring of each circuit at the installation location. The NEC should specify maximum short-circuit current ratings in 410, as is done in 600, to provide controllable limits for the ANSI standard which regulates the manufacturing of transformers.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Refer to panel action and statement for Comment 18-7.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #392)

18- 35 - (420, 420-9 (a) (New)): Accept
SUBMITTER: Dan Leaf, Palmdale, CA
COMMENT ON PROPOSAL NO: 18-70
RECOMMENDATION: Accept in Principle, revise 420-9(a) second sentence:
The grounding contacting pole of grounding type plug-in ground-fault circuit-interrupters shall be permitted to be of the movable, self-restoring type on circuits operating at not over 150 volts between ~~and to~~ any two conductors ~~nor over 150 volts between~~ or any conductor and ground.
SUBSTANTIATION: The phrase "and to" appears to be a typo intended to be "any two".
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 10
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10

(Log #919)

18- 36 - (420 (New)): Accept
SUBMITTER: Keith Sinclair, Power Plus
COMMENT ON PROPOSAL NO: 18-70
RECOMMENDATION: I agree that receptacles, cord connectors and attachment plugs (caps) should have a section soley dedicated to their use and or application, withdrawing them from Articles 410, 210 and 250.
SUBSTANTIATION: None.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 10
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10

(Log #920)

18- 37 - (420): Accept
SUBMITTER: Shane Smith, Lea Electric
COMMENT ON PROPOSAL NO: 18-70
RECOMMENDATION: Receptacles, cord connectors and attachment plugs (caps), should have their own article. Removing them from 410, 210 and 250 would lessen confusion.
SUBSTANTIATION: None.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 10
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10

(Log #921)

18- 38 - (420): Reject
SUBMITTER: Richard Hill, Lea Electric
COMMENT ON PROPOSAL NO: 18-70
RECOMMENDATION: New Article 420 Receptacles, Cord Connectors and Attachments Plugs (caps).
SUBSTANTIATION: Finally, receptacles get moved from 410. They were sandwiched in between lighting fixtures which made an awkward place to find receptacles. I like this change. Perhaps receptacles should have an article in Chapter 3 near switches (380).
PANEL ACTION: Reject.
PANEL STATEMENT: The panel rejects the comment because no specific recommendation was made. The panel is glad that the commenter likes the change and reminds the commenter that the Technical Correlating Committee assigns article designations.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 10
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10

(Log #922)

18- 39 - (420 (New)): Accept
SUBMITTER: Seth Cooper, Quality Electric
COMMENT ON PROPOSAL NO: 18-70
RECOMMENDATION: Receptacles, cord connectors, and attachment plugs should have their own section.
They do not have enough in common with fixtures to be integrated with them. With their own section, there will be more room for expansion, detail, etc.
SUBSTANTIATION: None.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 10
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10

(Log #924)

18- 40 - (420): Reject
SUBMITTER: Neil D. Lake, Lea Electric
COMMENT ON PROPOSAL NO: 18-70
RECOMMENDATION: I believe that this subject should be put in a section more suitable for what is covered. Example, somewhere in Section or Chapter 3.
SUBSTANTIATION: A plug or cord cap or receptacle is not something that uses electricity and where this subject is located, Chapter 4, is known as the "Use" Chapter.
PANEL ACTION: Reject.
PANEL STATEMENT: The Technical Correlating Committee assigns article designations.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 10
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10

(Log #2243)

18- 41 - (420-6(b) (New)): Hold
SUBMITTER: Tom Dunn, San Jose, CA
COMMENT ON PROPOSAL NO: 18-70
RECOMMENDATION: Delete the second sentence of this paragraph.
SUBSTANTIATION: The first sentence clearly states that plugs are not to be installed on the "hot", or "down-stream", end of a cord. The second sentence implies that the wires supplying power to a receptacle cannot have a plug at the other end.
This would eliminate a lot of extension cords.
Another example of what would not be permitted, is the case of carnival rides, where receptacles at the outside end of carousel sweeps are powered by plugs at the inside end which plug into receptacles at the center of the ride.
PANEL ACTION: Hold.
PANEL STATEMENT: Proposal 18-70 was the editorial relocation of the receptacle portion of Article 410. It did not contain any substantive change. This comment introduces a substantive change to Section 410.56(G) of the 1999 NEC for which there was no proposal at the 2002 NEC ROP stage. Therefore, this comment introduces new material and this comment is on hold.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 10
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10

ARTICLE 422 — APPLIANCES

(Log #225)

20- 3 - (422-2-Appliance, Fixed (New); Appliance, Portable (New); and Appliance, Stationary (New)): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 20-5
RECOMMENDATION: It was the action of the Technical Correlating Committee that this Proposal be reconsidered and the Panel clarify their Panel Statement since the terms "fixed" and

"portable" are used in Article 422. This action will be considered by the Panel as a Public Comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
The panel accepts the TCC comment to reconsider this proposal. The panel reaffirms its rejection of Proposal 20-5.
PANEL STATEMENT: Proposal 20-5 refers to "appliances fixed", "appliances portable", and "appliances stationary" which are not used in Article 422. Only the adjectives fixed and portable are used. Adding these definitions to Article 422 would not enhance clarity. Per the NEC Style Manual 2.2.2.1, Article 100 should contain any definition that is used in two or more articles in the NEC.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #226)

20- 4 - (422-11(f)): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 20-6
RECOMMENDATION: The Technical Correlating Committee directs that the Panel clarify the Panel Action and Statement on this Proposal. The Panel Action has not been incorporated into Proposal 20-5a as indicated in the Panel Statement. This action will be considered by the Panel as a Public Comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
The panel accepts the TCC comment to reconsider this proposal. The panel accepts Proposal 20-6.
PANEL STATEMENT: The actions of Proposal 20-6 were appropriate and the revised wording has been incorporated in the draft. The panel statement of Proposal 20-6 made erroneous reference to Proposal 20-5a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #590)

20- 5 - (422-11(f)): Accept
Note: The Technical Correlating Committee notes that the panel action on this Comment and on Comment 20-4 have conflicting panel actions and panel statements. Both panel actions state that the panel accepts Proposal 20-6, however, Proposal 20-6 was "Accept in Principle In Part". The panel statements indicated that the wording was modified and as such the Technical Correlating Committee understands that the panel is retaining their modified action on Proposal 20-6. Based on the record, the Technical Correlating Committee understands that the action on this comment is more appropriately "Accept in Principle". The Technical Correlating Committee directs that 422.11(F)(3) read as follows:
"(3) Water Heaters and Steam Boilers. Water heaters and steam boilers employing resistance-type immersion electric heating elements contained in an ASME-rated and stamped vessel, or listed instantaneous water heaters, shall be permitted to be subdivided into circuits not exceeding 120 amperes and protected at not more than 150 amperes."
SUBMITTER: Thomas L. Harman, Univ. of Houston Clear Lake
COMMENT ON PROPOSAL NO: 20-6
RECOMMENDATION: I agree with the Technical Correlating Committee's recommendation. Please incorporate Proposal 20-6 into Article 422-11 and add the new text to the requirement to subdivide the load of resistance-type electric heating elements.
SUBSTANTIATION: Proposal 20-6 was accepted by the panel but the new exception was not added to the revised wording of Article 422. This would add the words "or listed instantaneous water heaters" to Exception No. 3 of 422-11(g) in the revised article as written in Proposal 20-7.
PANEL ACTION: Accept.
The panel accepts Proposal 20-6.
PANEL STATEMENT: See panel statement on Comment 20-4.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #416)

20- 6 - (422-15(b)(3)a): Hold
SUBMITTER: Dan Leaf, Palmdale, CA
COMMENT ON PROPOSAL NO: 20-7
RECOMMENDATION: Accept in Principle revised as follows:
Delete 422-45.
SUBSTANTIATION: This section is virtually unenforceable. Is the authority having jurisdiction to require an ironing board for every dwelling unit that has a smoothing iron? There are hand-held appliances designed and intended for smoothing of clothing suspended from a hanger. This is akin to requiring safety glasses or a hard hat when performing electrical work; desirable perhaps but not related to an electrical safety code.
PANEL ACTION: Hold.
PANEL STATEMENT: The submitter has introduced new material. In accordance with the Regulations Governing Committee Projects, Paragraph 4-4.6.2.2(a) this comment should be put on hold.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #1928)

20- 7 - (422-31(b)): Reject
SUBMITTER: James T. Dollard, Jr., Philadelphia, PA
COMMENT ON PROPOSAL NO: 20-10
RECOMMENDATION: Accept this proposal in Principle as follows:
422-31. Disconnection of Permanently Connected Appliances
(a) Rated at Not Over 300 Volt-Amperes or 1/8 Horsepower. For permanently connected appliances rated at not over 300 volt-amperes or 1/8 hp, the branch-circuit overcurrent device shall be permitted to serve as the disconnecting means.
(b) Appliances Rated Over 300 Volt-Amperes or 1/8 Horsepower. For permanently connected appliances rated over 300 volt-amperes or 1/8 hp, the branch-circuit switch or circuit breaker shall be permitted to serve as the disconnecting means where the switch or circuit breaker is within sight from the appliance or is capable of being locked in the open position. <u>The provision for locking or adding a lock to the disconnecting means shall be permanently installed on or at the switch or circuit breaker used as the disconnecting means.</u>
FPN No. 1: For motor-driven appliances of more than 1/8 hp, see Section 422-35.
FPN No. 2: For appliances employing unit switches, see Section 422-33.
SUBSTANTIATION: This safety driven proposal should be accepted in principle. The intent of the submitter is similar to the intent of proposal 11-70 in this cycle to section 430-102(b) Exception. Proposal 11-70 was Accepted in Principle and the Panel action is reflected word for word in the proposed recommendation above to section 422-31(b).
The present text of 422-31(b), which reads as follows "…where the switch or circuit breaker is within sight from the appliance or is capable of being locked in the open position." Clearly requires that the switch or circuit breaker be CAPABLE of being locked in the open position.
The problem with the present wording of this section is that the disconnect in many appliance installations is a circuit breaker in a panelboard or a snap switch, neither of which have permanent provisions for being locked in the open position. This clearly does not meet the requirements of 422-31(b). The present text of 422-31(b) which reads as follows "…where the switch or circuit breaker is within sight from the appliance or is capable of being locked in the open position." clearly requires that the switch or circuit breaker be CAPABLE of being locked in the open position. The intent of this section is that with lock in hand an installer/maintainer can apply the lock and work safely. This text in the NEC does not include "through the use of a device which will permit a lock to be utilized".
However the onset of circuit breaker locking devices have given the impression that any circuit breaker is capable of being locked in the open position.
OSHA does not permit circuit breaker lockout devices.
OSHA requires that they be approved (listed by a Nationally Recognized Testing Laboratory). None are listed. Even if these devices were listed for the purpose then the NEC would expect that

installers/maintainers would each carry dozens of different accessory devices to safely lockout power sources. This is not practical.
Permanent provisions for making a circuit breaker and/or snap switch capable of being locked in the open position are readily available from manufacturers today.
Proposal 20-10 and this comment will not represent a large increase in the cost of an installation but will result in a dramatic increase in safety.
The practical safeguarding of persons from electrical hazards as detailed in the scope of the NEC must not be permitted to hinge on whether or not an installer just happens to have an accessory device that just happens to fit a snap switch or circuit breaker in a given installation.
Where permanently connected appliances rated over 300 volt-amperes or 1/8 hp, are installed we know that regular maintenance will take place, we must ensure that only a lock is needed by an installer/maintainer to work safely.
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter did not provide sufficient technical substantiation for the original proposal to require individual requirements for locking.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

ARTICLE 424 — FIXED ELECTRIC SPACE-HEATING EQUIPMENT

(Log #682)

20- 8 - (424-19(a)(2)): Reject
SUBMITTER: William E. Bickner, Stillwater, MN
COMMENT ON PROPOSAL NO: 20-21
RECOMMENDATION: This proposal should be accepted.
SUBSTANTIATION: The present language of this section clearly requires compliance with only ONE of items (a) through (d) (if one item is complied with, the others become irrelevant according to this language). Therefore, as provided by (b), a disconnecting means is not required within sight of heating equipment having a motor rated over 1/8 hp if a lockable disconnecting means is installed out of sight of the equipment. The substantiation for this change in the 1990 Code alleged that the change was editorial. If you intended to change the meaning of this section at that time, leave it as is. If not, accept this proposal.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel reaffirms its position that the existing text is clearer.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

ARTICLE 427 — FIXED ELECTRIC HEATING EQUIPMENT FOR PIPELINES AND VESSELS

(Log #127)

12- 3 - (427-23): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 12-8
RECOMMENDATION: It was the action of the Technical Correlating Committee that further consideration be given to the comments expressed in the voting. This action will be considered by the panel as a public comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
Change the panel's action on Proposal 12-8 to Accept in Principle.
Revise wording of the first sentence of Proposal 12-8 to read: "Electric heating equipment shall be listed and have a grounded conductive covering in accordance with (a) or (b)."
The remaining text of Proposal 12-8 stays as proposed in the ROP.
PANEL STATEMENT: The panel accepts the action of the Technical Correlating Committee and gives further consideration to the comments expressed in the voting. Upon review of the comments made in the voting, the panel has reversed its action of "Accept" on Proposal 12-8 and changes the panel action to "Accept in Principle".
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 2 Kelley, Laney

(Log #1905)

12- 4 - (427-23): Reject
SUBMITTER: Michael I. Callanan, International Brotherhood of Electrical Workers
COMMENT ON PROPOSAL NO: 12-8
RECOMMENDATION: Hold this proposal for further study
SUBSTANTIATION: No documentation was provided to show that coverings other than metal provide safe and dependable systems. This proposal should be held for further study so that a fact-finding report can be developed.
This comment represents the official position of the International Brotherhood of Electrical Workers Codes & Standards Committee.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action on Comment 12-3.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 2 Kelley, Laney

ARTICLE 430 — MOTORS, MOTOR CIRCUITS, AND CONTROLLERS

Note: The sequence nos. 11-2 and 11-3 were not used.

(Log #114)

11- 4 - (430): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 11-5
RECOMMENDATION: It was the action of the Technical Correlating Committee that further consideration be given to the comments expressed in the voting. This action will be considered by the panel as a public comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
Revise 430-52, 430-62, 430-57, and Table 430-152 as follows:
A. Renumber Table 430-152 to "430-52" as recommended in Proposal 11-5 with the following changes:
(1) Delete the "**" in the heading and in Note 3
(2) In the note following the table delete "Sections 430-52 through"
(3) In note 2 change "Section 430-52" to "430-52(c) Exception No. 1 and Exception No. 2"
B. Revise Section 430-62(a) as revised by the panel action on proposal 11-48 as follows:
(1) In the main rule, delete "and Table 430-152"
(2) In Exception No. 1, change "Table 430-152" to "Table 430-52"
C. Accept the remainder of the proposal to renumber the references from "Table 430-152" to "Table 430-52"
D. Delete the last sentence of the proposal; "**Relocating and changing Table 430-152 to Code Section 430-52 and changing Table 430-52 ."
PANEL STATEMENT: The panel requests that a document review be performed to ensure that all references to the renumbered table are updated.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #1012)

11- 5 - (430-2): Accept
SUBMITTER: Jerry Spencer, Potlatch Corporation
COMMENT ON PROPOSAL NO: 11-6
RECOMMENDATION: Retain 1999 NEC wording as is.
SUBSTANTIATION: Historically, there have been two sensors used as described in the proposal. RTD technology is dependable, but prohibitively expensive. "Klixon" type sensors have proven very unreliable over time. For this reason, all motor manufacturer's offer motors with independent cooling for this use. It makes more sense to use these engineered motors for the few applications needing them than to saddle all motors with extra costs, wiring, and potential problems.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15
COMMENT ON AFFIRMATIVE:
BUNCH: I vote affirmative, but do not agree with the substantiation that "Klixon type sensors have proven very unreliable over time". Millions of these products have been used by all compressor manufacturers for decades, very successfully.
HAMER: I agree with the comment substantiation on the unreliability of internal thermal switches. When ordered with a new motor, resistance temperature detectors are relatively economic and are a more effective way to protect a motor driven by an ASD.

(Log #115)

11- 6 - (430-6(a)(1)): Hold
Note: The Technical Correlating Committee directs that the Comment and the Proposal be reported as "Hold", and further notes that the panel statement is incorrect and the Comment does not introduce new material.
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 11-7
RECOMMENDATION: It was the action of the Technical Correlating Committee that further consideration be given to the comments expressed in the voting relative to the Style Manual. This action will be considered by the panel as a public comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Hold.
PANEL STATEMENT: This comment would introduce a concept that has not had public review by being included in a related proposal as published in the ROP.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15
COMMENT ON AFFIRMATIVE:
SCHRAM: Although I agree with the panel action to hold the comment, I do not agree with the reason stated by the panel. I consider it a misstatement of the facts. The concept has had public review by being included in the voting on Proposal 11-7, as noted in Comment 11-6. However, changes in the code text in response to the comment could not be properly handled in the time frame for processing the report. The notes to the tables, while similar, are not identical, and the time available did not permit development of appropriate text in 430-6(a)(1) applicable to all three tables.

(Log #116)

11- 7 - (430-14(a)): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 11-16
RECOMMENDATION: The Technical Correlating Committee directs that the Action on this Proposal be rewritten to comply with the NEC Style Manual. This action will be considered by the Panel as a Public Comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
Leave previous text unchanged but add an exception as follows:
"Exception: Ventilation shall not be required for submersible types of motors."
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #632)

11- 8 - (430-15(b)): Accept in Principle
SUBMITTER: James M. Daly, BICC General
COMMENT ON PROPOSAL NO: 11-84
RECOMMENDATION: The proposal should continue to be accepted in principle.
Revise the panel action to read:
"...each strand <u>within the conductor</u> shall not be larger than 10 AWG...".
SUBSTANTIATION: The additional text will clarify the intent and make it clear that 10 AWG is the maximum size strand permitted when constructing the stranded lead and is not intended to limit the entire stranded lead to a 10 AWG conductor.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: The panel accepts the recommendation. The reference should be to 430-145(b).
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #117)

11- 9 - (430-22): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 11-20
RECOMMENDATION: The Technical Correlating Committee notes that the Panel Statement indicates that the FPN was deleted, however, the Panel Action still includes the FPN following Exception No. 2.
The Technical Correlating Committee directs the panel clarify the Panel Action and Panel Statement on this proposal. This action will be considered by the Panel as a Public Comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
The FPN following Exception No. 2 should be deleted.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #422)

11- 10 - (430-22): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
COMMENT ON PROPOSAL NO: 11-20
RECOMMENDATION: Accept in principle, revise panel action:
(a) General. Branch-circuit conductors that supply a single <u>continuous duty rated</u> motor ~~used in a continuous duty application~~ shall have an ampacity...
(remainder unchanged)
SUBSTANTIATION: Continuous duty is not the same as continuous load, but apparently refers to the motor nameplate rating per 430-7(a)(6). Refer to the May/June 2000 issue of IAEI News article page 90 in which continuous duty was interpreted as a load of 3 hours or more. If a continuous duty rated motor is used in an application where the load continues for less than 3 hours, does this section apply? This comment is intended to clarify that continuous duty is determined by the motor nameplate, not the length of time of the load.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel intends Section 430-22(a) to apply to continuous duty application, as in the 1999 NEC. Section 430-22(b) in the 1999 NEC was renumbered as 430-22(e) by the panel action on Proposal 11-20, and it applies to motors used in other than continuous duty applications. See the note following Table 430-22(b) in the 1999 NEC.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #420)

11- 11 - (430-22(b)): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
COMMENT ON PROPOSAL NO: 11-23
RECOMMENDATION: Accept proposal.
SUBSTANTIATION: "Conductors" literally includes service and feeder conductors for compliance with Table 430-22(b) while (a) limits the requirements to branch-circuit conductors and 430-24 only applies a multiplier to the highest rated motor (branch circuit, feeder, service). If feeder or service conductors supply only a motor for duty cycle service they see the same heating effect as the branch-circuit conductors and may be the same size and ampacity, whereas feeder or service conductors supplying additional load normally have some diversity factor, as addressed in 430-26.
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter's concerns are addressed by the current language. Section 430-22(b) currently applies to all conductors including service and feeder conductors that supply only a motor for duty cycle service.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #118)

11- 12 - (430-24): Accept
Note: It was the action of the Technical Correlating Committee that the panel action be rejected, and the panel action on Proposal 11-24 be modified to delete the words "determined in accordance with Article 220 and other applicable Articles." This action meets the requirements of the NEC Style Manual.
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 11-24
RECOMMENDATION: The Technical Correlating Committee directs that the Action on this Proposal be rewritten to comply with the NEC Style Manual relative to references to entire articles. This action will be considered by the Panel as a Public Comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
In the panel action on Proposal 11-24, amend to read as follows "determined in accordance with 220-1 through 220- 41 and other applicable articles".
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #375)

11- 13 - (430-28): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
COMMENT ON PROPOSAL NO: 11-26
RECOMMENDATION: Accept in principle revised: Delete "and Part E".
SUBSTANTIATION: Since tap conductors may be a feeder the requirement for a branch-circuit overcurrent device is misleading. The panel statement that a device suitable for branch-circuit overcurrent protection may be used on feeders is correct, but it then becomes a feeder overcurrent device. Since the phrase "branch-circuit overcurrent device" describes a specific use it is not synonymous with "feeder overcurrent device", as those phrases are used in the Code. The Style Manual 3.3.4 requires words and terms to be clear and specific.
PANEL ACTION: Reject.
PANEL STATEMENT: The commenter's use of the term overcurrent device in the original proposal is an incorrect application for this section. All branch circuit OCPDs are fully rated for overload and short circuit performance. Not all overcurrent devices are fully rated, e.g. supplementary protective devices. Tap conductors must be protected by a fully rated device.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #1011)

11- 14 - (430-31, 430-125 (a)): Accept
SUBMITTER: Jerry Spencer, Potlatch Corporation
COMMENT ON PROPOSAL NO: 11-2, 11-28
RECOMMENDATION: Retain 1999 NEC wording as is.
SUBSTANTIATION: The proposal would require adding expensive equipment to already crowded motor control buckets. The present system of overloads has proven itself capable of taking loaded motors off-line in cases of phase loss, since the load rises dramatically on the two remaining phases. A motor so lightly loaded as not to trip would be capable of running cool enough to not pose a hazard. In the case cited, tying furnace firing to airflow would be a better choice.
PANEL ACTION: Accept.
PANEL STATEMENT: The submitter's reference to 11-2 should be to 11-12.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #119)

14- 3 - (430-32(a)(1)): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 11-31
RECOMMENDATION: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panels 14 and 19 for action. This action will be considered by the Panel as a Public Comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
The correction has been made in the rewrite of Article 505.
PANEL STATEMENT: See action on Comment 14-126.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #119a)

19- 5 - (430-32(a)(1)): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 11-31
RECOMMENDATION: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panels 14 and 19 for action. This action will be considered by the Panel as a Public Comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 8
VOTE ON PANEL ACTION:
AFFIRMATIVE: 8
COMMENT ON AFFIRMATIVE:
MCCULLOUGH: The Panel Action should indicate that the reference in 551-10(e)(3) bullet item 3 should be changed to 430-32(b). This was the action desired by Code-Making Panel 11 and the Technical Correlating Committee when Proposal 11-31 was referred to Code-Making Panel 19.

(Log #1468)

11- 15 - (430-34): Reject
SUBMITTER: George J. Ockuly, Chesterfield, MO
COMMENT ON PROPOSAL NO: 11-36
RECOMMENDATION: Change the word "relay" to "device" in three places in the accepted panel action, then continue to accept the proposal.
SUBSTANTIATION: There is no technical justification for eliminating fuses and circuit breakers from this paragraph since both fuses and circuit breakers are used to meet the overload protection requirements of 430-32.

PANEL ACTION: Reject.
PANEL STATEMENT: The technical reason for restricting the provision to overload relays is the different method of rating relays as opposed to fuses and circuit breakers. Overload relays are rated for tripping current. The rating on fuses and circuit breakers is a must-hold current.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #1010)

11- 16 - (430-43): Accept
SUBMITTER: Jerry Spencer, Potlatch Corporation
COMMENT ON PROPOSAL NO: 11-42
RECOMMENDATION: Text per 1999 NEC to remain as is.
SUBSTANTIATION: In many industries, critical pieces of equipment need to be restarted as soon as possible. The present code defines reasonable limitations. It is a violation of OSHA lockout/tagout to put oneself in danger from the restart of any motor. Additional regulations are unnecessary.
PANEL ACTION: Accept.
PANEL STATEMENT: See panel statement on Comment 11-17.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #2291)

11- 17 - (430-43): Accept
SUBMITTER: Christopher R. Pharo, Marlton, NJ
COMMENT ON PROPOSAL NO: 11-42
RECOMMENDATION: I ask that the panel reconsider this proposal.
SUBSTANTIATION: The intent of this proposal is to bring attention to the overload condition in order to prevent other more serious problems. (i.e., fires or equipment failures).

The submitter does agree that through normal operation certain motors or pumps will trip inadvertently. However, most of this equipment is equipped with an integral automatic resetting device for the overload. This would comply with the first sentence of 430-43.
PANEL ACTION: Accept.
PANEL STATEMENT: The panel has reconsidered the proposal and continues to reject it as too restrictive. The first sentence of 430-43 requires approval of the motor and automatic reset protection combination only, not the motor application.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #1471)

11- 18 - (430-53(c)): Accept
SUBMITTER: Vincent J. Saporita, Cooper Bussmann
COMMENT ON PROPOSAL NO: 11-45
RECOMMENDATION: Reject this proposal.
SUBSTANTIATION: This is a safety issue. The proposal and substantiation incorrectly assume that all group motor installations are for heating/air conditioning/refrigeration (HACR) applications. 430-53(c) also applies to (1) other listed factory assemblies and to (2) field assembled equipment. As written, this proposal would remove the requirements for the circuit breaker's "group motor listing" for these two other applications described above. No substantiation has been provided to show that these other "systems" will be safe and free from hazards without the currently required testing and listing.

While the code permits circuit breakers to be used interchangeably if listed for group installation, manufacturers have chosen not to submit their products for listing under this special application. Most likely because circuit breakers of the same rating from different manufacturers have significantly different energy let-through characteristics. This can result in damage to the controller and associated overload relays. Note the FPN reference to 110-10 at the end of 430-53(c).
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NEGATIVE: 5

EXPLANATION OF NEGATIVE:

RASMUSSEN: The comment should be rejected and the original proposal should be accepted. No fuse or circuit breaker is tested or identified by UL for group installation by itself. Either type of protective device becomes part of the listed installation when evaluated and identified for the intended application. Listing of Industrial Control Equipment such as Combination Motor Controllers for group installation does not now and has never required "special rated" (i.e.,HACR) circuit breakers. Depending on the rated fault current level, Industrial Control Equipment is either tested with any properly rated circuit breaker (for "standard or low fault" ratings) or with specific rating, type designation, and manufacturer circuit breakers (for "high fault" ratings.) Product safety standards are well aware of the differences between fuses and circuit breakers and, for "high fault" situations, between individual manufacturer and type circuit breakers. Removal of the words "group installation" will have no impact on safety or on product standards. As noted in the substantiation for the proposal, the requirements for circuit breakers marked HACR are identical to the requirements for all circuit breakers. However, since there is no difference between a circuit breaker with an HACR marked rating and a circuit breaker without this marking, UL intends to consider revising the Listing Information for Circuit Breakers to state that all circuit breakers are suitable for group motor installation when used in listed equipment as specified in the listing of the equipment.

SAUNDERS: There appears to be no difference in a HACR breaker and UL 489 test standards per UL Code-Making Panel 11 representative.

SCHRAM: Since UL has determined that special tests on circuit breakers marked "HACR" are no longer necessary, and this marking is permitted by UL on any listed circuit breaker at the manufacturer's request, this circuit breaker marking has become obsolete. Also, the UL representative on the panel has indicated that UL does not list any circuit breaker or fuse independently for group installation. Further, as I understand it, where circuit breakers are part of UL listed equipment, including combination motor controllers listed for group installation and multi-motor equipment, any special restrictions as to the rating, type, or make of supply circuit protective device are marked on the equipment. Therefore, I believe that the revision recommended in Proposal 11-45 and supported by Comments 11-20 and 11-21 should be accepted.

THOMAS: For listing purposes, the Type HACR circuit breaker is subjected to exactly the same tests as all standard breakers. According to the UL rep on the panel, the HACR label is available "for the asking". As such, it has no impact on safety in any way and should be eliminated. For group motor installations with nonhermetic motors, motor controller listings include specific breakers, which are tested with the controller. It is and will continue to be a code violation to use a controller with a breaker not included in its listing. Other than as part of the controller listing, circuit breakers are not currently listed for group installations. Changing the text of 430-53(c) as recommended in Proposal 11-45 will not degrade safety but will be one small step in eliminating unnecessary words and requirements from the code..

WRIGHT: See my explanation of negative vote on Comment 11-20.

COMMENT ON AFFIRMATIVE:

HAMER: This comment (to reject the proposal) should be accepted. A "group installation listing" is necessary to be sure that an inappropriate circuit breaker is not interchanged for an originally supplied circuit breaker. An inappropriately substituted circuit breaker may permit too much let-through energy during a short circuit downstream of the controller and overload. The "group installation listing" standard should address the case where the Group Installation may be connected to a high-short-circuit-capacity source. As listing standards exist today, "standard fault short circuit test" (i.e., low level) listing is the default, and special efforts must be made to make sure a group motor installation is properly applied for the more frequent industrial situation of a high-short-circuit-capacity source. The group installation listing standards need to adequately address this potential safety hazard, and the language of 430-53(c)(3) in the 1999 NEC should not be changed.

(Log #120)

11- 19 - (430-53(c)(3)): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 11-45
RECOMMENDATION: It was the action of the Technical Correlating Committee that further consideration be given to the comments expressed in the voting. This action will be considered by the panel as a public comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #849)

11- 20 - (430-53(c)(3)): Reject
SUBMITTER: Larry F. Miller, National Electrical Manufacturers Association (NEMA)
COMMENT ON PROPOSAL NO: 11-45
RECOMMENDATION: The panel should continue to accept the proposal.
SUBSTANTIATION: This comment is intended to address the perceived issues raised by the negative comments in the voting.

Addressing the comments from Mr. Bunch:

There is not an inconsistent application issue with this change. As noted in the proposal substantiation UL 489 requires that a breaker intended for use in HARC applications comply with the construction requirements for "all types". As such, the application after this change will be more consistent than in the past. Any listed circuit breaker could be used in an HARC application (provided the equipment marking did not prohibit the use of circuit breakers).

Addressing the comments from Mr. Garvey:

Fuses are evaluated to the UL 248 series of standards. There are no special tests required by the fuse standards for fuses to be used in group motor applications. Circuit breakers are evaluated to UL 489. There are no special tests required by the circuit breaker standard for circuit breakers to be used in group motor applications. However, because of this particular code section, UL 489 does require a special marking (HARC). If this code section did not require "listed for the purpose", the need for a special marking could be removed from the standards and both fuses and breakers would then be treated equally. Mr. Garvey's comment references UL category NJOT for motor controllers. This reference actually supports the objective of the proposal. The motor controller used in group applications will specify if a fuse, a circuit breaker or both can be used for the protection. The key is that this is part of the evaluation of the motor controller and not of the circuit breaker.

Addressing the comments from Mr. Naughton:

See responses to Bunch and Garvey. There are no special requirements for HARC breakers. Removal of the wording as suggested by the proposal only removes the need to a special marking on a standard circuit breaker. There is no hazard as stated in the comment because a breaker that is presently marked HARC can be used in any applications suitable for a circuit breaker. With the code change accepted, the ability to use the breaker in both group motor and non-group motor applications does not change.

Addressing the comments from Mr. Saporita:

Mr. Saporita is correct in that there are group motor installations other than HARC. However, HARC is the only marking that even exists to meet the words "listed for the purpose". There is no safety issue. NEC 430-53(c)(1) and (2) still require that the motor overload device and the motor controller be listed for group installation and specify a maximum rating of fuse or breaker. The point is that the controllers and overload relay have always been (and still will be) required to indicate what overcurrent protection is acceptable for the group installation. However, requiring a special marking (HARC) to be placed on a breaker is redundant to the already required evaluation of the controller. Particularly since a HARC breaker is a standards circuit breaker.

Addressing the comments form Mr. Saunders:

The change driven by the proposal does not make the breaker automatically acceptable in all group motor applications. That acceptability has been and will continue to be dictated by the evaluation of the controller and overload relay as required in 430-53(c)(1) and (2). Again, there is no special marking on a circuit breaker to meet the words "listed for the purpose" other than HACR.
PANEL ACTION: Reject.
PANEL STATEMENT: No technical documentation has been presented to justify such a major change.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NEGATIVE: 5
EXPLANATION OF NEGATIVE:

RASMUSSEN: The comment should be accepted. See my Explanation of Negative Vote on Comment 11-18.

SAUNDERS: See my explanation of negative vote on Comment 11-18.

SCHRAM: See my explanation of negative vote on Comment 11-18.

THOMAS: See my explanation of negative vote on Comment 11-18.

WRIGHT: The panel should maintain the position of accept on Proposal 11-45, as was done during the ROP stage. Comment Numbers 11-18, 11-22 and 11-23 should be rejected. Comment numbers 11-20 and 11-21 should be accepted.

The panel statement that "no technical documentation has been presented to justify such a major change" is simply not true. During the last code cycle, and again this code cycle, in the original Proposal 11-45, in the NEMA comment, and at the panel meeting, substantial documentation was presented to support the proposal. NEMA has stated, and UL has verified, that there are no differences in the testing or construction requirements in UL standards for circuit breakers listed for group motor applications and for circuit breakers not listed for group motor applications. No one questions the fact that, years ago, there were differences in the standard, but those differences are gone, and therefore the need for identification as a circuit breaker "listed for motor group applications" in the NEC is also gone. At this point, all listed circuit breakers are suitable for group motor applications when part of equipment listed for group motor applications. There is no need to force yet another unnecessary marking on the product, nor is there a need to force inspectors to search for an additional marking on the circuit breakers.

During the panel discussions, there seemed to be some confusion as to how controllers are tested and listed for group applications. There are two conditions of listing which determine the extent of testing and type of marking required on the controller. Under conditions of "standard" short-circuit current ratings (5kA, 10kA, etc., depending upon the horsepower rating of the controller), listing is obtained through testing with any listed thermal-magnetic circuit breaker, with a rating as specified by the controller manufacturer, from any circuit breaker manufacturer. The marking on the controller states the maximum rating of the circuit breaker to be used in the installation. No reference to the circuit breaker manufacturer is required. Whether or not a circuit breaker is marked for "group motor applications, or HACR", is immaterial. The testing and listing procedure is the same when fuses are specified.

Under condition of "high capacity" short-circuit current ratings (any rating above the "standard" rating), the controller must be tested with each specific circuit breaker (rating, manufacturer and type) for which the controller manufacturer desires listing. The controller then must be provided with marking which specifies the circuit breakers with which it was tested. Again, the presence of or lack of an "HACR" marking makes no difference. The test procedure is similar when fuses are specified, except that "umbrella" test limiters (which represent the most severe let-through conditions for any fuse of the specified type, such as RK5) may be used for the tests. In that case, only the fuse type and size must be marked on the controller.

Another concern expressed at the panel meetings relates to the current interchangeability of "HACR marked" circuit breakers in heating/air conditioning/refrigeration applications. The UL standard for those products currently permits substitution of any "HACR-marked" circuit breaker for another, freely, without the need for retesting. The fear is that, if the requirement for "group rating" is removed from the NEC, manufacturers of that equipment will be forced to retest their equipment with "non-HACR" circuit breakers.

The interchangeability in that type of equipment is based on the limited short-circuit current rating ("standard" short-circuit current ratings) which are assigned to those products. While UL might conduct a review of products, since there is no difference in construction or testing of the "non HACR" circuit breakers, the

interchangeability could no doubt be extended to the "non-HACR" circuit breakers with no additional testing or evaluation.

As pointed out in the original proposal and other comments, the current situation is a "catch 22" situation for UL. They cannot remove the identification requirement from their standard until it is removed from the code. The panel advocates leaving the marking in the code because it is still in the UL standard. The change must occur in the code first, in order for UL to proceed with a standard change.

COMMENT ON AFFIRMATIVE:

BUNCH: I vote affirmative with the panel action. It is not clear at this time if this change were made, that all equipment with HACR and fuse interchangeability now might be required to be retested and requalified.

HAMER: See my Affirmative Comment on Comment 11-18.

(Log #1778)

11- 21 - (430-53(c)(3)): Reject

SUBMITTER: Jim Pauley, Square D Company

COMMENT ON PROPOSAL NO: 11-45

RECOMMENDATION: The panel should continue to accept the proposal.

SUBSTANTIATION: The proposal does not introduce unsafe practices nor is it inconsistent with the product standards. Controllers and overload relays used in group motor applications must still be listed and marked for group application. This listing will handle the issue of what overcurrent device is acceptable. There is no need for special circuit breakers or a special marking such as HACR. All breakers have to pass the same set of test criteria and this in conjunction with the appropriate evaluation of the end equipment or controller/overload relay components covers all areas of concern.

This is (at least) the third code cycle for this proposal. All of the issues raised in previous cycles as well as those noted in the explanation of negatives have been addressed.

PANEL ACTION: Reject.

PANEL STATEMENT: See statment on Comment 11-20

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:

AFFIRMATIVE: 10

NEGATIVE: 5

EXPLANATION OF NEGATIVE:

RASMUSSEN: The comment should be accepted. See my Explanation of Negative Vote on Comment 11-18.

SAUNDERS: See my explanation of negative vote on Comment 11-18.

SCHRAM: See my explanation of negative vote on Comment 11-18.

THOMAS: See my explanation of negative vote on Comment 11-18.

WRIGHT: See my explanation of negative vote on Comment 11-20.

COMMENT ON AFFIRMATIVE:

HAMER: See my Affirmative Comment on Comment 11-18.

(Log #1898)

11- 22 - (430-53(c)(3)): Accept

SUBMITTER: Michael I. Callanan, International Brotherhood of Electrical Workers

COMMENT ON PROPOSAL NO: 11-45

RECOMMENDATION: Reject this proposal.

SUBSTANTIATION: The submitter should petition the listing authority to classify all breakers for all locations, thus in turn there will be no need for HACR markings.

This comment represents the official position of the International Brotherhood of Electrical Workers Codes & Standards Committee.

PANEL ACTION: Accept.

PANEL STATEMENT:

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:

AFFIRMATIVE: 10

NEGATIVE: 5

EXPLANATION OF NEGATIVE:

RASMUSSEN: The comment should be rejected and the original proposal should be accepted. See my Explanation of Negative Vote on Comment 11-18.

SAUNDERS: See my explanation of negative vote on Comment 11-18.

SCHRAM: See my explanation of negative vote on Comment 11-18.

THOMAS: See my explanation of negative vote on Comment 11-18.

WRIGHT: See my explanation of negative vote on Comment 11-20.

COMMENT ON AFFIRMATIVE:

HAMER: See my Affirmative Comment on Comment 11-18.

(Log #2289)

11- 23 - (430-53(c)(3)): Accept

SUBMITTER: Christopher R. Pharo, Marlton, NJ

COMMENT ON PROPOSAL NO: 11-45

RECOMMENDATION: I would urge the panel to reject this proposal.

SUBSTANTIATION: Removing the "listed for group installation" phrase and replacing it with "shall be listed" would create confusion. I believe this proposal would open a door to allow circuit breakers to be misused.

Keeping the 1999 wording intact ensures that circuit breakers will be used consistent with its listing.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:

AFFIRMATIVE: 10

NEGATIVE: 5

EXPLANATION OF NEGATIVE:

RASMUSSEN: The comment should be rejected and the original proposal should be accepted. See my Explanation of Negative Vote on Comment 11-18.

SAUNDERS: See my explanation of negative vote on Comment 11-18.

SCHRAM: See my explanation of negative vote on Comment 11-18.

THOMAS: See my explanation of negative vote on Comment 11-18.

WRIGHT: See my explanation of negative vote on Comment 11-20.

COMMENT ON AFFIRMATIVE:

HAMER: See my Affirmative Comment on Comment 11-18.

(Log #850)

11- 24 - (430-53(d)): Accept

SUBMITTER: Larry F. Miller, National Electrical Manufacturers Association (NEMA)

COMMENT ON PROPOSAL NO: 11-46

RECOMMENDATION: The Panel should continue to Accept the proposal in Principal but the last sentence of the Panel Action should be revised as follows:

The conductors from the branch-circuit short-circuit and ground-fault protective device <u>to the controller</u> shall (1) be suitably protected from physical damage and enclosed by either an enclosed controller or by a raceway, and shall be not more than 3 m (10 ft) long, or (2) ~~shall have an ampacity in accordance with 430-22~~ shall have an ampacity ~~in accordance with 430-22 and shall have an ampacity~~ not less than that of the branch circuit conductors.

SUBSTANTIATION: The original proposal limited the length of the conductors between the branch-circuit protective device and the controller. The Panel action removed the specification of which conductors need to be restricted to a 3 m (10 ft) length and provided with protection. As revised, it could be incorrectly interpreted to mean that the protection and limitation could apply to the conductors between the branch-circuit protective device and the motor. It is understood that the conductors between the controller and the motor are protected by the controller.

The intent of the affirmative comment submitted by Mr. R. Rasmussen on item (2) in the last sentence of the Panel's action is correct, but should be clarified. Reference to sizing in accordance with 430-22 is unnecessary since the branch-circuit conductor will always be at least as large as the conductor to the motor.

PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
SAPORITA: I vote negative on the Panel Action for the following two reasons:
1. A product standard does not exist for these products. Introduction of code requirements for products that do not have a bona fide product standard identifying their application use and limitations creates unnecessary Code rules, not unlike the situation that exists for Design E motor applications. As such it would be inappropriate for the Panel to approve this comment or original Proposal 11-46.
2. The creepage and clearance spacings are a real safety concern. For example, at 480 volts, the spacings through air between opposite polarity are 25.4 mm for branch circuit overcurrent protective devices (UL 489) but only 9.5 mm for these types of devices (UL 508). Spacings over surface are 50.8 mm for branch circuit devices but only 12.7 mm for control devices. This raises a concern for personnel safety.
COMMENT ON AFFIRMATIVE:
RASMUSSEN: I agree with the panel action to accept this comment. See my Affirmative Comment on Comment 11-25.

(Log #1467)

11- 25 - (430-53(d)): Reject
SUBMITTER: George J. Ockuly, Chesterfield, MO
COMMENT ON PROPOSAL NO: 11-46
RECOMMENDATION: Reject this proposal. There is no industry standard for this product.
SUBSTANTIATION: The panel's concerns from the previous Code cycle have not been addressed with a bonafide, published product standard. Until an industry standard is published, it is premature to permit such a significant variation to established, proven code requirements.
PANEL ACTION: Reject.
PANEL STATEMENT: The standard exists in concept as outlined in the substantiation for Proposal 11-46.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
SAPORITA: I vote negative on the panel action. See my Explantion of Negative vote on Comment 11-24.
COMMENT ON AFFIRMATIVE:
RASMUSSEN: I agree with the panel action to reject this comment. The devices specified in the comment and in the original proposal are Manual Self-Protected Motor Controllers. Proposed requirements for Manual Self-Protected Motor Controllers are located in a Bulletin dated July 28, 200 for UL 508. The proposed requirements are consistent with those already used for other branch circuit protective devices, including those for group motor applications.

(Log #1899)

11- 26 - (430-53(d)): Reject
SUBMITTER: Michael I. Callanan, International Brotherhood of Electrical Workers
COMMENT ON PROPOSAL NO: 11-46
RECOMMENDATION: Reject this proposal.
SUBSTANTIATION: The special category in UL508 is not available at this time. There are many questions in regards to spacing as to whether or not these manual motor protectors are usable for tap conductor protection in group installations.
As panel member Saunders stated there are many other concerns that have not been addressed to permit this change without standards available.
This comment represents the official position of the International Brotherhood of Electrical Workers Codes & Standards Committee.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Comment 11-25.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
SAPORITA: I vote negative on the panel action. See my Explantion of Negative vote on Comment 11-24.
COMMENT ON AFFIRMATIVE:
RASMUSSEN: I agree with the panel action to reject this comment. See my Affirmative Comment on Comment 11-25.

(Log #121)

11- 27 - (430-63): Accept
Note: It was the action of the Technical Correlating Committee that the panel action be revised to delete "as determined in accordance with Articles 210 and 220,". This action meets the requirements of the NEC Style Manual.
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 11-51
RECOMMENDATION: The Technical Correlating Committee directs the panel to revise the sentence structure for clarity. This action will be considered by the Panel as a Public Comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
Revise 430.63 to read as follows:
430.63. Rating or Setting - Power and Lighting Loads. Where a feeder supplies a motor load and, in addition a lighting or a lighting and appliance load, the feeder protective device shall have a rating sufficient to carry the lighting or lighting and appliance load as determined in accordance with Articles 210 and 220, plus the following:
(1) For a single motor, the rating permitted by 430.52.
(2) For a single hermetic refrigerant motor-compressor, the rating permitted by 440.22.
(3) For two or more motors, the rating permitted by 430.62.
Exception: Where the feeder overcurrent device provides the overcurrent protection for a motor control center, the provisions of 430.94 shall apply.
PANEL STATEMENT: These are editorial changes.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #1542)

11- 28 - (430-70, Exception): Accept in Principle
SUBMITTER: Michael J. Johnston, International Association of Electrical Inspectors
COMMENT ON PROPOSAL NO: 11-70
RECOMMENDATION: Exception: A disconnecting means, in addition to the controller disconnecting means as required in accordance with Section 430-102(a), shall not be required for the motor where the disconnecting means for the controller is individually capable of being locked in the open position. Circuit breakers without permanent provisions for applying a lock shall not be considered as capable of being locked in the open position.
SUBSTANTIATION: I support the panel's action to accept this proposal. I also agree with the panel's decision to include switches. Inspection departments have had difficulty with the wording in the previous editions of the code relative to capable of being locked in the open position. By adding the term permanent provisions, it should clarify the intent for the installer, user and inspection elements of the industry. It also will enhance safety.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: The action on Comment 11-56 meets the submitter's intent.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #368)

11- 29 - (430-74(a)): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
COMMENT ON PROPOSAL NO: 11-53
RECOMMENDATION: Accept proposal.
SUBSTANTIATION: The panel statement for rejection was that the proposal would permit a three-phase corner-grounded delta-connected grounded leg to remain energized. If a motor control circuit is supplied by such a source it doesn't appear to be significantly different than one supplied by a single-phase or three-

phase 4-wire wye source. The general rule of 380-2(b) states switches or breakers shall not disconnect the grounded conductor. Panel statement infers that present literal wording requires disconnecting means for grounded conductors (all sources of power) which was the reason for the proposal. Lack of consistency creates confusion (Style Manual 3.3.5).
PANEL ACTION: Reject.
PANEL STATEMENT: On a three phase corner grounded delta there is normally current in the grounded leg and the grounding point may be remote from the equipment served.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #332)

11- 30 - (430-83(a)(3)): Hold
SUBMITTER: R. L. Nailen, Hales Corners, WI
COMMENT ON PROPOSAL NO: 11-57a
RECOMMENDATION: As accepted, this proposal specifically includes "Design E" motors. All references to such motors should be stricken form the Code. As of Feb. 2000, NEMA has rescinded its Design E motor standard. Furthermore, no such motors were ever offered on the market by either U.S. or foreign manufacturers, as can readily be verified through NEMA. This and any other Code references to "Design E" characteristics are therefore unnecessary and inappropriate.
SUBSTANTIATION: The problem in continuing to cite a nonexistent standard in the Code is that it inevitably casts doubt on the product knowledge of the Code-making panel and on the currency of the Code itself. When a product has never existed except on paper, and will not exist in the future, it need not and should not be cited in a Code of practice.
PANEL ACTION: Hold.
PANEL STATEMENT: Deleting reference to Design E motors from the Code is a subject that has not had public review. There are several references to Design E motors in Article 430 that cannot be properly handled within the time frame for processing the report, such as 430-52. The hold would apply to the comment only.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #851)

11- 31 - (430-91): Reject
SUBMITTER: Larry F. Miller, National Electrical Manufacturers Association (NEMA)
COMMENT ON PROPOSAL NO: 11-58a
RECOMMENDATION: The panel should accept the proposal.
SUBSTANTIATION: First is the issue of other sections in the code not referring to enclosure types. This is not correct. Section 110-11 refers to equipment identified only..." type 1" ...plus there was a proposal accepted in Section 370-15(a) [Log#9-12] that includes a reference to an "enclosure type 6P rating." Other sections of the code are definitely referring to enclosure types and adding the Table to Chapter 9 will make it accessible to any section in the code needing to refer to the table.
Second is the authority to relocate the table to Chapter 9. The panel does in fact have the authority to put the table in Chapter 9. There is not one panel that has control of all of Chapter 9 but different sections of the Chapter are assigned to certain panels. Panel 11 could in fact put the information in Chapter 9 plus retain control of the table by requesting its maintenance be assigned to them.
PANEL ACTION: Reject.
PANEL STATEMENT: The current table location is acceptable and the proposed move would not increase ease of use.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #337)

11- 32 - (Table 430-91): Reject
SUBMITTER: James L. Boyer, Firetrol, Inc.
COMMENT ON PROPOSAL NO: 11-58a
RECOMMENDATION: Accept the proposal as submitted.
SUBSTANTIATION: The panel has given no technical substantiation for rejecting the proposal. 110-11 refers to "type 1."
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Comment 11-31
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #122)

11- 33 - (430-94): Accept
Note: The Technical Correlating Committee understands that the panel intended to reference Parts A, B, and H of Article 240. See Mr. Hamer's Comment on Affirmative Vote.
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 11-61
RECOMMENDATION: The Technical Correlating Committee directs that the Action on this Proposal be rewritten to comply with the NEC Style Manual relative referencing an entire article. This action will be considered by the Panel as a Public Comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
Change "Article 240" to "Parts A, B, and I of Article 240"
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15
COMMENT ON AFFIRMATIVE:
HAMER: While I agree that Parts A and B of Article 240 should be referenced in the context of "motor control centers," the content of Part H of Article 430 seems applicable to MCCs rated 600 volts and below (see Table 430-97). Part I of Article 240 (over 600 volts) should not be included in the reference unless Table 430-97 is expanded to include 5 kV and 7.2 kV motor starters.

(Log #2060)

11- 34 - (Table 430-97): Accept
SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc.
COMMENT ON PROPOSAL NO: 11-63
RECOMMENDATION: Use the soft conversions generated by Code-Making Panel 9 for the identical values in Table 384.36 under Proposal 9-116. The dimensions are minimum safety requirements, reflected in the applicable product standards. Furthermore, motor control centers and switchboards are functionally equivalent, differing primarily in application only. Using different numbers for the same purposes will generate chaos in the manufacturing process.
SUBSTANTIATION: None given.
PANEL ACTION: Accept.
Change mm dimensions as follows:
1st column: 19.1, 31.8, 50.8
2nd column: 12.7, 19.1, 25.4
3rd column: 12.7, 12.7, 25.4
PANEL STATEMENT: The change is only for consistency with Table 384.36 as accepted by Code-Making Panel 9.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #673)

11- 35 - (430-102): Reject
SUBMITTER: John M. Daughtry, Jr., International Paper
COMMENT ON PROPOSAL NO: 11-68
RECOMMENDATION: This proposal that would require motor disconnecting means located in sight of every motor. This proposal was accepted by NEC Code-Making Panel 11. This submits my formal objection to the proposal.
SUBSTANTIATION: Insists people walk to MCC and lock out. "Safety" would better be served by enforcing lock out at MCC. MCC in switchrooms are better protected from weather and better

protected from physical damage. The equipment in switchrooms are more likely to become less degraded over time, and, therefore, more robust.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel action did not remove the exception and would not require a disconnecting means at every motor. See panel statement on Comment 11-44 and panel action and statement on Comment 11-56.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #674)

11- 36 - (430-102): Reject
SUBMITTER: George A. Summerford, Jr., International Paper
COMMENT ON PROPOSAL NO: 11-68
RECOMMENDATION: This proposal would require motor disconnecting means located in sight of every motor. This proposal was accepted by NEC Code-Making Panel 11. This submittal is my formal objection to the proposal. Delete the text.
SUBSTANTIATION: Safety would be seriously compromised because in many cases environments at or near motors are poor and eventually the disconnecting switch integrity would get poor resultings in possible shorts causing injuries. MCC room disconnect equipment is much more reliable. Adding more devices, especially those making it easy to be operated under load, add to the chances of someone being injured. This is in my opinion a "convenience" - personnel are better served by walking to the MCC and locking it out.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel action did not remove the exception and would not require a disconnecting means at every motor. See panel statement on Comment 11-44 and panel action and statement on Comment 11-56.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #679)

11- 37 - (430-102): Reject
SUBMITTER: Fred Magee, International Paper
COMMENT ON PROPOSAL NO: 11-68
RECOMMENDATION: Add a second sentence to read: "The disconnecting means required in accordance with 430-102(a) may also serve as the disconnecting means for the motor. ~~If it is located in sight from the motor locations and the driven machinery location. Remove the exception in 430-102(b).~~
SUBSTANTIATION: Too many times the environment is less than ideal. Many motors arc locked out for work on equipment that is not "visible" from the work area. Lockout of the motor disconnect is already required by OSHA 1910.147. With proper maintenance and supervision, there is no need for a local disconnect. Why should we install more hazardous electrical equipment to try to correct not following present OSHA Guidelines. We hold people accountable for following the OSHA rules.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Comment 11-44.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #680)

11- 38 - (430-102): Reject
SUBMITTER: Phil Hendry, International Paper
COMMENT ON PROPOSAL NO: 11-68
RECOMMENDATION: Add a second sentence to read: "The disconnecting means required in accordance with 430-102(a) may also serve as the disconnecting means for the motor. ~~If it is located in sight from the motor locations and the driven machinery location. Remove the exception in 430-102(b).~~
SUBSTANTIATION: This proposal will add more electrical hazards into corrosive environments and will only create more complexity which will lead to more safety problems than it solves. The answer is to hold people accountable to follow existing laws and code. As a maintenance manager and engineer with hands-on electrical experience, I strongly disagree with the addition of this language. I've worked in plants with both designs for 30 years and fused disconnect electrical starters in a well maintained control room environment away from corrosive materials is the safest design.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Comment 11-44.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #681)

11- 39 - (430-102): Reject
SUBMITTER: Phil Hendry, International Paper
COMMENT ON PROPOSAL NO: 11-68
RECOMMENDATION: Add a second sentence to read: "The disconnecting means required in accordance with 430-102(a) may also serve as the disconnecting means for the motor. ~~If it is located in sight from the motor locations and the driven machinery location. Remove the exception in 430-102(b).~~
SUBSTANTIATION: Too many times the environment is less than ideal. Many motors are locked out for work on equipment that is not "visible" from the work area. Lockout of the motor disconnect is already required by OSHA 1910.147. With proper maintenance and supervision there is no need for a local disconnect. Why should we install more hazardous electrical equipment to try to correct not following present OSHA Guidelines. We hold people accountable for following the OSHA rules.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Comment 11-44.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #708)

11- 40 - (430-102): Reject
SUBMITTER: Charlie Beale, International Paper
COMMENT ON PROPOSAL NO: 11-68
RECOMMENDATION: Add a second sentence to read: "The disconnecting means required in accordance with 430-102(a) may also serve as the disconnecting means for the motor." ~~If it is located in sight from the motor location and the driven machinery location. Remove the exception in 430-102(b).~~
SUBSTANTIATION: Too many times the environment is less than ideal. Many motors are locked out for work on equipment that is not "visible" from the work area. Lockout of the motor disconnect is already required by OSHA 1910.147. With proper maintenance and supervision, there is no need for a local disconnect. Why should we install more hazardous electrical equipment to try to correct not following present OSHA Guidelines? We hold people accountable for following the OSHA rules.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Comment 11-44.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #709)

11- 41 - (430-102): Reject
SUBMITTER: Marc Connor, International Paper
COMMENT ON PROPOSAL NO: 11-68
RECOMMENDATION: Add a second sentence to read: "The disconnecting means required in accordance with 430-102(a) may also serve as the disconnecting means for the motor." ~~If it is located in sight from the motor location and the driven machinery location. Remove the exception in 430-102(b).~~
SUBSTANTIATION: Too many times the environment is less than ideal. Many motors are locked out for work on equipment that is not "visible" from the work area. Lockout of the motor disconnect is already required by OSHA 1910.147. With proper maintenance and supervision, there is no need for a local disconnect. Why should we install more hazardous electrical equipment to try to correct not following present OSHA Guidelines? We hold people accountable for following the OSHA rules.
PANEL ACTION: Reject.

PANEL STATEMENT: See panel statement on Comment 11-44.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #710)

11- 42 - (430-102): Reject
SUBMITTER: Ricky Loveland, International Paper
COMMENT ON PROPOSAL NO: 11-68
RECOMMENDATION: Add a second sentence to read: "The disconnecting means required in accordance with 430-102(a) may also serve as the disconnecting means for the motor." ~~If it is located in sight from the motor location and the driven machinery location. Remove the exception in 430-102(b).~~
SUBSTANTIATION: Too many times the environment is less than ideal. Many motors are locked out for work on equipment that is not "visible" from the work area. Lockout of the motor disconnect is already required by OSHA 1910.147. With proper maintenance and supervision, there is no need for a local disconnect. Why should we install more hazardous electrical equipment to try to correct not following present OSHA Guidelines? We hold people accountable for following the OSHA rules.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Comment 11-44.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #1437)

11- 43 - (430-102): Reject
SUBMITTER: Joseph Hozy, International Paper
COMMENT ON PROPOSAL NO: 11-68
RECOMMENDATION: Add a second sentence to read: "The disconnecting means required in accordance with 430-102(a) may also serve as the disconnecting means for the motor. ~~If it is located in sight form the motor location and the driven machinery location. "Remove the exception in 430-102(b).~~
SUBSTANTIATION: Too many times the environment is less than ideal. Many motors are locked out for work on equipment that is not "visible" form the work area. Lockout of the motor disconnect is already required by OSHA 1910.147. With proper maintenance and supervision there is no need for a local disconnect. Why should we install more hazardous electrical equipment to try to correct not following present OSHA Guidelines. We hold people accountable for following the OSHA rules.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Comment 11-44.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #2316)

11- 44 - (430-102): Reject
SUBMITTER: William M. Lewis, Eli Lilly and Co.
COMMENT ON PROPOSAL NO: 11-68
RECOMMENDATION: The proposal should be rejected.
SUBSTANTIATION: The recommendation does not address a valid safety of design issue, but an enforcement issue. Proper lock out tag out procedures will assure total safety from electrical shock or flash for all workers under the existing rules. Local disconnect switches are one of the weakest points in an industrial electrical system. Not only do they introduce an opportunity for nonqualified people to access live electricity but also they are the most common failure point in a typical motor circuit next to the motor itself. They are often subject to dirt, water, corrosion, and abuse and their installation where not required for lock out by nonqualified people presents a fire hazard. Also there are many places where "practicability" could be an area of disagreement. A laundry list of examples will never cover every eventuality. For instance, cleans rooms was not mentioned. This is an area where I usually do not install local disconnects, even if the rest of the building has them because of the difficulty of keeping the area sanitized. The suggestion that this will be minimal cost to the user is entirely inaccurate. Perhaps for a common pump in a clean pump room, it is minimal, however when you install 5000 of them in sizes up to 600 hp, the costs can become astronomical; all because of inadequate training of electricians or indifference to work safety requirements.
PANEL ACTION: Reject.
PANEL STATEMENT: The Panel Action on comment 11-56 has added a new provision to the exception, that specifically permits the use of the exception in industrial installations where conditions of maintenance and supervision ensure that only qualified persons will service the equipment. This change will resolve most of the concersn of those objecting to Proposals 11-68 and 11-69, and the original Panel Actions on them.

This submitter, together with many others, apparently assumes that Section 430-102(b) applies only to industrial installations, where OSHA regulations apply, and where there is worker training and qualification, and control and supervision of work practices. This is not an accurate assessment of the application of 430-102(b), which applies to any motor installation under Section 430-102, including residential and commercial installations. Such unlimited permissable use of remote lockable disconnecting means in lieu of disconnecting means in sight from the motor and driven machinery location is of major concern.

The submitter of Comment 11-153 has provided the panel with further field accident data in support of the panel action on the proposal. Also, as noted in the substantiation for Comment 11-153, and in dictionaries, the meanings of "practical" and "practicable" are not synonymous, although this could be an area of disagreement. The FPN stated in the panel action was worded so that it could not be construed as a laundry list.

It should be noted that the exception stated in the panel action on the proposal included the situation where a disconnecting means in sight from the motor and the driven machinery location would introduce additional or increased hazards to persons or property, as could be the case in clean rooms.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
THOMAS: See my explanation of negative vote on Comment 11-135.

(Log #2317)

11- 45 - (430-102): Reject
SUBMITTER: William M. Lewis, Eli Lilly and Co.
COMMENT ON PROPOSAL NO: 11-69
RECOMMENDATION: The proposal should be rejected and the present wording remain.
SUBSTANTIATION: The recommendation does not address a valid safety of design issue, but an enforcement issue. Proper lock out tag out procedures will assure total safety from electrical shock or flash for all workers under the existing rules. Local disconnect switches are one of the weakest points in an industrial electrical system. Not only do they introduce an opportunity for nonqualified people to access live electricity but also they are the most common failure point in a typical motor circuit next to the motor itself. They are often subject to dirt, water, corrosion, and abuse and their installation where not required for lock out by nonqualified people presents a fire hazard. Also there are many places where "practicability" could be an area of disagreement. A laundry list of examples will never cover every eventuality. For instance, cleans rooms was not mentioned. This is an area where I usually do not install local disconnects, even if the rest of the building has them because of the difficulty of keeping the area sanitized. The suggestion that this will be minimal cost to the user is entirely inaccurate. Perhaps for a common pump in a clean pump room, it is minimal, however when you install 5000 of them in sizes up to 600 hp, the costs can become astronomical; all because of inadequate training of electricians or indifference to work safety requirements.
PANEL ACTION: Reject.
PANEL STATEMENT: Leaving the exception unchanged would not include the panel action on Proposal 11-70. See panel statement on Comment 11-44.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
THOMAS: See my explanation of negative vote on Comment 11-135.

(Log #597)

11- 46 - (430-102(a)): Reject
SUBMITTER: John E. Propst, Equilon Enterprises, LLC
COMMENT ON PROPOSAL NO: 11-67
RECOMMENDATION: The purpose for this comment is to reject the action of the panel and to reject the original proposal.
SUBSTANTIATION: As noted in Mr. Cox's explanation of negative vote, the proposal and panel has not provided any substantiation of any problem. Within industrial applications, there is a long and successful track record of assuring safety through the use of approved lockout tagout programs, even for disconnect devices located out of sight. There are many scenarios in which the location of disconnect devices within sight of the controller, in the context and requirements of this proposal, could result in a less safe installation. A more appropriate solution for the concern would be to have the employer and employees comply with the requirements of NFPA 70E-2000.
PANEL ACTION: Reject.
PANEL STATEMENT: Exception No. 2 is intended only to permit a single disconnecting means for more than one controller under specified conditions. It was never intended to permit this disconnecting means to be out of sight of the controller locations. A problem does not need to have occured in the field as a condition for the revision of the Code.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #1733)

11- 47 - (430-102(a)): Reject
SUBMITTER: Edward W. Langschwager, Langschwager Electric Corp.
COMMENT ON PROPOSAL NO: 11-67
RECOMMENDATION: Delete proposed Exception No. 2 and return to the current Exception 2 as follows:
A single disconnecting means shall be permitted for a group of coordinated controllers that drive several parts of a single machine or piece of apparatus. The disconnecting means and the controllers shall be located in sight from the machine or apparatus."
SUBSTANTIATION: The existing exception is clear, and easy to understand. Mr. Hartwell, the submitter of Proposal 11-67, made an excellent attempt to coordinate the intent of the 1999 change and also preserve the continuity of the basic rule of 430-102 by requiring the disconnect to be located within sight of the controller. If the panel could not accept the original proposal, then do not bother to change it at all.
PANEL ACTION: Reject.
PANEL STATEMENT: See Panel Action Statement on comment 11-46.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #2140)

11- 48 - (430-102(a)): Reject
SUBMITTER: Donald R. Bonem, II, Dow Corning Corporation
COMMENT ON PROPOSAL NO: 11-67
RECOMMENDATION: I encourage the committee to reject this change, the committee has changed the intentions of the submitter's proposal and has added requirements that don't apply to this paragraph of the code which is concerned about controller installations, not location of disconnect by motors.
SUBSTANTIATION: See my comments on Proposal 11-68.
PANEL ACTION: Reject.
PANEL STATEMENT: See Panel Statement on comment 11-46.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #238)

11- 49 - (430-102(b)): Reject
SUBMITTER: Mark A. O'Brien, Fort James Corporation
COMMENT ON PROPOSAL NO: 11-68
RECOMMENDATION: Reconsider panel action and reject the proposal.
SUBSTANTIATION: The originator of this proposal did not supply any substantiation of any incidents or accidents caused by using the disconnecting means required in accordance with 430-120(a) for electrical safety lockout. The originator's statement that workers might attempt to work the equipment "hot" rather than walk an excessive distance is vague, a generality, and a violation of law. The originator's scenario substantiation stating that a worker who gets "hung up" in a piece of machinery could use a disconnect as a means of getting out of trouble clearly shows a lack of understanding of safety procedures, NFPA 70E requirements, and the Federal Law regarding lockouts. OSHA Regulations (Standards - 20 CFR) "The control of hazardous energy (lockout/tagout) - 1910.147 established the minimum requirement for safety lockout and tagout of all energy sources including electrical. Both OSHA and NFPA 70E presently provide for the correct and safe procedures to lock or tag electrical equipment.

Using a disconnect means required in 430-120(a) is a proven safe method of lockout. This is substantiated by many safe years with no accidents. Only when the law or company policy is violated has there been a problem. Fort James has put into effect all the practices required to be safe when locking out in accordance with all existing laws. Also, Fort James will discipline anyone not following these rules up to and including dismissal.

The submitter's statement that this change would be "at a very minor incremental cost to the owner" is not correct. At Fort James in Old Town, we have approximately 4000 motors. We purchase the latest standard of motor control centers with lockable devices for the purpose of lockout and tagout. Installing disconnects in the field for every motor will take up valuable field space that might interfere with operations but must be in sight of the motor. We have many motors that are clustered together which would make it difficult to find a location so close to the motors that a disconnect means to be within reach if one was to get "hung up". This proposed requirement has a very significant impact not only on cost, but also in real estate required. I realize that cost is no substitute for safety. However, in this particular case, the additional cost is not warranted when there is an already proven means of lockout.

There are many good reasons to use the disconnect required in 430-102(a) as the lockout device rather than a disconnect within sight of the motor. The starter disconnect is a proven safe lockout means. The starter also allows for determining if the starter is stopped prior to opening the disconnect. The disconnect at the starter is where everyone would go to check the status of equipment. The starter control circuit condition can be observed at the starter. It would be unsafe to open a disconnect at the motor without knowing the state of the starter.

I strongly request the panel reconsider its action and reject this proposal to remove exemption 430-102(b) based on inadequate substantiation supporting this requirement. The need for a field disconnect within sight of a motor should be left to the need of the user and not dictated by code.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Comment 11-44.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #239)

11- 50 - (430-102(b)): Reject
SUBMITTER: John T. Penberthy , Potlatch
COMMENT ON PROPOSAL NO: 11-68
RECOMMENDATION: I recommend reconsideration of the panel action and rejection of the proposal.
SUBSTANTIATION: The originator's substantiation of this proposal was incomplete and incorrect. He did not give examples of any accidents or injuries caused by following the current disconnect procedures outlined in 430-120(a) for electrical safety lockout. As well, his suggestion that an employee would routinely choose to circumvent the current requirements and work on equipment which is "hot" rather than walk a short distance, implies our employees blatantly disobey the law. It is a requirement of NFPA 70E and the Federal Law Regarding lockouts that these shortcuts not take place. OSHA Regulations (Standards - 20CFR) "The control of hazardous energy (lockout/tagout) - 1910.147 established the minimum requirement for safety lockout and tagout of all energy sources including electrical. Our company complies with these regulations on all lockout/tagout procedures. To imply we do otherwise is unsubstantiated and untrue.

The submitter of this proposal also stated that to convert to this new regulation would be "at a very minor incremental cost to the owner". It is obvious this statement has not been researched. At our site we currently have over 7,000 motors in service. Converting to a system, which requires disconnects for every motor in service would be very costly. As well, it is unnecessary. By following the requirements in 430-120(a) we are confident of safe operations and maintenance of our motors. It has only been when these methods have been violated that we have experienced problems.

Finally, it would be a mistake to eliminate the use of the disconnect required in 430-102(a). The option of using a disconnect, which is in sight of the motor instead of the controller disconnect gives rise to a whole new set of issues. The controller disconnect is where a worker can determine if the controller is open, prior to opening the disconnect. It would be unwise and a potential safety hazard to open or close a disconnect switch at the motor without knowing the state of the controller first.

In my opinion the only way to safely install local disconnects at every motor would be to install disconnects with control interlocks. These control interlocks would need to open before the disconnect opened and hopefully allow sufficient time for the controller to open. This type of installation would be at an even higher cost.

It is for these reasons that I strongly request the panel reconsider its action and reject this proposal to remove exemption 430-102(b). The reasons given for making the proposal are unsubstantiated. Determination of when a field disconnect is necessary should be left to each site affected, and not dictated by code.

PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Comment 11-44.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #240)

11- 51 - (430-102(b)): Reject
SUBMITTER: Michael V. Glenn, Longview Fibre Co.
COMMENT ON PROPOSAL NO: 11-68
RECOMMENDATION: Reconsider panel action and reject the proposal.
SUBSTANTIATION: The originator of this proposal did not supply any substantiation of any accidents caused by using the disconnecting means required in accordance with 430-120(a) for electrical safety lockout. The originator's statement that workers might attempt to work the equipment "hot" rather than walk an excessive distance is vague, a generality, and a violation of law. The originator's scenario substantiation stating that a worker who gets "hung up" in a piece of machinery could use a disconnect as a means of getting out of trouble is clearly a violation of all existing laws, safety procedures, NFPA 70E requirements, and the Federal Law Regarding lockouts. OSHA Regulations (Standards - 20CFR) "The control of hazardous energy (lockout/tagout) - 1910.147" establishes the minimum requirement for safety lockout and tagout of all energy sources including electrical. Both OSHA and NFPA 70E provide for the correct and safe procedures to lock or tag electrical equipment.

Using the disconnecting means required in 430-120(a) is a proven safe method of lock out. This is substantiated by many safe years with no accidents. Only when the law is violated has there been a problem. The submitter's statement that this change would be "at a very minor incremental cost to the owner" is incorrect. At our industrial facility we have approximately 8,000 AC and DC motors. We purchase the latest type of motor control centers with lockable devices just for the purpose of lockout and tagout. Installing disconnects in the field for every motor will increase building space and size requirements to provide the necessary space that does not interfere with operations but yet is in sight of the motor. For industrial type processes and equipment that must be coordinated and interlocked, it will require not only an interlocking scheme at the controller but at the disconnect as well. This will substantially increase the installed cost and the complexity of the equipment. This proposed requirement has a very significant impact not only on cost, but also in real estate required. I realize that cost is no substitute for safety. However, in this particular case the additional cost is not warranted when there is a proven safe means of lockout.

There are many more good reasons to use the disconnect required in 430-102(a) as the lockout device rather than a disconnect within sight of the motor. The controller disconnect is a proven safe lockout means. The controller disconnect allows for determining if the controller is open prior to opening or closing the circuit to the motor. It would be unwise to open or close a disconnect at the motor without knowing the state of the controller because the controller may be in the closed position and the motor could inadvertently start if the disconnect is closed. There are many automatic processes and equipment that for safety reasons cannot and should not have an individual motor de-energized without shutting down the process or the equipment as a whole. Using a disconnect at the motor in lieu of the controller disconnect bypasses all safety interlocking schemes.

I strongly request the panel reconsider its action and reject this proposal based on inadequate substantiation supporting this requirement, a significant financial impact on the user, and the increased industrial safety risks just mentioned. The need for a field disconnect within sight of the motor is an engineering design consideration and safety issue that should be left to the requirement of the user and not dictated by code.

Considering that industrial facilities have their own maintenance forces, purchase equipment that presently meet the requirement of the exemption in Article 430-102(b), have processes and environments that cannot tolerate a disconnect at the motor, and are more equipped to handle safety and lockout procedures, the following compromise may serve the purpose of both industry and the submitter: Change Article 430-102(b) Exemption to read as follows: "Exception: In an industrial facility or plant, a disconnecting means,...". The addition of the words "In an industrial facility or plant," limits the use of this procedure to those larger facilities that are manned, organized, and have better lockout and tagout control.

PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Comment 11-44.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #242)

11- 52 - (430-102(b)): Reject
SUBMITTER: James A. Rooks, J & R Consulting Inc.
COMMENT ON PROPOSAL NO: 11-68
RECOMMENDATION: Reconsider panel action and reject the proposal.
SUBSTANTIATION: The originator of the proposal did not supply substantiation of any accidents caused by proper use of the disconnect means now required in accordance with NEC 430-120(a) for electrical safety lockout. The originator's statement that workers might attempt to work equipment "hot" rather than walk an excessive distance is generally a serious disregard for safety issues. Usual operating procedures will require the disconnect at the source be opened and "locked out" before any work is done on the involved circuit or its motor. There is no acknowledgment that the disconnect is rated to interrupt motor load current. Opening a disconnect at the motor may allow false control scheme information to a process, causing possible serious process and/or safety issues elsewhere. The source disconnect still must be "locked out", still requiring the worker to walk the distance to that source four times. Any attempt to bypass the existing rules is a serious breach of safety rules and shows a disregard for human life.

Considering that safety and equipment ratings can be overcome, and the change is allowed, I suggest that as a minimum an exception be allowed for industry establishments which have and enforce an approved effectively safety "lock out" program.

PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Comment 11-44.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #243)

11- 53 - (430-102(b)): Reject
SUBMITTER: Phillip Cree, Alcoa Automotive Castings
COMMENT ON PROPOSAL NO: 11-68
RECOMMENDATION: I feel Mr. Glenn's observations are correct and I strongly agree that this proposal be removed.
SUBSTANTIATION: I agree with Mr. Glenn's statement on Proposal 11-68 (430-102(b)). Lockout tag should always be used regardless of distance or inconvenience. I feel this could be very costly to implement. I did not see any wording to address bridge cranes, servo gantries or robots. Our facility has all of these items. The changes recommended by Mr. Callanan are not substantiated by accident reports.

PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Comment 11-44.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #244)

11- 54 - (430-102(b)): Reject
SUBMITTER: Walter Bruehl, Boise Cascade Corporation
COMMENT ON PROPOSAL NO: 11-68
RECOMMENDATION: The Boise Cascade Corporation strenuously objects to the proposed change to NEC Article 430-102(b) that would eliminate the following exception:

"A disconnecting means, in addition to the controller disconnecting means as required in accordance with Section 430-102(a), shall not be required for the motor where the disconnection means at the controller is individually capable of being locked in the open position."

SUBSTANTIATION: This provision is fundamental to our lockout/tagout policy and procedure. Many of our systems have multiple sources of energy that must be verified at zero energy and locked out before the equipment can be safely worked on. In addition to a single motor there are often other motors, compressed air, steam, various fluids and other sources of energy that must be secured, locked out and verified as having zero energy and no chemicals or other hazards to the worker prior to working on the equipment. We require the lockout of the entire "system" to be complete prior to work beginning. Employee violation of this policy can result in disciplinary action including loss of employment at Boise Cascade.

The proposed change to require a local disconnect switch at the motor may result in a greater hazard to the worker by tempting the worker to short cut the lockout process that assures that all hazards are put in a safe condition prior to work. They may simply throw the local switch and forget about the other hazards associated with the equipment. Further when the local switch is closed the machinery may restart in an undesired condition and result in additional damage or confusion.

The controls for most of our machinery would need to be modified in a manner to protect the machine and workers from an individual inadvertently opening a local disconnect switch prior to safely shutting down the machine and safely securing it.

Some of our motor driven equipment is in hazardous, corrosive, or wet environments. Our policy has long been to keep the number of electrical components in these environments to a minimum due to the difficulty maintaining the integrity of the enclosure and its internal components under these conditions. A field mounted disconnect switch in a hazardous environment would need to be rated for the environment to avoid introducing an explosive hazard.

Further, Boise Cascade Corporation has in excess of 30,000 motor drives some as large as 14,000 hp. The cost and space required for all the additional local disconnects would be very prohibitive.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Comment 11-44.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #245)

11- 55 - (430-102(b)): Reject
SUBMITTER: Ray Crane, Weyerhaeuser Company Columbus Modified Fiber Facitlity
COMMENT ON PROPOSAL NO: 11-68
RECOMMENDATION: Deleted text.
~~Add a second sentence to read:~~
~~"The disconnecting means required in accordance with 430-102(a) may also serve as the disconnecting means for the motor if it is located in sight from the motor location and the driven machinery location."~~
~~Remove the exception in 430-102(b).~~
SUBSTANTIATION: Asbstract: The exception in 430-102(b) has allowed large industrial facilities to centralize their motor control and isolation equipment providing for a safe and proper environment for operating and maintaining electrical power equipment. These industrial facilities have maintenance and engineering systems in place such that only qualified personnel (as defined and required by 20 CFR) are allowed to disconnect, test, and lockout the equipment safely. Industry clearly identifies all lock out devices in the motor control centers and the motor and/or equipment. Standard Operating Procedures that meet or exceed the OSHA Electrical Safe Working Practices and the NFPA Standard for Electrical Safety Requirements for Employee Workplaces have been established and utilized for years. The submitter of the ROP has failed to justify this change because the examples provided entail direct violations of the law as well as deviations from any standard of safe work practices. There is no evidence of ANY accidents or safety incidents resulting from properly using the device required by 430-102(a) and properly following established and requisite lockout/tagout procedures required by 20 CFR and NFPA 70E. Our company has consistently used these practices for safely locking out and tagging of equipment prior to working on the equipment and our safety record clearly shows the procedure to be very effective.

Section 430-102 and the exceptions, has served industry well through the years and has done so in a safe manner. If the recommended changes were to be made, I believe it would increase the risk to employees. A few examples are as follows; increased chances of opening a disconnect under load, opening a disconnect to a dc motor with a fault and a large inertia that keeps the motor (generator) rotating, and opening a disconnect to a motor being driven by a variable frequency drive causing major damage to the drive.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel action on the proposal modified the existing exception, but did not delete it. See panel statement on Comment 11-44 and panel action and statement on Comment 11-56.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #246)

11- 56 - (430-102(b)): Accept in Principle
SUBMITTER: Ray Crane, Weyerhaeuser Company Columbus Modified Fiber Facitlity
COMMENT ON PROPOSAL NO: 11-68
RECOMMENDATION: Add a second sentence to read:

"The disconnecting means required in accordance with 430-102(a) may also serve as the disconnecting means for the motor if it is located in sight from the motor location and the driven machinery location."

~~Remove the exception in 430-102(b).~~ "Exception: In industrial occupancies, where conditions of maintenance and supervision ensure that only qualified persons service the installation, a ~~A~~ disconnecting means, in addition to the controller disconnecting means as required in accordance with Section 430-102(a), shall not be required for the motor where the disconnecting means for the controller is individually capable of being locked in the open position.

"FPN: For information on lockout/tagout procedures, see Standard for Electrical Safety Requirements for Employee Workplaces, NFPA 70E-1995."

SUBSTANTIATION: Abstract: The exception in 430-102(b) has allowed large industrial facilities to centralize their motor control and isolation equipment providing for a safe and proper environment for electrical power equipment. These industrial facilities have engineering and maintenance systems in place such that only qualified personnel (as defined and required by 20 CFR) are allowed to disconnect, test, and lockout the equipment safely. The submitter of the ROP has failed to justify this change because the examples provided entail direct violations of the law as well as deviations from any standard of safe work practices. There is no evidence of ANY accidents or safety incidents resulting from properly using the device required by 430-102(a) and properly following established and requisite lockout/tagout procedures required by 20 CFR and NFPA 70E.
PANEL ACTION: Accept in Principle.
Revise to read as follows:

"(b) Motor. A disconnecting means shall be located in sight from the motor location and the driven machinery location. The disconnecting means required in accordance with 430-102(a) shall be permitted to serve as the disconnecting means for the motor if it is located in sight from the motor location and the driven machinery location.

Exception: The disconnecting means shall not be required to be in sight from the motor and the driven machinery location under either condition (1) or (2) below, provided the disconnecting means required in accordance with 430-102(a) is individually capable of being locked in the open position. The provision for locking or adding a lock to the disconnecting means shall be permanently installed on or at the switch or circuit breaker used as the disconnecting means.

(1) Where such a location of the disconnecting means is impracticable or introduces additional or increased hazards to persons or property.

(2) In industrial installations, with written safety procedures, where conditions of maintenance and supervision ensure that only qualified persons will service the equipment.

FPN No. 1: Some examples of increased or additional hazards

include, but are not limited to: motors rated in excess of 100 Hp, multi-motor equipment, submersible motors, motors associated with variable frequency drives and motors located in hazardous (classified) locations.
Existing FPN to become FPN No. 2.
PANEL STATEMENT: The panel action meets the submitter's intent.

The panel reaffirms its position that where practicable and where the installation does not add increased or additional hazards, the motor disconnecting means shall be located within sight from the motor and driven machinery. The Panel however recognizes that frequently industrial establishments have a greater degree of control over the workplace. Data on the effectiveness of Lockout/Tagout programs for example, shows a correlation between the type of the facility and the effective implementation of the program. See for example the substantiation submitted with Comment 11-163. The addition of provision (2) of the exception should ensure that only those facilities that are most likely to have an effective Lockout/Tagout program can utilize the exception. Note that the provision for impracticable or additional or increased hazard remains unchanged from the original Panel action on Proposal 11-68.

This revision of the original panel action on the proposal adds condition (2) to the exception, editorially modifies the exception for clarity, and clarifies the use of the FPNs. The intent of condition (2) was recommended or suggested in Comments 11-56, 11-68, 11-117, 11-119, 11-125, 11-149, 11-163, 11-164, 11-168, 11-210 and 11-211, and also in comments expressed in voting on the panel action on the proposal.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #247)

11- 57 - (430-102(b)): Reject
SUBMITTER: Thomas A. Phelps, Bowater Incorporated
COMMENT ON PROPOSAL NO: 11-68
RECOMMENDATION: Reconsider panel action and reject the proposal.
SUBSTANTIATION: The originator of this proposal did not take into account the additional safety risk presented when relying on a disconnect switch located in view of the motor. A disconnect switch is not designed to start and stop a motor. If used for this purpose, it will eventually fail and cause equipment damage and possible personal injury. A motor starter is provided to start and stop the motor. Placing the disconnect switch at or near the motor will encourage its use as the starting and stopping device. Our practice is to locate the disconnect device at the starter in an environmental protected control center remote from the motor. Our lockout policy requires that we stop the motor, verify that the starter has opened, and proceed to open and lockout the disconnect switch. Making sure that the starter has done its job prior to opening the disconnect switch is a very important step in our safety procedure. Locating the disconnect switch near the motor would not eliminate the need to witness the motor starter in the open state before opening the disconnect switch.

The originator of this proposal suggests that people will violate the law and fail to lockout because the disconnect switch is installed in an inconvenient remote location. The people that might ignore this safety requirement are the same people who would likely use the proposed local disconnect switch without first shutting down and verifying that the motor is electrically disconnected by the starter. As mentioned above, the disconnect switch is not designed to dissipate the energy flowing to a motor. With age, and repeated use the switch will physically fail when used as the stopping derive. The resultant explosion will likely occur when someone's hand is on the handle of the disconnect device.

The originator suggests that the proposal will result in minor incremental cost to the owner. This is not true. It will be extremely expensive and in some cases not practical. We have some 10,000 motors in this industrial facility. Thirty three of these are 5,000 and 6,000 hp each. Because of the physical size of these disconnect devices, locating them in view of the motors is not practical. Cost is no substitute for safety. However, additional cost in this case will not improve safety. A proven safe means of lockout already exists.

The originator's statement "when the distance is excessive, workers attempt to work the equipment hot, rather than walk the distance four times" is vague, a generality, and the acceptance of a violation of law. The originator's suggestion that the disconnect device being located in view of the motor will be of assistance when a worker gets "hung up" clearly shows a lack of understanding of safety and an acceptance of unsafe work practices.

I strongly request the panel reconsider is action and reject this proposal to remove exemption 430-102(b) based on the increased safety risk that it would impose.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Comment 11-44.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #249)

11- 58 - (430-102(b)): Reject
SUBMITTER: Robert Huddleston, Jr., Gray, TN
COMMENT ON PROPOSAL NO: 11-69
RECOMMENDATION: Delete proposed exception and fine print note. Replace with current exception from the 1999 NEC.
SUBSTANTIATION: Much, much to expensive an idea that will not lead to any increase in safety. Current lock and tag policies and procedures are more than adequate. May not be as convenient, but the NEC is not supposed to be based on convenience. Use of the word "impracticable" is not appropriate and could be misinterpreted by the authority having jurisdiction.
PANEL ACTION: Reject.
PANEL STATEMENT: Leaving the exception unchanged would not include the panel action on Proposal 11-70. See panel statement on Comment 11-44.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
THOMAS: See my explanation of negative vote on Comment 11-135.

(Log #256)

11- 59 - (430-102(b)): Reject
SUBMITTER: Walter Bruehl, Boise Cascade Corporation
COMMENT ON PROPOSAL NO: 11-68
RECOMMENDATION: Reconsider panel action and reject the proposal. Leave this section as it appears in the 1999 code.
SUBSTANTIATION: NEC Section 430-102(b) Exception is fundamental to our lockout/tagout policy and procedure. All of our lockouts for process motors are done at the motor controller. Only a few simple stand-alone machines have local disconnects. Many of our systems have multiple sources of energy that must be verified at zero energy and locked out before the equipment can be safely worked on. In addition to a single motor there are often other motors, compressed air, steam, various fluids and other sources of energy that must be secured, locked out and verified as having zero energy and no chemicals or other hazards to the worker prior to working on the equipment. We require the lockout of the entire "system" to be complete prior to work beginning. Employee violation of this policy can result in disciplinary action including loss of employment.

The proposed change to require a local disconnect switch at the motor may result in a greater hazard to the worker by tempting the worker to short cut the lockout process that assures that all hazards are put in a safe condition prior to work. They may simply throw the local switch and forget about the other hazards associated with the equipment. Further, when the local switch is closed the machinery may restart in an undesired condition and result in additional damage or confusion.

The controls for most of our machinery would need to be modified in a manner to protect the machine and workers from an individual inadvertently opening a local disconnect switch prior to safely shutting down the machine or process and safely securing it.

Some motor driven equipment is in hazardous, corrosive or wet environments. It is desirable to keep the number of electrical components in these environments to a minimum due to the difficulty maintaining the integrity of the enclosure and its internal components under these conditions. A field mounted disconnect switch in a hazardous environment would need to be rated for the environment to avoid introducing an explosive hazard.

The author of the proposal to eliminate this exception may not be aware of the additional hazards introduced in the process industries by requiring local disconnects. These additional

disconnect switches are unnecessary and undesirable from a safety standpoint in the process industries.
PANEL ACTION: Reject.
PANEL STATEMENT: Leaving the exception unchanged would not include the panel action on Proposal 11-70. See panel statement on Comment 11-44.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #259)

11- 60 - (430-102(b)): Reject
SUBMITTER: William F. Robertson, AGRA Simons Engineering, Inc.
COMMENT ON PROPOSAL NO: 11-68
RECOMMENDATION: Reconsider panel action. Reject the proposal.
SUBSTANTIATION: The referenced proposal describes a problem that would not exist if maintenance workers follow OSHA safety procedures, as described in CFR 29, 1910.149. The referenced safety procedures are not optional. They are enforced by federal and state governmental agencies. Every business employing maintenance personnel requires strict compliance with these regulations. I challenge the proposal submitter to provide the name of any business that tolerates the actions of maintenance personnel described in his proposal.

Panel member Cox points to Section 90-1(b), which eloquently states:

"This Code contains provisions that are considered necessary for safety. Compliance therewith and proper maintenance will result in an installation that is essentially free from hazard but not necessarily efficient, convenient, or adequate for good service or future expansion of electrical use."

Existing Code requirements for disconnects are safe and adequate. Both of the submitter's "Serious problems" would not exist if OSHA lockout and tag-out procedures are followed...even though they may be inconvenient.

Further, the submitter provides no documentation to support his claim that a serious problem exists. He provides no statistics or data describing the number of injuries directly attributed to inadequate disconnects. Why did the panel vote to accept this proposal without supporting data? Certainly, inconvenience is not supporting data for a statement that existing Code requirements for disconnects are inadequate.

Further, the submitter's claim that locally-mounted disconnects can be installed "At very minor incremental cost to the owner" is false and misleading. Consider the following estimated installed costs, based on nationally recognized estimating data (e.g., Means), for locally-mounted, nonfused disconnect switches, including control wiring for an auxiliary contact on the switch installed in the motor control circuit.

Description	0.5-10 hp	50 hp	100 hp	150 hp
Nonfused switch, NEMA 4 encl.	$896	$985	$2732	$5447
Switch Labor	100	168	248	356
Switch terminations	72	120	240	240
Control cable material (220 ft)	180	180	180	180
Control cable labor	352	352	352	352
Conduit material (30 ft)	70	70	70	70
Conduit labor	300	300	300	300
Control terminations	40	40	40	40
Cable tray (ignored)				
Totals	$2010	$2215	$4162	$6985

The above installations are typical of equipment installed in the pulp and paper industry. Auxiliary contacts on switches are wired to PLC input cards, the cost of which were not included in the above example.

Larger 460 volt, paper machine motors (e.g., 600 - 1200 hp) would also require local disconnect switches. The installed cost of a 2000 A, 600 volt class bolted pressure switch in a NEMA 3R enclosure is about $20,000. The size of these switches may require an additional 8 - 10 feet in a paper machine drive isle. Consider a 400 ft long paper machine, an 80 ft tall building and a $3/ft^3$ building cost. The increased cost of the building alone is about $960,000.

This proposal would also apply to medium voltage motors. The installed cost for a 600 A, 5 kV class switch suitable for a 250 hp, 4000 volt motor will be about $17,000. These switches typically have a 3 ft x 5 ft footprint and require 4 ft - 0 in. working space in front.

Imagine the installed cost of this proposal for a larger paper mill with 6000 motors. These are not "minor incremental costs", they are staggering!

Application of a nonfused disconnect switch is more difficult and misunderstood than one might imagine. A nonfused disconnect switch's short-circuit withstand current rating is based on the upstream overcurrent device. If the upstream overcurrent device is a fuse, the switch's short-circuit withstand rating is the same as the fuse's interrupting current rating. If the upstream overcurrent device is a circuit breaker, the switch's short-circuit withstand current rating is 10 kA, unless the switch has been tested with that specific circuit breaker type. In reality, nonfused switches are rarely tested with upstream circuit breakers. There are simply too many combinations of switches and circuit breakers to make this economically attractive.

In most industrial plants in this country, the upstream overcurrent device will be a circuit breaker in a motor starter. The maximum available fault current on a motor control center bus fed from a 2000 kVA, 5.75 percent impedance transformer, connected to a primary system with a short-circuit capability of about 1000 MVA, is typically in the range of 50,000 amperes. The available fault current at a nonfused disconnect switch fed from a starter in such an MCC will depend on the impedance of the motor feeder. For motors rated 10 hp and less, a 12 AWG motor feeder would have to be about 24 ft long to reduce the fault duty on a locally-mounted nonfused switch to less than 10 kA rms asymmetrical. However, about 425 ft would be required for a 2/0 AWG feeder to a 100 hp motor. When the available fault current exceeds 10 kA, the disconnect device must be a fused switch, a molded case switch or a circuit breaker. Fused switches are often avoided because of associated single-phasing problems. The costs of molded case switches and circuit breakers are significantly higher than nonfused switches.

In summary, the panel should reconsider and reject the original proposal. The proposal is a solution to a problem that would not exist, if OSHA tag-out and lockout procedures are followed. The costs to implement the proposal are staggering for large industrial plants, and the benefits are minuscule. Existing Code requirements for motor disconnects are both safe and adequate. Changing the Code to make maintenance convenient is not the work of this panel.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Comment 11-44.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #261)

11- 61 - (430-102(b)): Reject
SUBMITTER: Ray Crane, Weyerhaeuser Company Columbus Modified Fiber Facitlity
COMMENT ON PROPOSAL NO: 11-68
RECOMMENDATION: Reject this proposal.
SUBSTANTIATION: Abstract: The exception in 430-102(b) has allowed large industrial facilities to centralize their motor control and isolation equipment providing for a safe and proper environment for electrical power equipment away from wet, caustic, explosive, and other hazardous locations. These industrial facilities have engineering and maintenance systems in place such that only qualified personnel (as defined and required by 29 CFR Part 1910) are allowed to disconnect, test, and lockout the equipment safely. The submitter of the Proposal has failed to justify this change because the samples provided entail direct violations of the law as well as deviations from any standard of safe work practices. There is no evidence of ANY accidents or safety incidents resulting from properly using the device required by 430-102(a) and properly following established and requisite lockout/tagout procedures required by 29 CFR Part 1910 and NFPA 70E.

Substantiation: The submitter of this Proposal has not supplied any substantiation for this change. I am not aware of any accidents caused by properly using the disconnecting means required in accordance with 430-120(a) for electrical safety lockout as required by 29 CFR Part 1910. I am aware, however, of several incidents caused by unqualified operators using field mounted disconnects for a lockout. These incidents include, opening disconnects under fault conditions such as DC motors with large inertia loads, standing in water while operating the disconnect, failing to test the

circuit to ensure that it is de-energized, explosions caused by equipment failure due to deterioration in adverse environments, explosions caused by using a nonload break disconnect to interrupt a running motor.

Implementing the change called for by this Proposal will, in my professional opinion, lead to further abuses of the lockout/tagout standards required by 29 CFR Part 1910 and NFPA 70E. With the disconnect located at the machine, unqualified persons will be tempted to operate the disconnect "just for a second" rather than properly lockout the equipment.

The originator's statement that workers might attempt to work the equipment "hot" rather than walk an excessive distance is vague, a generality, violation of Federal, State and Local law and our Companies Standard Operating Procedures. The originator's substantiation, stating that a worker who gets "hung up" in a piece of machinery could use a disconnect as a means of getting out of trouble clearly shows a lack of understanding of all safety procedures, NFPA 70E requirements, and the Federal Law Regarding lockouts. OSHA Regulations (Standard - 29 CFR Part 1910) "The control of hazardous energy (lockout/tagout) - 1910.147 established the minimum requirement for safety lockout and tagout of all energy sources including electrical. Both OSHA and NFPA 70E presently provide for the correct and safe procedures to lock or tag electrical equipment. The originator is not taking into consideration the Industry Standards now in effect and the Education and Development of our team members in safely locking out and tagging out equipment before working on the equipment. Industry today has dramatically improved the expectations and accountability of Safe Working Practices and has developed Safe Working Behaviors for all team members that are required to work on or operate equipment requiring removing power.

Using the disconnecting means required in 430-120(a) is a proven safe method of lock out. This is substantiated by many safe years of following these standards with no accidents. Only when the law is violated has there been a problem. The submitter's statement that this change would be "at a very minor incremental cost to the owner" is incorrect. At our industrial facility we have approximately 400 AC and DC motors from fractional to 800 HP. We purchase the latest type of motor control centers with lockable devices just for the purpose of lockout and tagout. Also we go the extra mile in protecting our team members by installing current limiting fuses in series with the circuit breakers or disconnecting means, just in case a fault occurs in the starter compartment. These current limiters interrupt the short circuit in less than a half cycle.

Installing disconnects in the field for every motor will increase building space and size requirements to provide the necessary space that does not interfere with operations but yet in sight of the motor. This proposed requirement has a very significant impact not only on cost, but also in real estate required. I realize that cost is no substitute for safety. However, in this particular case the additional cost is not warranted when there is a proven safe means of lockout and the recommendation will only increase the risk as stated above.

There are many good reasons to use the disconnect required in 430-102(a) as the lockout device rather than a disconnect within site of the motor. The controller disconnect is a proven safe lockout means. The controller disconnect allows for determining if the controller is open prior to opening the disconnect. The disconnect at the controller is where most everyone would go to check the status of the equipment. Proper identification at both the starter and the motor assists the person in disconnecting the proper equipment. Having a common location for disconnecting motors from the power source allows the controllers to be in an air conditioned, clean atmosphere reducing the risk of electrical faults from extreme atmospheres typical to industry. The controller control circuit condition can be observed at the controller. It would be unwise to open or close a disconnect at the motor without knowing if the controller has been opened by the control circuit.

I strongly request the panel reconsider its action and reject this proposal to remove exemption 430-102(b) based on inadequate substantiation supporting this requirement. The need for a field disconnect within sight of the motor should be left to the need of the user and not dictated by code.

PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Comment 11-44.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #262)

11- 62 - (430-102(b)): Reject
SUBMITTER: David Kay, Weyerhaeuser Corp.
COMMENT ON PROPOSAL NO: 11-68
RECOMMENDATION: Reconsider panel action and reject the proposal.
SUBSTANTIATION: I strongly disagree with the statements of the originator of this proposal. He did not submit any documentation to support his contention that the current method of locking out is unsafe. I have never heard of anyone being injured by following a lockout procedure; quite the contrary, the injuries happen when people fail to follow the lockout procedure. In my 15 years in paper mills it has not been my experience that people will take whatever time is required to lock out properly. If a worker refuses to properly lock out, it won't matter whether he has to walk 150 ft or 15 ft. In addition, the cost of local disconnects would be prohibitive. It's not uncommon for a medium-sized mill to have 5000 installed motors; larger mills may have 7000 or more. At a conservative cost of $500 per installed disconnect, the cost to a medium-sized mill would be $2.5 million. This does not include any costs associated with building considerations. In some situations, it would be difficult to install a line-of-sight disconnect without significant structural modifications.

Summary: I strongly request that the panel reconsider its action and reject this proposal. It tries to address a problem that doesn't exist. Everyone is in favor of safety. Because of this safety focus, we have developed a very effective lockout policy that incorporates the safest available equipment and the accompanying documentation. Every lockout-related issue is fully and thoroughly investigated. We already have a program that works very well. There is little to be gained by spending huge sums of money to install additional equipment that provides little, if any, additional protection.

PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Comment 11-44.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #285)

11- 63 - (430-102(b)): Reject
SUBMITTER: Terry Howle, Westvaco
COMMENT ON PROPOSAL NO: 11-68
RECOMMENDATION: I recommend that this proposal not be included in the 2002 NEC.
SUBSTANTIATION: 430-102(b) provides an exception for the disconnecting means to be located at a place other than within sight of the motor location and driven machinery location provided the disconnecting means is capable of being locked in the open position.

The design of the Westvaco Wickliffe, KY mill has the motor starter which is also the disconnecting means located in climate controlled rooms (Electrical Control Rooms). All motors are identified at the motor location (usually at the local start/stop station) and also on the starter door in the electrical control room. Our policy for lockout calls for a motor to be locked out at the starter. Verification is also included-the worker must try to start the motor from the local start/stop station and verify that it does not start. This has served the mill well for many years.

The additional costs of installing a local disconnect for the power leads to the motors is not warranted. These additional connection points (one for the wires coming into the local disconnect, and one for the outgoing wires) add to the potential for loose connections which usually cause failure. In addition, some motors are installed in areas that are hot and humid, thus adding to the potential for failure of the disconnect.

I recommend the panel reconsider and reject the proposal to remove exception 430-102(b) from the 2002 NEC because 430-102(b) provides a safe lockout method for motors.

PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Comment 11-44.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #287)

11- 64 - (430-102(b)): Reject
SUBMITTER: Adrian E. Totty, Fort James Corporation
COMMENT ON PROPOSAL NO: 11-68
RECOMMENDATION: I would encourage the panel to reject this proposal as unnecessary.
SUBSTANTIATION: The current OSHA regulations (1910.147) requiring that all energy sources be locked out is more than sufficient.

To assume a worker would not lock out a motor because they had to walk a short distance is a misconception and is without substantiation.

In the Muskogee Mill, failure to lock out results in dismissal. There have been no accidents due to not locking out a motor in over 20 years of operation and we have over 5000 motors.

The implementation of this proposal would result in a great expense on industry without any added benefits. I urge you to reconsider your action on the proposal.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Comment 11-44.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #292)

11- 65 - (430-102(b)): Reject
SUBMITTER: Jim Lepin, Fort James
COMMENT ON PROPOSAL NO: 11-68
RECOMMENDATION: Reconsider panel action and reject the proposal.
SUBSTANTIATION: The originator of this proposal did not supply any substantiation of any incidents or accidents caused by using the disconnecting means required in accordance with 430-120(a) for electrical safety lockout. The originator's statement that workers might attempt to work the equipment "hot" rather than walk an excessive distance is vague, a generality, and a violation of law. The originator's scenario substantiation stating that a worker who gets "hung up" in a piece of machinery could use a disconnect as a means of getting out of trouble clearly shows a lack of understanding of safety procedures. NFPA 70E requirements, and the Federal Law regarding lockouts. OSHA Regulations (Standards - 20 CFR) "The control of hazardous energy (lockout/tagout) - 1910.147 established the minimum requirement for safety lockout and tag-out of all energy sources including electrical. Both OSHA and NFPA 70E presently provide for the correct and safe procedures to lock or tag electrical equipment.

Using a disconnect means required in 430-120(a) is a proven safe method of lockout. This is substantiated by many safe years with no accidents. Only when the law or company policies are violated has there been a problem. Fort James has put into effect all the practices required to be safe when locking out in accordance with all existing laws. Also, Fort James will discipline anyone not following these rules up to and including dismissal.

The submitter's statement that this change would be "at a very minor incremental cost to the owner" is not correct. At the Fort James pulp and paper mill in Oregon, we have approximately 4000 motors. We purchase the latest standard of motor control centers with lockable devices for the purpose of lockout and tag-out. Installing disconnects in the field for every motor will take up valuable field space that might interfere with operations but must be in sight of the motor. We have many motors that are clustered together which would make it difficult to find a location close to the motors as a disconnect means to be within reach if one was to get "hung up." This proposed requirement would have a very significant impact not only on cost, but also in real estate required. I realize that cost is no substitute for safety. However, in this particular case, the additional cost is not warranted when there is an already proven means of lockout in place.

There are many good reasons to use the disconnect required in 430-102(a) as the lockout device rather than a disconnect within sight of the motor. The starter disconnect is a proven safe lockout means. The starter also allows for determining if the starter is stopped prior to opening the disconnect. The disconnect at the starter is where everyone would go to check the status of equipment. The starter control circuit condition can be observed at the starter. It would be unsafe to open a disconnect at the motor without knowing the state of the starter.

I strongly request the panel reconsider its action and reject this proposal to remove exemption 430-102(b) based on inadequate substantiation supporting this requirement.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Comment 11-44.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #309)

11- 66 - (430-102(b)): Reject
SUBMITTER: Daniel J. Cassidy, Great Northern Paper, Inc.
COMMENT ON PROPOSAL NO: 11-68
RECOMMENDATION: I recommend that this proposal be reconsidered and rejected.
SUBSTANTIATION: The submitter of this proposal does not cite any instances where this exception has caused damage or injury. The reasoning presented in the substantiation could be used to argue for a disconnecting means within sight of any electrical equipment. If the problem to be addressed is the "walking distance" to the disconnect, then it would seem that a disconnect installed nearby but not necessarily within sight of the motor should also be permitted (i.e., a controller disconnect located in an electrical room close to the motor location). The suggested location being in sight of the "...driven machinery location" would be difficult to satisfy for industrial machinery, where often the entire machine is not within sight of the motor itself (i.e., a motor in the basement driving a machine on the floor above, a long conveyor with a motor at one end, etc.). The proposal does not distinguish between motors of below 600V and those above 600V, thereby requiring disconnecting means within sight of very large motors operating at higher voltages. The statement that "workers attempt to work the equipment 'hot', rather than walk the distance..." is simply a blatant disregard of established modern safety practices.

Good engineering practice dictates that the motor controller should start and stop the motor, and the disconnecting means should be used primarily as an isolating device. Installing a locally mounted disconnect switch exposes personnel to some risk if the switch is operated under load, the risk being greater for larger motors at higher voltages. At our facility, whatever locally mounted disconnects have been deemed necessary, we have interlocked the control circuit of the controller with an auxiliary contact of the locally mounted switch, which will cause the controller to open if the locally mounted switch is opened. This also ensures that the switch is not energized when it is closed, since the controller is prevented from operating until the switch is closed. Our preference, however, is to use the controller disconnecting means for lockout wherever possible.

As to the submitter's claim that the proposal would result in a "... minor incremental cost..." this may be true for a facility with a few small motors, but for an industrial facility with hundreds of thousands of motors, many above 500 HP and some of several thousand HP, the impact on cost and space requirements would be fairly significant! I certainly do not suggest that cost should override safety concerns, but for a proposal with a cost impact of this magnitude, I believe the substantiation should be more specific and that the practical implications should be given consideration. The current code accommodates practical considerations while providing for safe lock out, however, it requires accurate identification of the disconnecting means for each motor, and secure locking provisions at the controller disconnecting means.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Comment 11-44.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #317)

11- 67 - (430-102(b)): Reject
SUBMITTER: Caroll Flournoy, Longview, TX
COMMENT ON PROPOSAL NO: 11-68
RECOMMENDATION: Reverse the panel's decision to accept in principle the change proposed by Michael I. Callanan, Log 4074.
SUBSTANTIATION: The panel has introduced vague wording. There is no evidence that lack of a local disconnect is truly a safety issue. Existing lockout/tagout rules and procedures are in place to handle this issue. Requiring local disconnects will place much more than "a minor incremental cost" on industries that have exhibited an excellent safety record.
PANEL ACTION: Reject.

PANEL STATEMENT: See panel statement on Comment 11-44.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
THOMAS: See my explanation of negative vote on Comment 11-135.

(Log #323)

11- 68 - (430-102(b)): Accept in Principle
SUBMITTER: Larry Menche, Willamette Industries Inc.
COMMENT ON PROPOSAL NO: 11-68
RECOMMENDATION: Reconsider panel action and reject the proposal to remove exemption 430-102(b) or include an exception for supervised locations.
SUBSTANTIATION: OSHA regulations (Standards - 20 CFR) "The Control of Hazardous Energy" (lockout/tagout) 1910.147 established the minimum requirements for safety lockout and tagout of all energy sources including electrical. Both OSHA and NFPA 70E presently provide for the correct and safe procedures to lock or tag electrical equipment. Using the disconnecting means required in 430-120(a) is a proven safe method of lockout.
There are many good reasons to use the disconnect required in 403-102(a) as the lockout device rather than a disconnect within sight of the motor.
• The controller disconnect is a proven safe lockout.
• There will be more of a tendency for someone not to lockout properly because they can see the disconnecting means.
• The disconnect at the controller is the logical place most people would go to check equipment status.
• The controller circuit condition can be observed at the controller.
• The controller control circuit condition can be observed at the controller.
• It could be hazardous to open a disconnect on a running piece of equipment where controls and associated interlocks are not also opened.
• It could be hazardous closing a disconnect to a piece of equipment when the contactor is already closed, thus starting the motor etc. with the disconnect.
The need for a field disconnect within sight of the motor should be left to the need of the user and not dictated by code.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Comment 11-56.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #324)

11- 69 - (430-102(b)): Reject
SUBMITTER: Terry Howle, Westvaco
COMMENT ON PROPOSAL NO: 11-69
RECOMMENDATION: Do not delete 430-102(b) - leave as it presently reads! Leave the exception in!
SUBSTANTIATION: All of our motor installations are designed with the disconnecting means for the controller being capable of being locked in the open position.
All safety lockout procedures are written with this in mind - the system works very well.
PANEL ACTION: Reject.
PANEL STATEMENT: Leaving the exception unchanged would not include the panel action on Proposal 11-70. See panel statement on Comment 11-44.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #325)

11- 70 - (430-102(b)): Reject
SUBMITTER: Terry Howle, Westvaco
COMMENT ON PROPOSAL NO: 11-68
RECOMMENDATION: Leave 430-102(b) as it presently reads. Do not delete the exception!
SUBSTANTIATION: 430-102(b) allows the disconnecting means for a motor to be located out of sight of the motor if this disconnecting means is lockable. All of our mills lock-out procedures are written with this in mind, and this procedure works great. There is no need to delete this exception.
PANEL ACTION: Reject.
PANEL STATEMENT: Leaving the exception unchanged would not include the panel action on Proposal 11-70. See panel statement on Comment 11-44.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #333)

11- 71 - (430-102(b)): Reject
SUBMITTER: Steve A. Stewart, Rogersville, TN
COMMENT ON PROPOSAL NO: 1-66
RECOMMENDATION: I believe the existing text in Article 430-102(b) of the 1999 Code should remain with no changes, including the exception.
SUBSTANTIATION: The use of "impracticable" in the exception is vague and difficult to interpret. OSHA 1910.147 and NFPA 70E for lockout/tagout provides adequate safeguards for personnel. An additional local, disconnect increases the likelihood of unqualified persons operating the device. Additional interlocks and wiring will be needed to disconnect the motor control circuit via the "disconnect means" to meet the requirements of Article 430.74. The impact of this proposed change would be increased cost of additional equipment, conduit and wiring. It also adds an additional electrical device that can fault or fail.
PANEL ACTION: Reject.
PANEL STATEMENT: The reference to the proposal number is incorrect. See panel statement on Comment 11-2 and 11-44.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
THOMAS: See my explanation of negative vote on Comment 11-135.

(Log #336)

11- 72 - (430-102(b)): Reject
SUBMITTER: Larry J Marshall, Castlewood, VA
COMMENT ON PROPOSAL NO: 11-68
RECOMMENDATION: I believe the existing text should remain with no changes to Article 430-102(b).
SUBSTANTIATION: Use of "impracticable" in the exception is vague and will be difficult to interpret. OSHA 1910.147 and NFPA 70E for lockout/tagout, provides adequate safeguards for personnel. The addition of a local disconnect increases the chances of the device being operated by an unqualified person. Also, to meet the requirements of Article 430.74, additional interlocks and wiring will be needed to disconnect the motor control circuit via the "disconnecting means". The impact of this proposed change would be to increase the cost of each motor installation with additional equipment, conduit, and wiring. If the local disconnect is installed, it adds an additional electrical device that can fault or fail.
PANEL ACTION: Reject.
PANEL STATEMENT: Leaving the exception unchanged would not include the panel action on Proposal 11-70. See panel statement on Comment 11-44.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
THOMAS: See my explanation of negative vote on Comment 11-135.

(Log #338)

11- 73 - (430-102(b)): Reject
SUBMITTER: James Wentz, Batesville, AR
COMMENT ON PROPOSAL NO: 11-69
RECOMMENDATION: The Panel should have rejected Proposal 11-69.

SUBSTANTIATION: I have read the technical explanations why Proposal 11-69 should not be adopted. Now I will give you my reasons. I am an electrician inspector for a company here in Batesville. I have used a version of the lock and tag procedure outlined in OSHA 1910.333 for more than twenty five years. I have had no problems as long as this procedure is followed. Our employees understand they have no option but to follow this procedure. The companies that have had problems are those which do not have a strong training program or do not enforce the rules they have in place. Adding a disconnect at the motor is not going to change those problems. If a person is going to cut off a lock in an electric room they will cut it off on the floor by the motor. We cannot control a persons disregard for rules and regulations. If we are not careful we will regulate ourselves out of business. Do not punish the companies that follow the regulations already in place for they are more than adequate.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Comment 11-44.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #339)

11- 74 - (430-102(b)): Reject
SUBMITTER: James Wentz, Batesville, AR
COMMENT ON PROPOSAL NO: 11-68
RECOMMENDATION: The Panel should have rejected Proposal 11-68.
SUBSTANTIATION: I have read the technical explanations why Proposal 11-69 should not be adopted. Now I will give you my reasons. I am an electrician inspector for a company here in Batesville. I have used a version of the lock and tag procedure outlined in OSHA 1910.333 for more than twenty five years. I have had no problems as long as this procedure is followed. Our employees understand they have no option but to follow this procedure. The companies that have had problems are those which do not have a strong training program or do not enforce the rules they have in place. Adding a disconnect at the motor is not going to change those problems. If a person is going to cut off a lock in an electric room they will cut it off on the floor by the motor. We cannot control a persons disregard for rules and regulations. If we are not careful we will regulate ourselves out of business. Do not punish the companies that follow the regulations already in place for they are more than adequate.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Comment 11-44.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #341)

11- 75 - (430-102(b)): Reject
SUBMITTER: Wayne Eads, PPG Industries
COMMENT ON PROPOSAL NO: 11-68
RECOMMENDATION: Exception as stated in 11-68 should not be altered.
SUBSTANTIATION: The exception given in 11-68 should not be altered. In the chemical process industry which I work, being required to have local disconnects at each motor would be unsafe. One example of this is, corrosion problems, a local disconnect is another point at which corrosion can cause a failure with power loss. A second is the problem of inadvertent and unauthorized power disruption to motor, a local disconnect is another point someone could accidentally turn power off to the motor. In either case listed, power loss to the motor could result in process upsets which could have environmental and personal safety impact.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel action on the proposal modified the existing exception, but did not delete it. See panel statement on Comment 11-44 and panel action and statement on Comment 11-56.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #348)

11- 76 - (430-102(b)): Reject
SUBMITTER: Vernon E. Beachum, William A. Martin, Douglas C. Moody, William R. Ravenscroft, Westvaco
COMMENT ON PROPOSAL NO: 11-68
RECOMMENDATION: Reconsider Panel Action and retain the wording of Section 430-102(b) and its Exception as it is in the 1999 NFPA 70.
SUBSTANTIATION: The wording of the 1999 NEC Section 430-102(b) and the wording of the Exception are sufficient to provide for the safe isolation of the motors covered under this section.

Further comments:

Our workforce, as with other large industrial facilities, consists of highly skilled and thoroughly trained professionals. Our facility has a well-developed policy for the control of hazardous energy (lockout/tagout) as required under 20 CFR 1910.147 and referenced in the existing FPN under Section 430-102(b). Our employees, as well as outside contractors performing work in the facility, are regularly trained on this procedure. This procedure has resulted in the reduction of both workplace injuries and damage to equipment. Both OSHA and NFPA 70E presently provide for safe procedures to lock or tag electrical equipment. The requirements under 430-102(a) provide a proven and safe disconnecting method.

There are many benefits to using the controller disconnect under 430-102(a) as the disconnecting and lockout device rather than a field disconnect located at the motor. Programmable Logic Controllers (PLCs) are used in many industrial facilities for controlling motors. Opening the motor controller disconnect device (a fused disconnect, MCP or breaker) removes all power from within the controller supplying all devices related to that controller. If a field disconnect at the motor were to be used, a set of auxiliary contacts must be included to open the controller to prevent closing the local disconnect into a start command. Furthermore, the electrical status of the motor circuit can be fully determined only at the motor controller and not at a field disconnect near the motor. Additionally, the disconnecting device used to isolate the controller is rated to handle both motor and fault currents. A typical nonfused disconnecting device that would be used at the motor is not usually rated to handle fault current.

Another concern relating to the use of a field disconnect is that process areas of industrial facilities may be wet, corrosive, and/or dusty. These types of conditions negatively impact the integrity, reliability, and ultimate safety of field (at the motor) installation of disconnect switches even when the best available NEMA 3R, 4 and 4X enclosures are used. Adequate space, NEC Section 110-26 "Spaces About Electrical Equipment," for the proper installation of these additional devices could also be a great problem. The space problem, of course, increases as the motor horsepower increases.

We have nearly 8,000 in-service motors (AC and DC) at our facility. These motors vary in size from fractional horsepower to 2500 hp. We use state-of-the-art grouped motor control centers (MCCs) for 460 volt applications and grouped medium voltage controllers for 2300 Volt motors. This equipment is located within Electrical Control Rooms (ECRs) many of which are air-conditioned and supplied with highly filtered pressurizing air. All motor control equipment is purchased with the means of physically locking its source-disconnecting device. The space required to safely install an additional disconnect at or within sight of each motor is simply not available within our facility. A local, at the motor, disconnect is another point of potential failure. In fact, due to the conditions mentioned above at the motor location, the potential for failure is high. A local disconnect also provides the greatest potential within the electrical system for exposure by unqualified personnel. Since safety, not convenience, is the primary concern for any electrical installation, we feel Article 430, Sections 102(a) and (b) provides a proven safe and reliable means to isolate a motor.

Additionally, we support the negative responses of Mr. Cox and Mr. Saunders as reported under Panel Action, NEC Proposal 11-61, as they relate to Log #2926 and Log #4074. Therefore, the Luke Electrical Committee requests that the panel reconsiders its proposed change and keep the Exception under 430-102(b) as is, except for the possible inclusion of an additional FPN(s) for clarity. The decision to use or not use a field disconnect device within sight of the motor should be dependent upon the user's application and the principles of good engineering practice and should not be dictated by the National Electrical Code.
PANEL ACTION: Reject.
PANEL STATEMENT: Leaving the exception unchanged would not include the panel action on Proposal 11-70. See panel statement on Comment 11-44.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #349)

11- 77 - (430-102(b)): Reject
SUBMITTER: Joe Bowman, Telforfd, TN
COMMENT ON PROPOSAL NO: 11-69
RECOMMENDATION: I propose NEC 430-102(b) remain as is.
SUBSTANTIATION: OSHA and NFPA 70E lockout and tagout regulations address working on motor installations safely. If these regulations are followed and enforced, as required, the need for a local disconnect is eliminated other than for convenience. The additional cost would be enormous for industries with thousands of motor installations. The cost of following existing OSHA and NFPA 70E regulations is minimum and creates, safe work behaviors for ALL motor installations, even those covered by the proposed Exception.
PANEL ACTION: Reject.
PANEL STATEMENT: Leaving the exception unchanged would not include the panel action on Proposal 11-70. See panel statement on Comment 11-44.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #350)

11- 78 - (430-102(b)): Reject
SUBMITTER: Joe Bowman, Telforfd, TN
COMMENT ON PROPOSAL NO: 11-68
RECOMMENDATION: I propose NEC 430-102(b) remain as is.
SUBSTANTIATION: If OSHA and NFPA lockout/tagout regulations are followed and enforced as required, working on motors, along with associated electrical equipment, "hot" would not be an issue. Requiring a local disconnect is an attempt to provide an engineering solution to a behavioral problem. If the proposed change were adopted, the same electrician who worked equipment "hot" prior to the change would do the same on equipment covered by the Exception. The cost to industries with thousands of motor installations would be enormous. In my opinion, enforcing existing lockout/tagout regulations rather than changing the code is the solution.
PANEL ACTION: Reject.
PANEL STATEMENT: Leaving the exception unchanged would not include the panel action on Proposal 11-70. See panel statement on Comment 11-44.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #351)

11- 79 - (430-102(b)): Reject
SUBMITTER: J. B. Gonzalez, R.M. Montgomery, WESTVACO Corporation
COMMENT ON PROPOSAL NO: 11-68
RECOMMENDATION: Reconsider Panel Action and reject the proposal.
SUBSTANTIATION: The originator of this proposal seems to have not given consideration to typical industrial installations. If acted upon without due consideration of all facts, the panel could possibly make an erroneous judgment.

Industrial facilities can present wet, corrosive, and/or dusty environments that can be very detrimental to the integrity and reliability of field (at the motor site) mounted disconnect devices. Equipment installed in NEMA 3R, 4, or 4X enclosures has been subjected to failure when exposed to such environments over a period of time. From experience, installations of load-break disconnect switches in NEMA 4X stainless steel enclosures at motor sites have resulted in some failures due to excessive corrosion within a period of about five years.

Although 600V class load-break disconnects are readily available for smaller motors, they are very difficult to find for 200 HP and larger motors. Furthermore, medium voltage motors would require the installation of motor controllers at the motor site. Such controllers are available in neither NEMA 4 nor NEMA 4X enclosures and require real estate not available in the great majority of applications. Field space limitations can result in violations of NEC Section 110-26: Spaces About Electrical Equipment, especially when these larger disconnect devices would be required.

Our facility has a long-standing practice of purchasing state-of-the-art, grouped motor control centers and medium voltage motor controllers with lockable devices for 460V and 2300/4160V applications, respectively. They are located in electrical control rooms (ECRs) that are pressurized with filtered air to minimize outside air intrusion and environmentally conditioned to control temperature and humidity. This installation provides an optimum environment for the safe and reliable operation of these devices.

Like most industrial facilities, our workforce consists of highly skilled, thoroughly trained professionals whose personal safety, as well as the safety of their coworkers, is paramount. OSHA and NFPA 70E lockout and tag procedures are strictly observed for isolation of equipment at the respective motor controller. Workers are required to go to the ECR to properly isolate the source of power. Workers are also provided with the means to verify, at the motor site, that the motor has been properly isolated from its power source.

The proponent of 11-68-(430-102(b)) Log #4074 has failed to provide specific facts to properly substantiate his position. Furthermore, our experience indicates that a clearly written and established lockout and tag procedure in accordance to OSHA and NFPA 70E will insure worker safety. Procedures such as ours are safe and straightforward, whereas locating the disconnect device near the motor in a hostile environment may result in equipment faults and unsafe and unreliable operation.

Therefore, we strongly request that the panel reconsider its action and reject this proposal to remove exemption 430-102(b) based on inadequate substantiation supporting this requirement. The need for a field disconnect within sight of the motor should be left to the specific need of the user and not dictated by code.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Comment 11-44.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #468)

11- 80 - (430-102(b)): Reject
SUBMITTER: Anthony L. Sherrill, Batesville, AR
COMMENT ON PROPOSAL NO: 11-69
RECOMMENDATION: The panel should have rejected the proposal.
SUBSTANTIATION: • The code panel realized that this proposal was not practical in many applications. The wording in the panel's revised exception makes this proposal unenforceable. Each application could be argued as impracticable or as adding additional hazards. Every location where the local disconnect is added could present additional hazards because it could expose unqualified personnel to live circuits. Also, if more expensive "Load Break Disconnects" are not installed, additional hazards are introduced by the possibility of unqualified personnel operating the disconnects under load. If this were truly a safety issue, there should not be thousands of applications where the requirement is impracticable.

• OSHA Lockout/Tagout procedures, when properly followed, have proven adequate for many years in the chemical industry. The example in the substantiation is a severe violation of this standard. As qualified electricians, we are expected to follow OSHA safety standards. The additional local disconnect will not necessarily protect those who choose not to follow established safety standards.

• This substantiation is based on a single job. It seems to me that the application the submitter refers to should not fall under the exception to Section 430-102(b) since the circuit breaker is not "capable of being locked in the open position." Also, the OSHA Lockout/Tagout procedures should eliminate the question of who has the authority to lock or unlock the disconnect.

• I am only familiar with working in the chemical industry where OSHA regulations are strictly enforced. If this proposal was accepted because of areas where these regulations are not strictly enforced, there should at least be an exception for areas where the conditions of maintenance and supervision ensure that only qualified personnel utilizing the OSHA Lockout/Tagout procedures perform maintenance on the equipment.
PANEL ACTION: Reject.

PANEL STATEMENT: See panel statement on Comment 11-44.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
THOMAS: See my explanation of negative vote on Comment 11-135.

(Log #471)

11- 81 - (430-102(b)): Reject
SUBMITTER: John Leibee, PPG Industries
COMMENT ON PROPOSAL NO: 11-68
RECOMMENDATION: Leave existing text in NEC 1999 430-102(b) as it stands.
SUBSTANTIATION: The justification for Proposal 11-68 states that workers would attempt to work the equipment "hot" as opposed to walking to lockout a disconnect is a people problem and not a Code issue.
This proposal also will allow the same worker to open a disconnect "within sight" and not apply a lock and still be in compliance with NFPA 70E Chapter 5, paragraph 5-1.3.1. This poses a more serious threat because the disconnect can be closed while the workers' back is turned or while he is at a break or lunch. This just happened in our area and resulted in a fatality.
PANEL ACTION: Reject.
PANEL STATEMENT: Leaving the exception unchanged would not include the panel action on Proposal 11-70. See panel statement on Comment 11-44.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #522)

11- 82 - (430-102(b)): Reject
SUBMITTER: Felix R. Gipson, Solvan Polymers
COMMENT ON PROPOSAL NO: 11-68
RECOMMENDATION: I think 430-102(b) is fine as written.
SUBSTANTIATION: If someone is too lazy to walk a few steps to lock-out equipment, then they should be addressed, not the code.
We have a lock-tag-try procedure that works well.
PANEL ACTION: Reject.
PANEL STATEMENT: Leaving the exception unchanged would not include the panel action on Proposal 11-70. See panel statement on Comment 11-44.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #545)

11- 83 - (430-102(b)): Reject
SUBMITTER: James D. Erwin, Celanese Ltd
COMMENT ON PROPOSAL NO: 11-68
RECOMMENDATION: I am formally rejecting the panel acceptance in principle of:
Proposal No. 11-68 (430-102(b)): Accept in Principle NEC-P11 (Log #4074)
SUBSTANTIATION: The panel does not provide sufficient technical support to accept this proposal. The submitter states as his substantiation, "When the distance is excessive, workers attempt to work the equipment "hot," rather than walk the distance four times." The violation of existing codes and safety policies do not necessitate their change or removal. Petrochemical facilities incorporate very stringent lockout/tagout procedures based upon OSHA and NEC requirements and allowances. If safety policies based upon the current NEC are in place and strictly enforced, you will not have the situation of a worker getting "hung up". The submitter also refers to the addition of local disconnecting means as a "very minor incremental cost to the owner". This is far from the truth when explosion-proof disconnects are required in electrically classified facilities, especially when their use cannot be substantiated.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Comment 11-44.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #546)

11- 84 - (430-102(b)): Reject
SUBMITTER: James D. Erwin, Celanese Ltd
COMMENT ON PROPOSAL NO: 11-69
RECOMMENDATION: I am formally rejecting the panel acceptance in principle of:
Proposal No. 11-69 (430-102(b)): Accept in Principle NEC-P11 (Log #2926)
SUBSTANTIATION: The panel does not provide sufficient technical support to accept this proposal. In petrochemical facilities, lockout/tagout procedures are written and strictly enforced at all levels, including the provisions for locking out the primary disconnecting means. The submitter states that, "There is a very good possibility that a disconnect switch can be unlocked and energized when a maintenance personnel is asked to turn on a specific exhaust fan because of odors they want to exhaust out of a room. This is in direct violation of existing OSHA and NEC policies and is not sufficient reason to change existing NEC allowances. Besides, if this occurs at a location, no minimum number of disconnecting means, local or otherwise, would suffice if someone is bent upon restoring power. Additionally, if the local disconnecting means is not the load-break type, additional safety hazards could be introduced. Once again, you are depending upon written safety procedures to ensure that the equipment is operated properly. Contrary to what the submitter states, the only sure way that electrical personnel are "in control of the switch", is to follow established lockout/tagout procedures which include verification that the equipment is deenergized before working on it. This can be safely accomplished using existing NEC allowances without the need of installing local disconnecting means.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Comment 11-44.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #602)

11- 85 - (430-102(b)): Reject
SUBMITTER: John E. Propst, Equilon Enterprises, LLC
COMMENT ON PROPOSAL NO: 11-68
RECOMMENDATION: The purpose for this comment is to reject the action of the panel, to reject the original proposal, and to reject the revised wording of the panel.
SUBSTANTIATION: The negative explanations provided by Mr. Cox, Mr. Hamer, and Mr. Saunders identifies many issues and concerns related to this proposal. I would like to reiterate the concern about the enforcement issues related to "Practicable", the concern about setting requirements to address convenience versus safety, and the proven track record of industry when employers and employees effectively apply the electrical safety requirements of NFPA 70E. The submitter nor panel has provided any substantiation of any real problems when the safety aspects of NFPA 70E have been applied.
PANEL ACTION: Reject.
PANEL STATEMENT: Leaving the exception unchanged would not include the panel action on Proposal 11-70. See panel statement on Comment 11-44.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
THOMAS: See my explanation of negative vote on Comment 11-135.

(Log #646)

11- 86 - (430-102(b)): Reject
SUBMITTER: Raymond Pearigen, International Paper
COMMENT ON PROPOSAL NO: 11-68
RECOMMENDATION: Reject the proposal and retain the current 430-102(b) Exception.
SUBSTANTIATION: The International Paper mill in Georgetown, SC is a fully integrated pulp and paper facility employing 800 plus people, and makes uncoated paper and pulp for market.
The Georgetown Mill is concerned about the proposed change to Article 430 from the NEC Panel 11 committee which will eliminate an exception which allows disconnects to be located out of sight provided disconnects can be locked in the open position for the following reasons.

The environment in a paper mill, as well as may other process industries is less than perfect. The introduction of disconnects at the motor will make motor installations more failure prone and will make void past work which has put disconnects and motor controllers into dedicated electric rooms, thereby making them more reliable.

There is a legitimate safety concern of utilizing local disconnects to make or break the motor load after the effects of age and environment have taken their toll. Failure of the disconnect to open or close properly can create a hazardous condition to employee safety and potential damage to equipment. Once again, the present practice of locating controllers and disconnects in dedicated electric rooms minimizes the role that the operating floor environment can play in equipment failure.

The addition of disconnects in the field will require additional interlocks to prove closed the disconnect on pieces of equipment requiring sequencing on startup and shutdown. However, the addition of such interlocks can interject more problems when troubleshooting in the field.

Furthermore, the lock out of motors is already a requirement of OSHA 1910.147. In facilities such as the Georgetown Mill, where proper maintenance and training exists, and strict adherence to a "lock out, tag out" policy is required, there is no need for a disconnect in sight of a motor.

Finally, while it is realized that cost is not the only criteria for accepting or rejecting a new change to the NEC, it must be noted that this proposal will add additional cost to every new motor installation, and increased maintenance cost over the life of the equipment which the motor serves. These costs will be incurred in the harsh industrial environment that characterizes process industries.

PANEL ACTION: Reject.

PANEL STATEMENT: Leaving the exception unchanged would not include the panel action on Proposal 11-70. See panel statement on Comment 11-44.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:

AFFIRMATIVE: 15

(Log #647)

11- 87 - (430-102(b)): Reject

SUBMITTER: William W. Ogburn, International Paper

COMMENT ON PROPOSAL NO: 11-68

RECOMMENDATION: Reject the proposal and retain the current 430-102(b) Exception.

SUBSTANTIATION: The International Paper mill in Georgetown, SC is a fully integrated pulp and paper facility employing 800 plus people, and makes uncoated paper and pulp for market.

The Georgetown Mill is concerned about the proposed change to Article 430 from the NEC Panel 11 committee which will eliminate an exception which allows disconnects to be located out of sight provided disconnects can be locked in the open position for the following reasons.

The environment in a paper mill, as well as may other process industries is less than perfect. The introduction of disconnects at the motor will make motor installations more failure prone and will make void past work which has put disconnects and motor controllers into dedicated electric rooms, thereby making them more reliable.

There is a legitimate safety concern of utilizing local disconnects to make or break the motor load after the effects of age and environment have taken their toll. Failure of the disconnect to open or close properly can create a hazardous condition to employee safety and potential damage to equipment. Once again, the present practice of locating controllers and disconnects in dedicated electric rooms minimizes the role that the operating floor environment can play in circuit failure.

The addition of disconnects in the field will require additional interlocks to prove closed the disconnect on pieces of equipment requiring sequencing on startup and shutdown. However, the addition of such interlocks can interject more problems when troubleshooting in the field.

Furthermore, the lock out of motors is already a requirement of OSHA 1910.147. In facilities such as the Georgetown Mill, where proper maintenance and training exists, and strict adherence to a "lock out, tag out" policy is required, there is no need for a disconnect in sight of a motor.

Finally, while it is realized that cost is not the only criteria for accepting or rejecting a new change to the NEC, it must be noted that this proposal will add additional cost to every new motor installation, and increased maintenance cost over the life of the equipment which the motor serves. These costs will be incurred in the harsh industrial environment that characterizes process industries.

PANEL ACTION: Reject.

PANEL STATEMENT: Leaving the exception unchanged would not include the panel action on Proposal 11-70. See panel statement on Comment 11-44.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:

AFFIRMATIVE: 15

(Log #648)

11- 88 - (430-102(b)): Reject

SUBMITTER: Wade Marsh, International Paper

COMMENT ON PROPOSAL NO: 11-68

RECOMMENDATION: Reject the proposal and retain the current 430-102(b) Exception.

SUBSTANTIATION: The International Paper mill in Georgetown, SC is a fully integrated pulp and paper facility employing 800 plus people, and makes uncoated paper and pulp for market.

The Georgetown Mill is concerned about the proposed change to Article 430 from the NEC Panel 11 committee which will eliminate an exception which allows disconnects to be located out of sight provided disconnects can be locked in the open position for the following reasons.

The environment in a paper mill, as well as may other process industries is less than perfect. The introduction of disconnects at the motor will make motor installations more failure prone and will make void past work which has put disconnects and motor controllers into dedicated electric rooms, thereby making them more reliable.

There is a legitimate safety concern of utilizing local disconnects to make or break the motor load after the effects of age and environment have taken their toll. Failure of the disconnect to open or close properly can create a hazardous condition to employee safety and potential damage to equipment. Once again, the present practice of locating controllers and disconnects in dedicated electric rooms minimizes the role that the operating floor environment can play in circuit failure.

The addition of disconnects in the field will require additional interlocks to prove closed the disconnect on pieces of equipment requiring sequencing on startup and shutdown. However, the addition of such interlocks can interject more problems when troubleshooting in the field.

Furthermore, the lock out of motors is already a requirement of OSHA 1910.147. In facilities such as the Georgetown Mill, where proper maintenance and training exists, and strict adherence to a "lock out, tag out" policy is required, there is no need for a disconnect in sight of a motor.

Finally, while it is realized that cost is not the only criteria for accepting or rejecting a new change to the NEC, it must be noted that this proposal will add additional cost to every new motor installation, and increased maintenance cost over the life of the equipment which the motor serves. These costs will be incurred in the harsh industrial environment that characterizes process industries.

PANEL ACTION: Reject.

PANEL STATEMENT: Leaving the exception unchanged would not include the panel action on Proposal 11-70. See panel statement on Comment 11-44.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:

AFFIRMATIVE: 15

(Log #649)

11- 89 - (430-102(b)): Reject

SUBMITTER: Dennis M. Dauzuk, International Paper

COMMENT ON PROPOSAL NO: 11-68

RECOMMENDATION: Reject the proposal and retain the current 430-102(b) Exception.

SUBSTANTIATION: The International Paper mill in Georgetown, SC is a pulp and paper facility employing 800 people, and manufactures uncoated paper and pulp.

The Georgetown Mill is concerned about the proposed change to Article 430 from the NEC Panel 11 committee which will eliminate the current which allows disconnects to be located out of sight of the equipment, provided it can be locked in the open position.

There is a safety concern when utilizing local, within sight of the

motor. Failure of the disconnect to properly open or close would create a hazardous condition to employee safety and potential damage to equipment. The current industrial design of constructing dedicated electrical equipment rooms minimizes the role that the operating floor environment contributes to increased employee risks with the failure of electrical equipment.

The lock out of motors, and other energy sources, is already a requirement of OSHA 1910.147. In facilities such as the Georgetown Mill, where proper maintenance and training exists, with strict adherence to a "lock out, tag out" policy is required, there is no need for a disconnect in sight of a motor.

The addition of disconnects in the field will add complexity to the electrical interlock systems without adding any benefits. The addition of the added interlocks will interject more problems when troubleshooting.

Finally, while it is realized that cost is not the only criteria for accepting or rejecting a new change to the NEC, it must be noted that this proposal will add additional cost to every new motor installation, and increased maintenance cost over the life of the equipment which the motor serves. These costs will further limit the success of domestic industries that compete in global markets.

PANEL ACTION: Reject.
PANEL STATEMENT: Leaving the exception unchanged would not include the panel action on Proposal 11-70. See panel statement on Comment 11-44.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #653)

11- 90 - (430-102(b)): Reject
SUBMITTER: Peter J. Connery, International Paper Co.
COMMENT ON PROPOSAL NO: 11-68
RECOMMENDATION: Delete new wording to section/paragraph - make no change!!
SUBSTANTIATION: New rulings may require multiple disconnects when equipment is not visible from the work area. OSHA has lock-out policy that, when enforced, adequately protect workers. Interlocks from a starter contact are often utilized - this change would add another interlock at disconnect to prove disconnect was also closed. Disconnect would add hazard dependent on location, dust, fumes, etc.
PANEL ACTION: Reject.
PANEL STATEMENT: Leaving the exception unchanged would not include the panel action on Proposal 11-70. See panel statement on Comment 11-44.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #657)

11- 91 - (430-102(b) and Execption and Fine Print Notes): Accept in Principle
SUBMITTER: Tim Arendt, Western Code Advisory Task Group
COMMENT ON PROPOSAL NO: 11-68
RECOMMENDATION: We as a group of over 40 IBEW/IAEI members, with experience installing and inspecting electrical systems, support this proposal.
SUBSTANTIATION: An insight disconnect provides the highest level of safety for persons working on motors and related equipment. Our experience gives evidence that lock-out tag-out is unreliable in terms of worker protection. A non-visible tag should never be a substitute for an insight disconnect. The exception and FPNs, as worded, provides application latitude for authorities having jurisdiction and the design community.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Comment 11-56.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #663)

11- 92 - (430-102(b)): Reject
SUBMITTER: S. L. Ralston, Madison, IN
COMMENT ON PROPOSAL NO: 11-68
RECOMMENDATION: Reject the proposal.
SUBSTANTIATION: As noted in the negative vote comments, no evidence was presented that indicated an unsafe condition. OSHA 1910.147 and NFPA 70E requirements for lockout-tagout have proven to be safe in countless installations for years of service. A disconnect is not designed for or intended as stop or start device. If a disconnect is installed on the load side of the controller ,it will likely be used to stop and start the motor. Local stop, start push buttons or special emergency stop control circuits operate the controller to safely stop and start the motor.

The NEC has never required a disconnecting device in sight of the motor in industrial locations where trained operation and maintenance personnel are used. This requirement has not always been required for all applications. The 1971 NEC, Section 430-86(a), allowed the controller disconnect to serve as the motor disconnect where the controller disconnect was lockable. In the 1993 NEC, Section 430-86 was deleted and disconnecting location requirements were moved to Section 430-102 with a 430-102(b) exception to allow a lockable controller disconnect to serve as the motor disconnect. Between 1974 and 1993 the exception for allowing a lockable controller disconnect to be the motor disconnect applied for industrial locations. The 1993, 1996, and 1999 NECs made this exception applicable to all locations with only editorial revisions in those three Codes. This is safe and the 1999 NEC wording should be kept. If an in-sight disconnect is required and a motor is inadvertently started by closing this disconnect, an unsafe condition will be created.

PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Comment 11-44.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #664)

11- 93 - (430-102(b)): Reject
SUBMITTER: S. L. Ralston, Madison, IN
COMMENT ON PROPOSAL NO: 11-69
RECOMMENDATION: Reject the proposal.
SUBSTANTIATION: See my comment substantiation on proposal 11-68. The same reasoning applies.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Comment 11-44.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #665)

11- 94 - (430-102(b)): Reject
SUBMITTER: Rick Kirby, International Paper
COMMENT ON PROPOSAL NO: 11-68
RECOMMENDATION: Do not accept proposed revision concerning local motor disconnects. Existing language is more than sufficient to provide workers safe LES means.
SUBSTANTIATION: Additional disconnects will increase exposure of equipment and personnel for failure or shock. Adequate, lockable equipment in protected rooms is sufficient. You shouldn't have to have a disconnect within sight of motor to get someone to lock out - it's his safety involved.
PANEL ACTION: Reject.
PANEL STATEMENT: Leaving the exception unchanged would not include the panel action on Proposal 11-70. See panel statement on Comment 11-44.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #666)

11- 95 - (430-102(b)): Reject
SUBMITTER: Michael McKernan, International Paper Co.
COMMENT ON PROPOSAL NO: 11-68
RECOMMENDATION: Reject proposal to change wording of 430-102(b) to require disconnecting means located within sight of motor.
SUBSTANTIATION: In may industries, especially process industries that have bad environments and tight spaces, it is impractical and dangerous to install a disconnecting means within sight of the motor. What do yo do with a OC motor or high voltage motor for a wet basement area or explosive area?
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Comment 11-44.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #668)

11- 96 - (430-102(b)): Reject
SUBMITTER: Brian T. Peterson, International Paper Corp.
COMMENT ON PROPOSAL NO: 11-68
RECOMMENDATION: Reject the proposal.
SUBSTANTIATION: Installing local disconnects out in the field is not a good idea in many applications. Corrosion is much more of a problem in our industry (pulp and paper) out in the field compared to our motor control rooms which are typically conditioned and protected from the environment. Exception 430-102(b) should remain in the code. It is safer.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Comment 11-44.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #672)

11- 97 - (430-102(b)): Reject
SUBMITTER: George Lavender, International Paper
COMMENT ON PROPOSAL NO: 11-68
RECOMMENDATION: I say do not add second sentence to read:
"The disconnecting means required in accordance with 430-102(a) may also serve as the disconnecting means for the motor if it is located in sight from the motor location and the driven machinery location." Remove the exception in 430-102(b).
SUBSTANTIATION: The environment of many motors in the paper industry is less than ideal. A local disconnect adds another potential source of problems and danger. Many motors on equipment is not visible conveyors, paper machines etc. Would this require multiple disconnects? Lock out of motor disconnect is already required by OSHA 1910.147. Therefore no need for this.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Comment 11-44.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #675)

11- 98 - (430-102(b)): Reject
SUBMITTER: Danny L. Stone, International Paper
COMMENT ON PROPOSAL NO: 11-68
RECOMMENDATION: Reject the proposal and retain the current 430-102(b) Exception.
SUBSTANTIATION: The International Paper mill in Georgetown, SC is a fully integrated pulp and paper facility employing 800 plus people, and makes uncoated paper and pulp for market.

The Georgetown Mill is concerned about the proposed change to Article 430 from the NEC Panel 11 committee which will eliminate an exception which allows disconnects to be located out of sight provided it can be locked in the open position for the following reasons.

The environment in a paper mill, as well as may other process industries is less than perfect. The introduction of disconnects into such conditions will make motor installations more failure prone and will make void past work which has put disconnects and motor controllers into dedicated electric rooms, thereby making them more reliable.

There is a legitimate safety concern of utilizing such located disconnects to make or break the motor load after the effects of age and environment have taken their toll. Once again, the present practice of locating controllers and disconnects in dedicated electric rooms minimizes the role that the operating floor environment can play in circuit failure.

The addition of disconnects in the field will require additional interlocks to prove closed the disconnect on pieces of equipment requiring interlocking on startup and shutdown.

Furthermore, the lock out of motors is already a requirement of OSHA 1910.147. In facilities such as the Georgetown Mill, where proper maintenance and training exists, and strict adherence to a "lock out, tag out" policy is required, there is no need for a disconnect in sight of a motor.

Finally, while it is realized that cost is not the only criteria for accepting or rejecting a new change to the NEC, it must be noted that this proposal will add additional cost to every new motor installation, and increased maintenance cost over the life of the equipment which the motor serves. These costs will be incurred in the harsh industrial environment that characterizes process industries.
PANEL ACTION: Reject.
PANEL STATEMENT: Leaving the exception unchanged would not include the panel action on Proposal 11-70. See panel statement on Comment 11-44.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #676)

11- 99 - (430-102(b)): Reject
SUBMITTER: Mark D. Stewart, International Paper
COMMENT ON PROPOSAL NO: 11-68
RECOMMENDATION: Reject the proposal and retain the current 430-102(b) Exception.
SUBSTANTIATION: The International Paper mill in Georgetown, SC is a fully integrated pulp and paper facility employing 800 plus people, and makes uncoated paper and pulp for market.

The Georgetown Mill is concerned about the proposed change to Article 430 from the NEC Panel 11 committee which will eliminate an exception which allows disconnects to be located out of sight provided it can be locked in the open position for the following reasons.

The environment in a paper mill, as well as may other process industries is less than perfect. The introduction of disconnects into such conditions will make motor installations more failure prone and will make void past work which has put disconnects and motor controllers into dedicated electric rooms, thereby making them more reliable.

There is a legitimate safety concern of utilizing such located disconnects to make or break the motor load after the effects of age and environment have taken their toll. Failure of the disconnect to open or close properly can create a hazardoyus condition to employee safety and potential damage to equipment. Once again, the present practice of locating controllers and disconnects in dedicated electric rooms minimizes the role that the operating floor environment can play in circuit failure.

The addition of disconnects in the field will require additional interlocks to prove closed the disconnect on pieces of equipment requiring interlocking on startup and shutdown. However, the addition of such interlocks can interject some problems when troubleshooting in the field.

Furthermore, the lock out of motors is already a requirement of OSHA 1910.147. In facilities such as the Georgetown Mill, where proper maintenance and training exists, and strict adherence to a "lock out, tag out" policy is required, there is no need for a disconnect in sight of a motor.

Finally, while it is realized that cost is not the only criteria for accepting or rejecting a new change to the NEC, it must be noted that this proposal will add additional cost to every new motor installation, and increased maintenance cost over the life of the equipment which the motor serves. These costs will be incurred in the harsh industrial environment that characterizes process industries.
PANEL ACTION: Reject.
PANEL STATEMENT: Leaving the exception unchanged would not include the panel action on Proposal 11-70. See panel statement on Comment 11-44.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #677)

11- 100 - (430-102(b)): Reject
SUBMITTER: Alan J. Greene, International Paper Co.
COMMENT ON PROPOSAL NO: 11-68, 11-69, 11-70
RECOMMENDATION: Leave 430-102(b) as is currently worded in the 1996 NEC. As stated, the code provides adequate protection and a means for locking out individual pieces of equipment. The paragraph calls for a local disconnecting means unless there is an individual, lockable, disconnecting means at the controller location.
SUBSTANTIATION: The existing exception in the 1996 NEC is adequate safety protection provided: (1) The disconnecting means at the controller is a permanently installed, lockable mechanism, and (2) a controlled lockout system or procedure is in place. The addition of a field disconnect invites many additional problems, both in safety and in reliability. Complex interlocking between the controller and field disconnect would be required, and relied on, in order to make the opening and closing of the field disconnect safe. Also, the additional hardware added to the motor circuit provides another source of potential reliability problems, especially as the equipment ages. In closing, I would seriously doubt that adding a new restrictive NEC Code would mean much to a company or individual who is currently not enforcing or following the intent of OSHA 1910.147. Is the NEC moving from ensuring adequate protection and installation practices are utilized to providing convenience?
PANEL ACTION: Reject.
PANEL STATEMENT: Leaving the exception unchanged would not include the panel action on Proposal 11-70. See panel statement on Comment 11-44.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #678)

11- 101 - (430-102(b)): Reject
SUBMITTER: Jim Bruce, International Paper Co.
COMMENT ON PROPOSAL NO: 11-68
RECOMMENDATION: Disregard this proposal in its entirety. Make no changes to the section.
SUBSTANTIATION: 1. The environment at many motors is less than ideal. A local disconnect adds another potential source of failure to a motor circuit. It has taken years to move motor controls from the local area to electrical control rooms to improve the reliability of the equipment and the safety to personnel disconnecting motors or working on the motor controls. This item would move the industry in reverse.
2. Many motors are locked out for work on equipment that is not "visible" from the work area. Examples are conveyors, paper machines, fans, boilers, etc. Would this new ruling require multiple disconnects?
3. Disconnects could possibly pose a hazard if opened or closed while under load as the units age, particularly in less than environmentally friendly atmospheres. Even the installation of an auxiliary interlock, while reducing the hazard, would not eliminate the situation should the interlock fail.
4. Lockout of the motor disconnect is already required by OSHA 1910.147. In locations where proper maintenance and supervision exists, there is no need for a local disconnect when the regulations are followed.
5. Many systems have "interlocks" from a starter auxiliary contact. This would require adding an interlock at the disconnect to prove the disconnect was also closed.
PANEL ACTION: Reject.
PANEL STATEMENT: Leaving the exception unchanged would not include the panel action on Proposal 11-70. See panel statement on Comment 11-44.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #711)

11- 102 - (430-102(b)): Reject
SUBMITTER: R. S. Belton, International Paper Co.
COMMENT ON PROPOSAL NO: 11-68
RECOMMENDATION: Disregard proposal 11-68 in its entirety. Make no changes to the section.
SUBSTANTIATION: 1. The environment at many motors is less than ideal. A local disconnect adds another potential source of failure to a motor circuit. It has taken years to move motor controls from the local area to electrical control rooms to improve the reliability of the equipment and the safety to personnel disconnecting motors or working on the motor controls. This item would move the industry in reverse.
2. Many motors are locked out for work on equipment that is not "visible" from the work area. Examples are conveyors, paper machines, fans, boilers, etc. Would this new ruling require multiple disconnects?
3. Disconnects could possibly pose a hazard if opened or closed while under load as the units age, particularly in less than environmentally friendly atmospheres. Even the installation of an auxiliary interlock, while reducing the hazard, would not eliminate the situation should the interlock fail.
4. Lockout of the motor disconnect is already required by OSHA 1910.147. In locations where proper maintenance and supervision exists there is no need for a local disconnect when the regulations are followed.
5. Many systems have "interlocks" from a starter auxiliary contact. This would require adding an interlock at the disconnect to prove the disconnect was also closed.
PANEL ACTION: Reject.
PANEL STATEMENT: Leaving the exception unchanged would not include the panel action on Proposal 11-70. See panel statement on Comment 11-44.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #712)

11- 103 - (430-102(b)): Reject
SUBMITTER: Frank Laurent, International Paper Co.
COMMENT ON PROPOSAL NO: 11-68
RECOMMENDATION: Disregard proposal 11-68 in its entirety. Make no changes to the section.
SUBSTANTIATION: 1. The environment at many motors is less than ideal. A local disconnect adds another potential source of failure to a motor circuit. It has taken years to move motor controls from the local area to electrical control rooms to improve the reliability of the equipment and the safety to personnel disconnecting motors or working on the motor controls. This item would move the industry in reverse.
2. Many motors are locked out for work on equipment that is not "visible" from the work area. Examples are conveyors, paper machines, fans, boilers, etc. Would this new ruling require multiple disconnects?
3. Disconnects could possibly pose a hazard if opened or closed while under load as the units age, particularly in less than environmentally friendly atmospheres. Even the installation of an auxiliary interlock, while reducing the hazard, would not eliminate the situation should the interlock fail.
4. Lockout of the motor disconnect is already required by OSHA 1910.147. In locations where proper maintenance and supervision exists there is no need for a local disconnect when the regulations are followed.
5. Many systems have "interlocks" from a starter auxiliary contact. This would require adding an interlock at the disconnect to prove the disconnect was also closed.
PANEL ACTION: Reject.
PANEL STATEMENT: Leaving the exception unchanged would not include the panel action on Proposal 11-70. See panel statement on Comment 11-44.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #713)

11- 104 - (430-102(b)): Reject
SUBMITTER: James W. Fontenot, International Paper Co.
COMMENT ON PROPOSAL NO: 11-68
RECOMMENDATION: Disregard proposal 11-68 in its entirety. Make no changes to the section.
SUBSTANTIATION: 1. The environment at many motors is less than ideal. A local disconnect adds another potential source of failure to a motor circuit. It has taken years to move motor controls from the local area to electrical control rooms to improve the reliability of the equipment and the safety to personnel disconnecting motors or working on the motor controls. This item would move the industry in reverse.
2. Many motors are locked out for work on equipment that is not "visible" from the work area. Examples are conveyors, paper machines, fans, boilers, etc. Would this new ruling require multiple disconnects?
3. Disconnects could possibly pose a hazard if opened or closed while under load as the units age, particularly in less than environmentally friendly atmospheres. Even the installation of an auxiliary interlock, while reducing the hazard, would not eliminate the situation should the interlock fail.
4. Lockout of the motor disconnect is already required by OSHA 1910.147. In locations where proper maintenance and supervision exists there is no need for a local disconnect when the regulations are followed.
5. Many systems have "interlocks" from a starter auxiliary contact. This would require adding an interlock at the disconnect to prove the disconnect was also closed.
PANEL ACTION: Reject.
PANEL STATEMENT: Leaving the exception unchanged would not include the panel action on Proposal 11-70. See panel statement on Comment 11-44.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #714)

11- 105 - (430-102(b)): Reject
SUBMITTER: Tim C. Sykes, International Paper Co.
COMMENT ON PROPOSAL NO: 11-68
RECOMMENDATION: Disregard proposal 11-68 in its entirety. Make no changes to the section.
SUBSTANTIATION: 1. The environment at many motors is less than ideal. A local disconnect adds another potential source of failure to a motor circuit. It has taken years to move motor controls from the local area to electrical control rooms to improve the reliability of the equipment and the safety to personnel disconnecting motors or working on the motor controls. This item would move the industry in reverse.
2. Many motors are locked out for work on equipment that is not "visible" from the work area. Examples are conveyors, paper machines, fans, boilers, etc. Would this new ruling require multiple disconnects?
3. Disconnects could possibly pose a hazard if opened or closed while under load as the units age, particularly in less than environmentally friendly atmospheres. Even the installation of an auxiliary interlock, while reducing the hazard, would not eliminate the situation should the interlock fail.
4. Lockout of the motor disconnect is already required by OSHA 1910.147. In locations where proper maintenance and supervision exists there is no need for a local disconnect when the regulations are followed.
5. Many systems have "interlocks" from a starter auxiliary contact. This would require adding an interlock at the disconnect to prove the disconnect was also closed.
PANEL ACTION: Reject.
PANEL STATEMENT: Leaving the exception unchanged would not include the panel action on Proposal 11-70. See panel statement on Comment 11-44.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #715)

11- 106 - (430-102(b)): Reject
SUBMITTER: Mike Quimby, International Paper Co.
COMMENT ON PROPOSAL NO: 11-68
RECOMMENDATION: Disregard proposal 11-68 in its entirety. Make no changes to the section.
SUBSTANTIATION: 1. The environment at many motors is less than ideal. A local disconnect adds another potential source of failure to a motor circuit. It has taken years to move motor controls from the local area to electrical control rooms to improve the reliability of the equipment and the safety to personnel disconnecting motors or working on the motor controls. This item would move the industry in reverse.
2. Many motors are locked out for work on equipment that is not "visible" from the work area. Examples are conveyors, paper machines, fans, boilers, etc. Would this new ruling require multiple disconnects?
3. Disconnects could possibly pose a hazard if opened or closed while under load as the units age, particularly in less than environmentally friendly atmospheres. Even the installation of an auxiliary interlock, while reducing the hazard, would not eliminate the situation should the interlock fail.
4. Lockout of the motor disconnect is already required by OSHA 1910.147. In locations where proper maintenance and supervision exists there is no need for a local disconnect when the regulations are followed.
5. Many systems have "interlocks" from a starter auxiliary contact. This would require adding an interlock at the disconnect to prove the disconnect was also closed.
PANEL ACTION: Reject.
PANEL STATEMENT: Leaving the exception unchanged would not include the panel action on Proposal 11-70. See panel statement on Comment 11-44.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #716)

11- 107 - (430-102(b)): Reject
SUBMITTER: Jonathan Garwood, International Paper Co.
COMMENT ON PROPOSAL NO: 11-68
RECOMMENDATION: Disregard proposal 11-68 in its entirety. Make no changes to the section.
SUBSTANTIATION: 1. The environment at many motors is less than ideal. A local disconnect adds another potential source of failure to a motor circuit. It has taken years to move motor controls from the local area to electrical control rooms to improve the reliability of the equipment and the safety to personnel disconnecting motors or working on the motor controls. This item would move the industry in reverse.
2. Many motors are locked out for work on equipment that is not "visible" from the work area. Examples are conveyors, paper machines, fans, boilers, etc. Would this new ruling require multiple disconnects?
3. Disconnects could possibly pose a hazard if opened or closed while under load as the units age, particularly in less than environmentally friendly atmospheres. Even the installation of an auxiliary interlock, while reducing the hazard, would not eliminate the situation should the interlock fail.
4. Lockout of the motor disconnect is already required by OSHA 1910.147. In locations where proper maintenance and supervision exists there is no need for a local disconnect when the regulations are followed.
5. Many systems have "interlocks" from a starter auxiliary contact. This would require adding an interlock at the disconnect to prove the disconnect was also closed.
PANEL ACTION: Reject.
PANEL STATEMENT: Leaving the exception unchanged would not include the panel action on Proposal 11-70. See panel statement on Comment 11-44.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #717)

11- 108 - (430-102(b)): Reject
SUBMITTER: John M. Meazle, International Paper Co.
COMMENT ON PROPOSAL NO: 11-68
RECOMMENDATION: Disregard proposal 11-68 in its entirety. Make no changes to the section.
SUBSTANTIATION: 1. The environment at many motors is less than ideal. A local disconnect adds another potential source of failure to a motor circuit. It has taken years to move motor controls from the local area to electrical control rooms to improve the reliability of the equipment and the safety to personnel disconnecting motors or working on the motor controls. This item would move the industry in reverse.

2. Many motors are locked out for work on equipment that is not "visible" from the work area. Examples are conveyors, paper machines, fans, boilers, etc. Would this new ruling require multiple disconnects?

3. Disconnects could possibly pose a hazard if opened or closed while under load as the units age, particularly in less than environmentally friendly atmospheres. Even the installation of an auxiliary interlock, while reducing the hazard, would not eliminate the situation should the interlock fail.

4. Lockout of the motor disconnect is already required by OSHA 1910.147. In locations where proper maintenance and supervision exists there is no need for a local disconnect when the regulations are followed.

5. Many systems have "interlocks" from a starter auxiliary contact. This would require adding an interlock at the disconnect to prove the disconnect was also closed.
PANEL ACTION: Reject.
PANEL STATEMENT: Leaving the exception unchanged would not include the panel action on Proposal 11-70. See panel statement on Comment 11-44.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #735)

11- 109 - (430-102(b)): Reject
SUBMITTER: Robert B. Alexander, Fluor Daniel
COMMENT ON PROPOSAL NO: 11-69
RECOMMENDATION: Reject the proposal.
SUBSTANTIATION: • This proposal lacks sufficient substantiation. There is no offer for public review in either the proposal or the panel statement that establishes how many deaths or injuries, if any, would be prevented by requiring local disconnects where current installation requirements are met and safe work practices are followed.

• The examples given in this proposal are, at best, anecdotal. In fact, in the lone substantive anecdote the current system worked properly.

• It is not necessarily the intent of code to make workers "comfortable"; in fact, when working on dangerous systems workers should be decidedly uncomfortable, so that they will take great care to ensure their safety with strict adherence to safe work practices.

• Panel action on Proposal 11-70 properly addressed the legitimate concerns of this proposal.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Comment 11-44.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #812)

11- 110 - (430-102(b)): Reject
SUBMITTER: William D. Glover, New Martinsville, WV
COMMENT ON PROPOSAL NO: 11-68
RECOMMENDATION: Reject the proposal.
SUBSTANTIATION: The substantiation offered for this proposal seems to be only an expression of safety concerns. There is no evidence presented in this proposal nor is there any generally recognized evidence that these concerns represent a safety problem that should be corrected by changing the existing wording of 430-102(b).

The safety concern, stated in the substantiation, of working the equipment "hot" rather than walk the distance four times would not be corrected by this proposed code change. Employers lockout/tagout procedures will continue to require lockout/tagout of these motors by the same well established procedure of applying the lock at the controller location. These locations typically contain the required lockout devices, safety equipment, restricted access, Nomex clothing, fire extinguishers and other safety features that are not available at scattered field locations.

The safety concern, stated in the substantiation, of a worker being "hung up" should be discounted as it is already properly handled by the local start/stop or E-stop circuits. A disconnect switch installed for this purpose would place the operator of the switch in danger since it is not rated for this service.

The proposed changes will not achieve their stated objectives. Lockout/tagout confusion will result and additional safety hazards will be created. The existing wording of 430-102(b) has a proven safety record over a long period of time.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Comment 11-44.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #816)

11- 111 - (430-102(b)): Reject
SUBMITTER: Ralph Prichard, Bear, DE
COMMENT ON PROPOSAL NO: 11-68
RECOMMENDATION: The panel should reject this proposal.
SUBSTANTIATION: When lockout/tagout requirements are followed, additional disconnect safeguards are not required.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Comment 11-44.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #818)

11- 112 - (430-102(b)): Reject
SUBMITTER: Ralph Prichard, Bear, DE
COMMENT ON PROPOSAL NO: 11-69
RECOMMENDATION: The panel should reject this proposal.
SUBSTANTIATION: When lockout/tagout requirements are followed, additional disconnect safeguards are not required.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Comment 11-44.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #822)

11- 113 - (430-102(b)): Reject
SUBMITTER: J. Pat Roche, Celanese Acetate
COMMENT ON PROPOSAL NO: 11-68
RECOMMENDATION: This proposal should be rejected.
SUBSTANTIATION: The substantiation provided is inadequate for such a significant change. It is based on personnel violating recognized safety procedures required to be followed by OSHA. The requirements established by the NEC can never be effective in preventing willful violations of requirements such as these. The reference to excessive distances is undefined and too imprecise for any meaningful substantiation. Ten feet might be excessive to someone who is going to violate safe work practices.

The present exception requires a disconnecting means at the controller, which is capable of being locked in the open position. When the equipment specified by the existing code language is used and required safe work practices are followed no one is going to be "hung up". The proposal substantiation did not contain even one specific instance, just a possibility of what might happen if someone violated recognized safety procedures. This is not adequate substantiation.

The generalizations of the substantiation continued with the reference to "very minor incremental cost". The cost for future thousands of unnecessary disconnects, some of which would have to be explosion-proof, is not "very minor".
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Comment 11-44.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #823)

11- 114 - (430-102(b)): Reject
SUBMITTER: J. Pat Roche, Celanese Acetate
COMMENT ON PROPOSAL NO: 11-69
RECOMMENDATION: This proposal should be rejected.
SUBSTANTIATION: The substantiation provided is inadequate for such a significant change. I asked "how do you lock out a circuit breaker that is not capable of being locked out". You can't; and if the electrician had such a situation, the installation did not meet existing code. The existing exception requires the disconnecting means for the controller is individually capable of being locked in the open position. This is the essential safety requirement - lock and tag. That is the only sure way personnel are in control.

Even if that disconnect is in sight of the motor, and it is not locked out - that is an unsafe situation. Who knows what happens when the person working turns his back or steps away for a moment. Dependence on being within sight of the disconnecting means and possibly not locking the disconnecting means is a more unsafe situation.

The incident related in the substantiation apparently involved several safety procedure violations. The lock being cut off implies it was not tagged properly. It was apparently not the electrician's own safety lock, or it would not have had to be cut off after he was notified. Why didn't the worker have his own lock and tag on the disconnecting means. Note too procedures did work as he was still notified before the equipment was energized.

The addition of many unnecessary, costly disconnecting means is no remedy for not following required safe work practices.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Comment 11-44.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #895)

11- 115 - (430-102(b)): Reject
SUBMITTER: Kurt D. Brillhart, Hemlock Semiconductor Corporation
COMMENT ON PROPOSAL NO: 11-68
RECOMMENDATION: Revise 430-102(b): The motor controller disconnect means shall be capable of being locked in the open position. If a disconnecting means is not located in sight from motor location and the driven machinery location, then motor operating controls for the motor controller shall be in sight from the motor location.

Revise exception in 430-102(b): If the motor controller disconnect means is not capable of being locked in the open position then a lockable disconnecting means shall be located in site from the motor location and driven machinery location.

Revise FPN: A lockable disconnecting means in sight of the motor location and the driven machinery location provides a convenient method for working on motors and driven machinery. For information on lockout/tagout procedures see Standard for Electrical Safety Requirements for Employee Workplaces, NFPA 70E-1995.
SUBSTANTIATION: The current wording of 430-102(b), its exception and proposed change 11-68 are out of compliance with OSHA requirements, standard equipment, and safe work practices. The principle of the "in sight disconnect" is to provide a disconnect means close to the work area to provide a worker a convenient method to isolate the energy source and protect the worker. However, since the installation of OSHA Regulation 1910.147: "The control of hazardous energy (lockout/tagout)" and 1910.333: "Selection and use of work practices", this is no longer considered a safe method to protect workers. The principle of these standards is that equipment must be de-energized and locked out to work on that equipment. As 1910.333(b)(2) states: "Lockout and Tagging." While any employee is exposed to contact with parts of fixed electric equipment or circuits which have been deenergized, the circuits energizing the parts shall be locked out or tagged or both in accordance with the requirements of this paragraph.

A second point is that most of today's installations involve a combination disconnect means and motor controller. All of this equipment is built and designed with the latest advancements in lockout methods. This is largely due to OSHA regulation 1910.147(c)(2)(iii) that states: After January 2, 1990, whenever replacement or major repair, renovation or modification of a machine or equipment is performed, and whenever new machines or equipment are installed, energy isolating devices for such machine or equipment shall be designed to accept a lockout device.

All lookouts must properly test the effectiveness of the lockout. In other words the worker must be in full view of motor and the driven machinery and attempt start the equipment to prove that the proper energy source has been deenergized. This stipulation is covered under 1910.147(c)(4)(ii)(D) which states: Procedures shall clearly ... outline... specific requirements for testing a machine or equipment to determine and verify the effectiveness of lockout devices, tagout devices, and other energy control measures.

Lockout procedures and standards is true worker safety. No safe guard can protect workers if they take safety shortcuts and remove safety barriers. Furthermore, opening a disconnect means that is located in site from motor location that is not lockable or is not locked out prior to performing work on electrical circuits is prohibited under OSHA standards. Thus, "lockability" of the disconnecting means is far more important than disconnect location. Thus, a lockable disconnect means should be the general rule. If the disconnect means is not located in site from motor then the operating controls must be within site to test the effectiveness of the lockout. This also provides the proper method for shutting off the circuit if a worker gets "hung up" in the equipment. Finally, an in sight disconnect means is purely a convenience, and it should not be a general requirement since it does not provide any additional safety to the worker.
PANEL ACTION: Reject.
PANEL STATEMENT: Motor operating controls for the motor controller are not suitable as disconnecting means under Part J. The recommended text would require that a snap switch used as both the motor controller and disconnecting means, and located within sight of the motor, be lockable.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #896)

11- 116 - (430-102(b)): Reject
SUBMITTER: Kurt D. Brillhart, Hemlock Semiconductor Corporation
COMMENT ON PROPOSAL NO: 11-69
RECOMMENDATION: The panel should reject the proposal.
SUBSTANTIATION: There is no evidence to support the injuries and deaths that have occurred because of ineffectiveness of OSHA standard 1910.147 or NFPA 70E-1995 standard and that a disconnect switch within site of the motor will reduce injuries. In fact, the number of injuries has decreased since the inception of these standards/regulations.

Ironically, a disconnect in sight of the motor and driven machinery location can provide a false sense of security and lead to possible safety risks by making it too easy to flip the switch off and skip the lockout. "In Sight" is roughly defined as visible within 50 feet. A worker cannot keep their eyes on the position of the disconnect switch all the time, especially when it is 50 feet away or takes a lunch break. It is very easy to get preoccupied with one's task and miss someone flipping on the disconnect switch.

The person servicing the equipment is responsible for their own safety and ensuring that the equipment is adequately locked out. Lockout is for the safety of the personnel servicing the equipment. This is specifically addressed in 1910.147(b) "Definitions" which states: "Authorized employee. A person who locks out or tags out machines or equipment in order to perform servicing or maintenance on that machine or equipment. An affected employee becomes an authorized employee when the employee's duties include performing servicing or maintenance covered under this section."

Improper removal of a lock can happen with a disconnect switch located within sight of the motor. This can happen when the worker goes on break or is preoccupied. The only true safe guard against this type of incidence is following proper safety practices and lockout/tagout procedures. So while a nearby disconnect may make personnel "feel" comfortable, there is no substitute for a lock on a disconnect means with only a key in your pocket. The existing NEC requirements in 430-102(b) and its exception have been time proven to be adequate to protect workers and should not be changed.

PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Comment 11-44.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #899)

11- 117 - (430-102(b)): Accept in Principle
SUBMITTER: John Paschal, Bechtel
COMMENT ON PROPOSAL NO: 11-68
RECOMMENDATION: Leave the existing code wording unchanged, at least in industrial establishments where only skilled professional persons work on electrical systems, and where lock-out, tag-out procedures are commonly followed.
SUBSTANTIATION: There is no reason to add the expense of local motor disconnects, many of which are outdoor and/or explosionproof, where combination motor controllers can be padlocked in the OFF position and tagged out. The skilled professional workmen in these industrial areas are trained in safety, and would no more remove someone else's padlock to energize a circuit than they would cut off their own arm. More than in almost any other discipline, the electrical discipline requires disciplined personnel, and it is impossible to make something foolproof to undisciplined persons. The extra local switch is like putting an expensive band-aid over cancer. What needs to be done is to eliminate the caner, the unskilled, and undisciplined person who would remove someone else's padlock and then energize a circuit.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Comment 11-56.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #905)

11- 118 - (430-102(b)): Reject
SUBMITTER: Stephen Whitfield, Solvay Polymers, Inc.
COMMENT ON PROPOSAL NO: 11-68
RECOMMENDATION: We very strongly disagree with Mr. Michael I. Callanan's recommendation to remove the exception in 430-102(b).
SUBSTANTIATION: We agree with all of the arguments presented by messieurs Cox, Hammer, Sanders, and Thomas in the Explanation of Negative. One point mentioned by Mr. Cox should be stressed: "Disconnects are not designed to be used as controllers." Since the purpose of this recommendation seems to be to provide a lockout point near the motor the possibility that the disconnect could be opened under load presents a real danger. Mr. Thomas summed it up quite well in his statement, "The existing text is adequate to provide a safe installation." We have a Lockout/Tagout procedure that meets the requirements of OSHA and NFPA 70E and even prior to those regulations have enjoyed decades without an injury due to improperly locking out a motor.
We further take issue with Mr. Callanan's substantiation for requesting the change. His statement that "workers attempt to work the equipment 'hot' rather than walk the distance..." to lock it out borders on ludicrous. Any electrician in our plant with that attitude of laziness and disrespect for safety rules would be terminated immediately. In addition, we disagree with his statement that disconnects could be added "at very minor incremental cost to the owner." We have hundreds of motors in our plant. The cost to add a disconnect in each motor circuit would be anything but "minor."
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Comment 11-44.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #964)

11- 119 - (430-102(b)): Accept in Principle
SUBMITTER: John Sigmund, PPG Industries
COMMENT ON PROPOSAL NO: 11-68
RECOMMENDATION: Exception to read as follows:
Exception: A disconnecting means, in addition to the controller disconnecting means as required in accordance with section 430-102(a), shall not be required for the motor where the disconnecting means for the controller is individually capable of being locked in the open position, provided that conditions of maintenance and supervision assure that lockout procedures are followed.
SUBSTANTIATION: The justification for proposal 11-68 states that workers may work equipment hot rather than follow lockout procedures. In a plant that has supervision and maintenance training that requires the strict adherence to lockout procedures, this would not be tolerated. Following safety procedures is a condition of employment, and violation risks termination. Following lockout procedures would also negate the second justification of a worker getting "hung up" in equipment. Lockout procedures would not allow guards to be removed from equipment before the lockout had taken place.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Comment 11-56.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #990)

11- 120 - (430-102(b)): Reject
SUBMITTER: Jon C. Anderson, Cognis Corporation
COMMENT ON PROPOSAL NO: 11-68
RECOMMENDATION: The Panel should reject this proposal.
SUBSTANTIATION: I don't see the justification for the huge financial commitment needed when the "Lock-Out Tag-Out" procedure was introduced for this exact purpose.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Comment 11-44.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #992)

11- 121 - (430-102(b)): Reject
SUBMITTER: Walter Finn, Dow Corning Corporation
COMMENT ON PROPOSAL NO: 11-68
RECOMMENDATION: I am recommending deletion of the proposed change that would require a disconnect located at individual motors.
SUBSTANTIATION: As a former IBEW electrician with honorary withdrawal status, I hope that the motivation behind this proposed change is a well intended safety recommendation, even though I believe it misses the mark. Safety of personnel is appropriately accomplished with the current required lockout procedure. There are no statistics that support the recommendation. A very small percentage (I would guess less than 2 percent) of situations would require an electrician to walk 5 minutes to accomplish lockout. It would be more sensible to require disconnects on motors that are greater than 500 ft from an NEC/OSHA approved disconnecting means, although having a local stop is in my estimation is a better overall solution.
The addition of disconnects will not only add cost and decrease reliability, but will create new safety risks. I recall that the proposal says these would not be required where hazard is increased by installation of a disconnect or where "impracticable". This would be very difficult to assess, and would result in numerous problems and disparities between installations. Motors are often in areas that are outdoors, dusty or dirty, even though the areas are not defined by NEC as "hazardous" or "classified". Disconnects, even when rated for these applications, corrode and fall into poor conditions in these areas.
I believe the requirement to have local disconnects at HVAC units is a useful and safety improving requirement, although these disconnects, even though rated for the area, often freeze up and/or corrode to the point they are not workable. The proposed requirement will encompass situations that do not have the same criteria that HVAC units typically have (more complicated power and control than a single motor). When we design systems that have similar remote applications where the benefit outweighs the disadvantages, we design local disconnects in the system. If the approach had been to try to assess the situations where the benefit would outweigh the downside, and require local lockable disconnects in these "exception locations", it would be more likely to provide a benefit to the safety of workers. However, it would be a difficult task, as individual situations have many differences.

PANEL ACTION: Reject.
PANEL STATEMENT: The panel action did not remove the exception and would not require a disconnecting means at every motor. See panel statement on Comment 11-44 and panel action and statement on Comment 11-56.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #1004)

11- 122 - (430-102(b)): Reject
SUBMITTER: Craig M. Wellman, Newark, DE
COMMENT ON PROPOSAL NO: 11-68
RECOMMENDATION: The panel should revise its action so it only accepts the following:
"The provisions for locking or addition of a lock shall be permanently installed on or at the switch or circuit breaker used as a disconnecting means."
SUBSTANTIATION: Substantiation for the NEC addition above was well stated by the original proposer. The substantiation offered for other parts of his proposal are not persuasive.
It is currently a legal requirement that equipment be deenergized and a lock and tag procedure followed. The statement that some people prefer to work equipment hot rather than walk the distance is the same as saying some people prefer to not wear seat belts because they are uncomfortable. Well, wearing seat belts is a legal requirement in most jurisdictions and enforcement processes are increasingly effective. Enforcement processes are also available for following lockout procedures.
The other issue is the worker who gets "hung up" in moving equipment. A local disconnect switch is not an adequate solution for this hazard. A disconnect switch would still not be close enough or easy enough for an operator in trouble to throw. Where that hazard exists, an emergency stop button or a pull cord or a two-hand release is already required before the equipment can be used.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Comment 11-44.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #1009)

11- 122a - (430-102(b)): Reject
SUBMITTER: Jerry Spencer, Potlatch Corporation
COMMENT ON PROPOSAL NO: 11-68
RECOMMENDATION: Leave text in 1999 NEC as is.
SUBSTANTIATION: All of the substantiation offered ignores OSHA lockout/tagout. If a personal lock and tag on a disconnect will not deter a person from closing the disconnect, with discharge a near certainty for violators, after OSHA penalties, nothing will deter them, short of standing with both arms wrapped around the handle. A worker who doesn't lock out a distant disconnect will not lock out a near disconnect, but feel safer.
PANEL ACTION: Reject.
PANEL STATEMENT: The reference is incorrect. Leaving the exception unchanged would not include the panel action on proposal 11-70, which the submitter has ignored. See panel statement on comment 11-44.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #1027)

11- 123 - (430-102(b)): Reject
SUBMITTER: Rusty Harp, Cognis Corporation
COMMENT ON PROPOSAL NO: 11-68
RECOMMENDATION: The panel should reject this proposal.
SUBSTANTIATION: As noted under FPN, this proposal has been clarified under NFPA 70E-1995 regulations including Lockout/Tagout procedures under OSHA 1910.147. Enforcement of these procedures is the responsibility of the person doing the work. Additional line of site disconnects will not improve personal safety for those individuals who do not practice nor follow safety guidelines or procedures. The current text under Section 430-102(b) is adequate for personal and equipment safety.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Comment 11-44.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #1028)

11- 124 - (430-102(b)): Reject
SUBMITTER: Rusty Harp, Cognis Corporation
COMMENT ON PROPOSAL NO: 11-69
RECOMMENDATION: The panel should reject this proposal.
SUBSTANTIATION: Removing the exception 430-102(b) implies that the motor/equipment intended for service is safe to work on since the worker has opened the line of site disconnecting means. However, this doesn't mean that the supply power to the controller has been opened and therefore hazardous conditions(s) may exist to the unknowingly worker. Exception 430-102(b) provides a means of safety for the worker by disconnecting power from the controller. Enforcing NFPA 70E-1995 Lockout/ Tagout and the contents of the existing 430-102(b) is adequate for personnel and equipment safety.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Comment 11-44.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #1033)

11- 125 - (430-102(b)): Accept in Principle
SUBMITTER: Brian L. Bashore, International Paper Lock Haven Mill
COMMENT ON PROPOSAL NO: 11-68
RECOMMENDATION: Add a second sentence to read:
"The disconnecting means required in accordance with 430-102(a) may also serve as the disconnecting means for the motor if it is located in sight from the motor location and the driven machinery location."
Remove the exception in 430-102(b).
I disagree with the proposed recommendation from Michael I. Callanan.
(b) Motor. A disconnecting means shall be located in sight from the motor location and driven machinery location. The disconnecting means required in accordance with 430-102(a) shall be permitted to serve as the disconnecting means for the motor if it is located in sight from the motor location and the driven machinery location.
Exception: The disconnecting means shall not be required to be in sight of the motor if such a location of the disconnecting means is impracticable or introduces additional or increased hazards to persons or property <u>or in locations where proper maintenance and supervision exists</u> and the disconnecting means is individually capable of being locked in the open position. The provision for locking or adding a lock to the disconnecting means shall be permanently installed on or at the switch or circuit breaker used as the disconnecting means.
FPN*: Some examples of increased or additional hazards include, but are not limited to; motors rated in excess of 100 hp, multi-motor equipment, submersible motors, motors associated with variable frequency drives and motors located in hazardous (classified) locations."
*FPN: Fine Print Notes are informational only and are not enforceable as requirements of the Code. This means that this rule could be applied to any new or upgraded installation at the discretion of the authority having jurisdiction.
The exception needs to stay and add to the exception "property or in locations where proper maintenance and supervision exists."
SUBSTANTIATION: Reasons for my comments are 11 years of Electrical Maintenance experience in an industrial facility.
The Lock Haven Mill has equipment and starter labeling and zero energy state procedures that make this proposed change unnecessary in an industrial facility.
The environment at many motors is less than ideal. A local disconnect would add another potential source of failure to a motor circuit. The Lock Haven Mill has been moving motor controls from the local area to electrical control rooms to improve the reliability of the equipment and the safety to personnel disconnecting motors or working on the motor controls. This item would move the industry in reverse.

Many motors are locked out for work on equipment that is not "visible" from the work area. Examples are DC motors, medium voltage motors, etc. This new ruling requiring disconnects in sight of the motor would create a serious safety hazard for qualified and unqualified personnel at the Lock Haven Mill and other facilities.

Disconnects could possibly pose a hazard if opened or closed while under load as the units age, particularly in less than environmentally friendly atmospheres. Even the installation of auxiliary interlock, while reducing the hazard, would not eliminate the situation should the interlock fail.

These disconnects would be added to the mill infrared routes. This would create a safety hazard for these employees that open and scan this equipment under load in less than environmentally friendly atmospheres.

Lockout of the motor disconnect is already required by OSHA 1910.147. In locations where proper maintenance and supervision exists, there is no need for a local disconnect when the regulations are followed.

Many systems have "interlocks" from a starter auxiliary contact. This would require adding an interlock at the disconnect to prove the disconnect was also closed. This would increase the potential for problems and expose the Mill's maintenance personnel to more hazards when troubleshooting.

PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Comment 11-56.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #1103)

11- 126 - (430-102(b)): Accept in Principle
SUBMITTER: Francis C. Pologruto, MacDonald Electric Co./Rep. IBEW
COMMENT ON PROPOSAL NO: 11-68
RECOMMENDATION: I agree with the panel's action.
SUBSTANTIATION: This proposal will reduce the risk for personnel, who work on roof top units, or other remote locations, where a disconnect switch will be required, within sight of the unit that they are working on. Safety was the issue for the last 3 code cycles and finally Code-Making Panel 1 has agreed to restrict the exception.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Comment 11-56.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #1172)

11- 127 - (430-102(b)): Reject
SUBMITTER: Barry Peterson, Bayer Corporation
COMMENT ON PROPOSAL NO: 11-69
RECOMMENDATION: The panel should have rejected the proposal.
SUBSTANTIATION: As stated in the negative vote comments, there is no evidence presented that an unsafe condition exists. OSHA 1910.147 and NFPA 70E requirements on lockout/tagout have proven to be safe in countless installations and years of service.

In hazardous areas, a disconnecting means is just one more place to possibly cause an unnecessary safety problem. Example - Someone opening the switch under load and possibly causing an explosion or not tightening the bolts on the disconnect after opening it. This voids the area classification rating of the disconnect.

A possible exception should be that "Where OSHA 1910.147 and NFPA 70E requirements are met, the existing exception for 430-102(b) is acceptable."
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Comment 11-44.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #1173)

11- 128 - (430-102(b)): Reject
SUBMITTER: Barry Peterson, Bayer Corporation
COMMENT ON PROPOSAL NO: 11-68
RECOMMENDATION: The panel should have rejected the proposal.
SUBSTANTIATION: As stated in the negative vote comments, there is no evidence presented that an unsafe condition exists. OSHA 1910.147 and NFPA 70E requirements on lockout-tagout have proven to be safe in countless installations and years of service.

In hazardous areas, a disconnecting means is just one more place to possibly cause an unnecessary safety problem. Example - Someone opening the switch under load and possibly causing an explosion or not tightening the bolts on the disconnect after opening it. This voids the area classification rating of the disconnect.

A possible exception should be that "Where OSHA 1910.147 and NFPA 70E requirements are met, the existing exception for 430-102(b) is acceptable."
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Comment 11-44.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #1185)

11- 129 - (430-102(b)): Reject
SUBMITTER: Tim Fisher, Sr., Cognis Corporation
COMMENT ON PROPOSAL NO: 11-68
RECOMMENDATION: The Panel should reject this proposal.
SUBSTANTIATION: Proposal 11-68 should be rejected by the panel due to several reasons:

1. The manner in which the exception is worded makes enforcement almost impossible because there is too much room for interpretation of "impracticable" by the authority having jurisdiction.
2. OSHA lockout/tagout and NFPA 70E already require that the machinery have a mechanism for the mechanic to lockout all sources of energy to the equipment. The problem of accidental energization is taken care of as long as these rules are followed and enforced.
3. The addition of another electrical device in a circuit for remote machinery is simply adding significant cost and an additional source of failure to that circuit.

PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Comment 11-44.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
THOMAS: See my explanation of negative vote on Comment 11-135.

(Log #1189)

11- 129a - (430-102(b)): Reject
SUBMITTER: R. Ken Gibbs, Anheuser-Busch Companies Inc
COMMENT ON PROPOSAL NO: 11-68
RECOMMENDATION: Proposal should be rejected. The present wording is well understood within the industry and assures safe installations when proper maintenance procedures are in place.
SUBSTANTIATION: Contrary to the "Substantiation", it is our experience that proper trouble-shooting of motor circuits begins at the controller location. As such, lock-out/tag-out devices are applied at the controller disconnecting means prior to progressing the trouble-shooting process to the motor if necessary. A separate, local motor disconnect provides no additional safety value but would add additional installation costs, require on/off status feedback to the automatic control circuit, encourage potential unintended operating abuses, and introduce another point of failure to the motor circuitry. Strategically placed local emergency stop stations should provide a failsafe means to bring operating equipment to a zero energy state vs. installation of individual motor disconnects that may in many cases be inaccessible in a personnel emergency. Responsible owners assure plant safety through the preparation and enforcement of operating and maintenance procedures including detailed training programs.
PANEL ACTION: Reject.

PANEL STATEMENT: The reference is incorrect. See panel statement on comment 11-44.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #1197)

11- 130 - (430-102(b)): Reject
SUBMITTER: Kenneth P. White, Olin Corp.
COMMENT ON PROPOSAL NO: 11-68
RECOMMENDATION: Reject Proposal 11-68, leave existing wording.
SUBSTANTIATION: As a user who had local disconnects in a chemical plant as a plant policy and has since removed them, I am very much against local disconnects. Unless the disconnect is fully rated, you have the risk of an operator opening the disconnect to stop the motor, thus exposing the individual to a possible arc flash. You also have to interlock the contactor to prevent operators from closing the disconnect to start the motor. These interlocks often fail and electricians often jump them out to keep equipment running. Disconnects, often subject to exposure from chemicals, are subject to failure, again exposing personnel to arc flash. The existing lockout procedures that are in agreement with OSHA and 70E have worked very well for several years keeping people safe when working on motors.
PANEL ACTION: Reject.
PANEL STATEMENT: Leaving the exception unchanged would not include the panel action on Proposal 11-70. See panel statement on Comment 11-44.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #1198)

11- 131 - (430-102(b)): Reject
SUBMITTER: Kenneth P. White, Olin Corp.
COMMENT ON PROPOSAL NO: 11-69
RECOMMENDATION: Reject Proposal 11-69, leave existing wording.
SUBSTANTIATION: As a user who had local disconnects in a chemical plant as a plant policy and has since removed them, I am very much against local disconnects. Unless the disconnect is fully rated, you have the risk of an operator opening the disconnect to stop the motor, thus exposing the individual to a possible arc flash. You also have to interlock the contactor to prevent operators from closing the disconnect to start the motor. These interlocks often fail and electricians often jump them out to keep equipment running. Disconnects, often subject to exposure from chemicals, are subject to failure, again exposing personnel to arc flash. The existing lockout procedures that are in agreement with OSHA and 70E have worked very well for several years keeping people safe when working on motors.
PANEL ACTION: Reject.
PANEL STATEMENT: Leaving the exception unchanged would not include the panel action on Proposal 11-70. See panel statement on Comment 11-44.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #1216)

11- 132 - (430-102(b)): Reject
SUBMITTER: Dann Strube, Lanesville, IN
COMMENT ON PROPOSAL NO: 11-68
RECOMMENDATION: This proposal should have been rejected.
SUBSTANTIATION: The current rule is adequate for safety. The statement that workers will not use lock-out tag-out is defective. If the worker is too lazy to go 100 feet, they are also too lazy to go 50 feet. Proper training and worker compliance with safe work practice will provide safety. Throwing money at the problem will not.

Contrary to the proposer's statement the cost of this change is not small. The cost of this change is monumental. Since the FPN is not a requirement, we may find inspectors requiring the additional disconnect for very large motors or motors in hazardous locations. Even without that problem the cost to the industry is unacceptable.

All of the negative votes on this proposal were 100% correct.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Comment 11-44.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #1343)

11- 133 - (430-102(b)): Accept
SUBMITTER: Larry T. Smith, National Electrical Seminars
COMMENT ON PROPOSAL NO: 11-70
RECOMMENDATION: Accept Proposal 11-70 as amended by Code Making Panel 11.
SUBSTANTIATION: This revision will improve safety.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #1344)

11- 134 - (430-102(b)): Reject
SUBMITTER: Larry T. Smith, National Electrical Seminars
COMMENT ON PROPOSAL NO: 11-68
RECOMMENDATION: Reject Proposal 11-68 in its entirety.
SUBSTANTIATION: There are four reasons to reconsider and reject this proposal.
1. The proposer hasn't offered any tangible evidence to substantiate a change of this magnitude.
2. Existing Lockout/Tagout requirements coupled with mandated employee training, and the existing provisions of Sections 430-102(b) are an effective combination.
3. There is nothing to prevent the installation of disconnecting means within sight of the motor as an extra measure of safety.
4. The term additional or increased hazards is totally subjective.

First. Where are the statistics to support this revision? Show us the money! How many accidents and fatalities can be attributed to 430-102(b) as presently written? If the numbers are there, we as an industry should embrace the proposed change. If the numbers existed, I believe that Mr. Cox, Mr. Hamer, Mr. Saunders and Mr. Thomas, representing their respective industries, would be leading the charge instead of casting negative votes and opinions.

Second. Is Lockout/Tagout an employee training mandated by OSHA ineffective? Acceptance of the proposal would seem to indicate so.

Third. Even though Section 430-102(b) doesn't require a disconnecting means within sight of the motor when the controller is capable of being locked in the open position, the option of providing one within sight is always there. And many times it is provided. It is policy for many industrial plants, grain companies and railroads to provide a disconnecting means within sight of the motor. It's been an optional extra measure of safety and, at times, convenience.

Fourth. The term additional or increased hazards is totally subjective. Any engineer, inspector, contractor, building owner and even installer who chooses to omit the disconnecting means because it will introduce additional or increased hazards might well be assuming some liability in the event of an accident involving the motor installation.

In conclusion, I urge the members of the panel to carefully weigh their decision. Let the proposer come forth with the statistics to support the change - then we can all support it.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Comment 11-44.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #1361)

11- 135 - (430-102(b)): Reject
SUBMITTER: David P. Brown, Baltimore Gas and Electric Co/EEI
COMMENT ON PROPOSAL NO: 11-68
RECOMMENDATION: This Proposal should be Rejected.
SUBSTANTIATION: Acceptance of this proposal will require a disconnecting means within sight of the motor and driven machinery where practicable. Use of the word "practicable" is unenforceable. EEI-EL&P supports the comments as provided by Lynn F. Saunders. Specifically, OSHA requirements, regulations

and procedures specify the prerequisites for lockout of equipment. Failure to follow the applicable OSHA Regulations and Requirements is not reason for this Code change. Similar proposals over the years have been consistently rejected by the Panel due to lack of substantiation and no new substantiation has been presented. Therefore, this proposal should be rejected.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Comment 11-44.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
THOMAS: I agree with the panel intent, but I feel that the term "impracticable" is a vague and unenforceable term likely to generate confusion and disagreements in the field.

(Log #1362)

11- 136 - (430-102(b)): Reject
SUBMITTER: David P. Brown, Baltimore Gas and Electric Co/EEI
COMMENT ON PROPOSAL NO: 11-69
RECOMMENDATION: This Proposal should be Rejected.
SUBSTANTIATION: Acceptance of this proposal will require a disconnecting means within sight of the motor and driven machinery where practicable. Use of the word "practicable" is unenforceable. EEI-EL&P supports the comments as provided by Lynn F. Saunders. Specifically, OSHA requirements, regulations and procedures specify the prerequisites for lockout of equipment. Failure to follow the applicable OSHA regulations and procedures specify the prerequisites for lockout of equipment. Failure to follow the applicable OSHA Regulations and Requirements is not reason to put this redundant requirement in the NEC. Similar proposals over the years have been consistently rejected by the Panel due to lack of substantiation and no new substantiation has been presented. Therefore, this proposal should be rejected.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Comment 11-44.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
THOMAS: See my explanation of negative vote on Comment 11-135.

(Log #1409)

11- 137 - (430-102(b)): Reject
SUBMITTER: Kari Barrett, American Chemistry Council
COMMENT ON PROPOSAL NO: 11-68
RECOMMENDATION: The panel should have rejected the proposal.
SUBSTANTIATION: As stated in the negative vote comments, there is no evidence presented that an unsafe condition exists. The substantiation provided indicates a lack of training by the employer and a lack of discipline by the employees. OSHA 1910.147 and NFPA 70E requirements on lock out-tag out have proven to be safe in countless installations and years of service. A disconnecting means is not designed for or intended as an emergency stop means. The local stop pushbutton or specially designed emergency stop control circuits serve that function.
The panel rewrite is vague and unenforceable. "Impracticable" is a word that will generate disagreements between the designer/owner and the inspector on many installations. Since the FPN is not a mandatory part of the code, inspectors could disregard it and require disconnects in sight from the motor locations where the panel has already agreed that they may introduce additional or increased hazards.
It should also be pointed out that if the panel permits some installations without a disconnecting means in sight from the motor location and the panel accepts those as safe installations, then all installations should be safe without a disconnecting means as proposed.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Comment 11-44.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #1410)

11- 138 - (430-102(b)): Reject
SUBMITTER: Kari Barrett, American Chemistry Council
COMMENT ON PROPOSAL NO: 11-69
RECOMMENDATION: The panel should have rejected the proposal.
SUBSTANTIATION: As stated in the negative vote comments, there is no evidence presented than an unsafe condition exists. The substantiation provided indicates a lack of training by the employer and a lack of discipline by the employees. OSHA 1910.147 and NFPA 70E requirements on lock out-tag out have proven to be safe in countless installations and years of service. A disconnecting means is not designed for or intended as an emergency stop means. The local stop pushbutton or specially designed emergency stop control circuits serve that function.
The panel rewrite is vague and unenforceable. "Impracticable" is a word that will generate disagreements between the designer/owner and the inspector on many installations. Since the FPN is not a mandatory part of the code, inspectors could disregard it and require disconnects in sight from the motor locations where the panel has already agreed that they may introduce additional or increased hazards.
It should also be pointed out that if the panel permits some installations without a disconnecting means in sight from the motor location and the panel accepts those as safe installations, then all installations should be safe without a disconnecting means as proposed.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Comment 11-44.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
THOMAS: See my explanation of negative vote on Comment 11-135.

(Log #1432)

11- 139 - (430-102(b)): Reject
SUBMITTER: Tom Kwarciany, Carl Lippens, Gunter Wise, Andrew Weber, & Patty Skufca, Mead Paper
COMMENT ON PROPOSAL NO: 11-68
RECOMMENDATION: On behalf of Mead Corporation, my employer, we urgently request that the panel reject this proposal and prevent it from becoming law.
SUBSTANTIATION: The subject defined proposal is a recommendation to make mandatory the use of a local disconnecting means for all electrical motors. The purpose of this rebuttal is to ask the NFPA to vote against this proposal and prevent it from becoming law.
The substantiation used by the submitter of the proposal is based on assumptions and inaccuracies. The safety concerns brought up are opinion and are by no means justification for such an involved change. The first safety argument suggests that employees may be tempted to work on "hot" equipment if the distance to the disconnecting means is excessive. We at Mead Paper have policies and training in place to prevent any such activity. Such behavior would be dealt with in a swift and severe manner up to and including dismissal. In addition, a local disconnect would encourage the act of switching a motor under load whether or not a load-braking type disconnect is installed, a very dangerous act in and of itself. Further, we question strongly the assumption that a trained craftsperson would rather work on a kive 480, 2300, or 4160 volt system to save the effort of walking an "excessive" distance or even climbing a few flights of stairs. The second safety argument suggests a local disconnect would help in the event that a worker got "hung up". The problem is that if you are "hung up", it would be difficult to throw a disconnect switch. When the proper lockout/tagout procedure is followed, the opportunity for a "hang-up" doesn't exist. Furthermore, in locations where "hang-up" hazards exist for operating machinery, emergency stop buttons are in place at several strategic points around the equipment, whereas a single local disconnect would do little in protection around large moving machinery (i.e., Paper Machines). Finally, the statement that the proposal would reduce accidental injuries and death cites no evidence or statistics and is purely opinion.

The second and less important argument against this proposal is purely economical. The last part of the proposal reads "...at very minor incremental cost to the owner". We argue the following: the proposed changes would provide a questionable reduction in accidental injuries and deaths, at a large capital and operating cost to the facility. These costs would manifest in the form of all of the following:

1. New equipment cost of the local disconnects.
2. Labor and material cost of a new wire run and installation of the new equipment.
3. Lost production time during changeover.
4. Labor costs for the revision of drawings, lockout procedures, training and engineering.
5. Higher maintenance costs would also be realized as mechanical wire connections double and more equipment is maintained.

At this facility, there are approximately 6000 electrical motors in service. An estimated 30% of these are in hazardous locations, which would require a NEMA 4X enclosed disconnect. Large motors would require extraordinary measures to comply with this proposal. Consider the act of installing a local disconnect on a 2300 volt, 2000 horsepower synchronous motor. Our facility is not mapped to allow sufficient clearance for the placement of such a device within sight of the motor. The statement "...at very minor incremental cost to the owner" is, in a word, wrong.

The bottom line: This proposal is not justifiable through safety. There has been no research; there is no hard accurate data, only opinion. On the contrary, this change will introduce some safety risks that are known such as switching motors off under load, and general confusion in procedure. Compliance with this proposal would not involve a "minor incremental cost: It would result in a huge capital expenditure, which would redirect money from essential projects and redirect manpower valuable to maintenance.

PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Comment 11-44.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #1434)

11- 140 - (430-102(b)): Reject
SUBMITTER: Gordon Beatty, Patrick Malie, Keith Glaser, Mead
COMMENT ON PROPOSAL NO: 11-68
RECOMMENDATION: Reconsider Panel Action and reject the proposal.
SUBSTANTIATION: - The first safety issue stated in the proposal substantiation is: "When the distance is excessive, workers attempt to work equipment 'hot', rather than walk the distance four times."

This is a vague, subjective, and unsubstantiated statement. There is no definition of "excessive" distance. What research or records were used to determine this? The statement generalizes that all workers will do this at some unspecified "excessive distance".

A "worker" that will not lock out a motor because the controller is "too far" away is in violation of all our safety policies and the law. This action is grounds for immediate dismissal, as it is in complete violation of our lockout/tagout procedures. We have very formal lockout/tagout procedures. These procedures have proven to be a safe way to work on equipment. Mandating retrofitting local disconnects for all motors is subscribing to an unsubstantiated unsafe "worker", not an unsafe situation.

There are instances where a local disconnect would be practical and these should be looked at on a case-by-case basis, not by broad-brushing the NEC.

- The second safety issue stated in the proposal substantiation is: "The other issue concerns the worker who gets 'hung up' and the disconnecting means is not within sight".

The NEC Article 100 defines a motor circuit switch as: "A switch rated in horsepower capable of interrupting the maximum operating overload current of a motor of the same horsepower rating as the switch at the rated voltage".

Exceptions soften this requirement, such as 430-109(e) for instance. It allows a general purpose switch to be used on an AC motor rated larger than 100 HP. The switch must be labeled "Do Not Open Under Load". This not only seems to defeat the intent of the proposed code change, but may provide a new means for injury. A switch not rated for load break on a motor could flash over, arc, and even explode if operated under load.

The proposed code change is also being substantiated on the grounds that if someone is "hung up" the disconnect could be used. If a "worker" doesn't follow the present law, and well defined lockout/tagout procedures by walking the required distance, what will prevent them from throwing the disconnect under load, in violation of the sign that says "Do Not Open Under Load".

The issue of a person getting "hung up" is quite concerning. A hardwired emergency stop pushbutton is the required way of stopping a machine in an emergency or "hung up" situation. It is normal to have several of these "E-stops" distributed around the machine for easy access. Most machinery in a manufacturing environment requires more than one motor. To quickly rescue a worker that is "hung up", the E-stop should be pressed to stop all motors on the equipment simultaneously. To attempt to select the correct motor disconnect switch from the many associated with a machine only delays the rescue attempt.

- Stated in the proposal's substantiation is "This proposal will reduce accidental injuries and death...". Based on the above NEC exceptions this proposal has the potential of actually having injuries occur, instead of using already established, proven, safe methods.

- Stated in the proposal's substantiation is: "...at very minor incremental cost to the owner". Let's take an example of a 100 hp AC motor. A 480V rated motor switch, 200 AMP (for HP rating), in a NEMA 4 enclosure, is over $4400 list (Square-D). It is 27 in. H x 18 in. W x 10 in. D. A similar switch for a 200 hp AC motor, 400 amp rating, lists at over $9000 and is 46 in. H x 26 in. W x 10 in. D.

Considering that we have thousands of motors, the cost is far from minor or incremental. Additionally, the space requirements for installation, clearances, and equipment maintenance access around these size switches can be prohibitive in existing facilities. New processes would require increasing building size and floor space, also not a minor cost.

Cost is not an argument for avoiding safety implementations. However, mandating a code change does not improve established safety procedures has a potential for injuries to occur, and also creates significant costs is not prudent, sensible or warranted.

Since the proposal's substantiation is that a hypothetical "worker" won't go lock out a motor because it's "too far", indicates where the issue is. The issue is an unsafe person who won't follow established safety procedures. Putting in more equipment at the owner's expense so that an unsafe person can continue to not have a proper "safety mind set" will not guarantee that the disconnects will be properly used either.

We strongly request that the panel reconsider its action and reject this proposal to remove exemption 430-102(b) based on inadequate substantiation of the proposal, and a potential negative impact to another section of the code [430-109(e)]. The need for a field disconnect within sight of a motor should be left to the owner and not dictated by code.

PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Comment 11-44.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #1438)

11- 141 - (430-102(b)): Reject
SUBMITTER: Tommy S. Joseph, International Paper Co.
COMMENT ON PROPOSAL NO: 11-68
RECOMMENDATION: Disregard proposal NEC-P11 Log 4074 in its entirety. Make no changes to the section.
SUBSTANTIATION: 1. The environment at many motors is less than ideal. A local disconnect adds another potential source of failure to a motor circuit. It has taken years to move motor controls from the local area to electrical control rooms to improve the reliability of the equipment and the safety to personnel disconnecting motors or working on the motor controls. This item would move the industry in reverse.

2. Many motors are locked out for work on equipment that is not "visible" from the work area. Examples are conveyors, paper machines, fans, boilers, etc. Would this new ruling require multiple disconnects?

3. Disconnects could possibly pose a hazard if opened or closed while under load as the units age, particularly in less than environmentally friendly atmospheres. Even the installation of an auxiliary interlock, while reducing the hazard, would not eliminate the situation should the interlock fail.

4. Lockout of the motor disconnect is already required by OSHA 1910.147. In locations where proper maintenance and supervision exists ,there is no need for a local disconnect when the regulations are followed.

5. Many systems have "interlocks" from a starter auxiliary contact. This would require adding an interlock at the disconnect to prove the disconnect was also closed.

PANEL ACTION: Reject.
PANEL STATEMENT: Leaving the exception unchanged would not include the panel action on Proposal 11-70. See panel statement on Comment 11-44.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #1456)

11- 142 - (430-102(b)): Reject
SUBMITTER: Paul E. Guidry, Fluor Daniel, Inc.
COMMENT ON PROPOSAL NO: 11-68
RECOMMENDATION: Delete entire text shown in ROP Panel Action. Leave Section 430-102(b) as is. I believe the panel should have rejected proposal 11-68-(430-102(b)) instead of Accepting it in Principle.
SUBSTANTIATION: The submitter provided no substantiation to back up his statement that there are "...two serious safety issues" with the present rules in the Code. At the panel meeting the submitter stated that the IBEW will continue to make this proposal until the general rule is changed to include a local disconnecting means at all motors. No evidence or statistics were presented to prove that a problem exists. The panel shouldn't be making Code changes just to appease certain groups. If a worker gets "hung up" as the submitter states is happening, then he obviously ignored safe work practices outlined in OSHA and NFPA 70E.

The submitter also made the statement in his substantiation that "When the distance is excessive (to the disconnecting means) workers attempt to work the equipment "hot" rather than walk the distance four times." This implies that now the Code should have requirements to accommodate a worker who is too lazy to do their job correctly. The intent of the Code isn't to provide convenience. Section 90-1(b) states that "This Code contains provisions that are considered necessary for safety. Compliance therewith and proper maintenance will result in an installation that is essentially free from hazard but not necessarily efficient, convenient, or adequate for good service or future expansion of electrical use." Adding a disconnecting means at every motor doesn't improve safety, it merely provides a convenience for workers.

The direction that the panel took is troublesome not only because they're trying to please certain interests but also because the word "practicable" is used in the text. This is in violation of the Style Manual. What is practicable in one person's mind may not be practicable to others. This language is vague and probably unenforceable.

Also, the FPN that was added to explain what isn't practicable should have been part of the text of the Code in order to be enforceable.
PANEL ACTION: Reject.
PANEL STATEMENT: Leaving the exception unchanged would not include the panel action on Proposal 11-70. See panel statement on Comment 11-44.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
THOMAS: See my explanation of negative vote on Comment 11-135.

(Log #1465)

11- 143 - (430-102(b)): Reject
SUBMITTER: Bill Green, Jacobs Engineering
COMMENT ON PROPOSAL NO: 11-68
RECOMMENDATION: Reconsider Panel Action and reject the proposal.
SUBSTANTIATION: The originator of this proposal did not supply any substantiation of any accidents caused by using the disconnecting means required in accordance with 430-120(a) for electrical safety lockout. The originator's statement that workers might attempt to work the equipment "hot" rather than walk an excessive distance is vague, a generality, and a violation of law. The originator's scenario substantiation stating that a worker who gets "hung up" in a piece of machinery could use a disconnect as a means of getting out of trouble clearly shows a lack of understanding of all safety procedures, NFPA 70E requirements, and the Federal Law regarding lockouts. OSHA Regulations (Standards - 20 CFR) "The control of hazardous energy (lockout/tagout). - 1910.147 established the minimum requirement for safety lockout and tagout of all energy sources including electrical. Both OSHA and NFPA 70E presently provide for the correct and safe procedures to lock or tag electrical equipment.

Using the disconnecting means required in 430-120(a) is a proven safe method of lock out. This is substantiated by many safe years with no accidents. Only when the law is violated has there been a problem. The submitter's statement that this change would be "at a very minor incremental cost to the owner" is incorrect. At our industrial facility we have approximately 20,000 AC and DC motors. We purchase the latest type of motor control centers with lockable devices just for the purpose of lockout and tagout. Installing disconnects in the field for every motor will increase building space and size requirements to provide the necessary space that does not interfere with operations but yet in sight of the motor. This proposed requirement has a very significant impact not only on cost, but also in real estate required. In addition, it will decrease electrical safety, where disconnect switches will be installed in wet locations.

There are many good reasons to use the disconnect required in 430-102(a) as the lockout device rather than a disconnect within site of the motor. The disconnect at the controller is where most everyone would go to check the status of the equipment. The controller control circuit condition can be observed at the controller. It would be unwise to open or close a disconnect at the motor without knowing the state of the controller.

I strongly request the panel reconsider its action and reject this proposal to remove exemption 430-102(b) based on inadequate substantiation supporting this requirement. The need for a field disconnect within sight of the motor should be left to the need of the user and not dictated by code.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Comment 11-44.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #1474)

11- 144 - (430-102(b)): Accept
SUBMITTER: Vincent J. Saporita, Cooper Bussmann
COMMENT ON PROPOSAL NO: 11-68
RECOMMENDATION: The panel did not discuss the existing FPN at the end of 430-102(b), which should remain as "FPN No. 2", while labeling the new proposed Fine Print Note as "FPN No. 1". In the first sentence of the new proposed exception, the phrase, "required in accordance with 430-102(a)." should be added after the third "disconnecting means" and before "is individually capable...". The panel should then continue to accept the proposal.
SUBSTANTIATION: This comment addressed the existing FPN and clarifies which disconnecting means "is individually capable of being locked in the open position."
PANEL ACTION: Accept.
PANEL STATEMENT: The submitter's recommendation has been incorporated in the panel action on comment 11-56.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #1515)

11- 145 - (430-102(b)): Reject
SUBMITTER: Marybeth Sodini, Olin Corporation
COMMENT ON PROPOSAL NO: 11-68
RECOMMENDATION: Do not delete the exception in 430-102(b) and do not add a sentence reading: "The disconnecting means required in accordance with 430.102(a) may also serve as the disconnecting means for the motor if it is located in sight from the motor location and the driven machinery location."
SUBSTANTIATION: Remote motor controllers should be allowed as a lockout location as currently stated in 430.102(b). Motor control center equipment, which remotely de-energizes the motor and control circuit, can be safely maintained when lockout procedures are enforced. If lockout procedures are not enforced, having a local disconnect available may not necessarily increase safety.

In addition, locating additional remote switching devices in the field can create problems including:

1. Often there are two separate power connections associated with driven equipment, power for the equipment, and power for a remote operator controller such as a hand switch. If a remote

switch is used to disconnect power to the equipment the controller could still be powered unless a second remote disconnect or interlock is provided. A failed interlock could create an unexpected hazard, while a second disconnect would complicate the lockout. Using a single disconnect that locks the control and equipment power, eliminates these problems.

2. Locating disconnect switches and/or controllers in the field increases the possibility of failure due to exposure to moisture (outdoors) and in certain industries, hazardous substances. Failed interlocks could pose a safety hazard to the electrician, while a failed controller might pose an additional hazard to the community if critical equipment fails at the wrong time.

PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Comment 11-44.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #1517)

11- 146 - (430-102(b)): Reject
SUBMITTER: Dale W. Pettigrew, Cognis Corporation
COMMENT ON PROPOSAL NO: 11-68
RECOMMENDATION: The panel should reject this proposal.
SUBSTANTIATION: Exception in 430-102 should be retained in the Code. Additional disconnects are not required for personnel safety if lockout/tagout procedures are followed as required by OSHA and as implemented in manufacturing and processing facilities. These procedures prohibit the worker from performing maintenance on any equipment that is not locked out, regardless of the distance to the lockable disconnect. The safety factor is built into the lockout practice, not into the location of the lockout in relation to the equipment.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Comment 11-44.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #1518)

11- 147 - (430-102(b)): Reject
SUBMITTER: Rich Frey, Cognis Corporation
COMMENT ON PROPOSAL NO: 11-68
RECOMMENDATION: The panel should reject this proposal.
SUBSTANTIATION: Keep Exception 430-102(b). No additional disconnects are required for personnel safety if lockout/tagout procedures are followed as required by OSHA. A long distance to a lockable disconnect is no excuse for working in a unsafe manner.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Comment 11-44.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #1524)

11- 148 - (430-102(b)): Reject
SUBMITTER: Carl J. Fredericks, S. Houston, TX
COMMENT ON PROPOSAL NO: 11-68
RECOMMENDATION: This proposal should have been rejected.
SUBSTANTIATION: The proposed code change would put an extreme cost burden on many thousands of owners and users with no substantiated safety benefit. This change could result in costs of up to a thousand dollars or more per motor installation, even in the restricted range currently envisioned by the panel. We should consider that some large industrial sites have 10,000 or more operating motor installations - all without a safety problem.

Existing code requirements, used with lockout/tagout procedures as required in NFPA 70E (including test/try functions and proper labeling and documentation), allow for a safe installation, though not necessarily one that is convenient to maintain. Where the maintenance cost savings of a local disconnect really justifies the cost and other associated problems, the owner is already free to install these.

The panel should not fail to consider that extra required devices add safety problems of their own. Ultimately even a local switch will need to be maintained and create the same issue this proposal seeks to address.

I would suggest that safety concerns in this category be directed to specific facilities, work groups or individuals that do not comply with NFPA 70E. One such violation would be attempting to work an installation hot to avoid walking back to a remote disconnect. Imposing a cost of this magnitude on the entire industry is not the way to address unacceptable work practices such as described in the proposal.

PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Comment 11-44.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #1526)

11- 149 - (430-102(b)): Accept in Principle
SUBMITTER: Michael J. Johnston, International Association of Electrical Inspectors
COMMENT ON PROPOSAL NO: 11-68
RECOMMENDATION: Add new text as follows:

(b) Motor. A disconnecting means shall be located in sight from the motor location and the driven machinery location. The disconnecting means required in accordance with 430-102(a) shall be permitted to serve as the disconnecting means for the motor if it is located in sight from the motor location and the driven machinery location.

Exception: The disconnecting means shall not be required to be in sight of the motor if such a location of the disconnecting means is impracticable or introduces additional or increased hazards to persons or property and the disconnecting means individually capable of being locked in the open position. The provision for adding a lock to the disconnecting means shall be permanently installed on or at the switch or circuit breaker used as the disconnecting means.

FPN: Some examples of increased or additional hazards include, but are not limited to; motors rated in excess of 100 hp, multi-motor equipment, submersible motors, motors associated with variable frequency drives and motors located in hazardous (classified) locations.

SUBSTANTIATION: I support the panel's action to accept in principle and support the proposal as adjusted by the panel. The revision and new text will provide a requirement that will enhance safety for the workman, inspectors, and others. This is a direct safety issue, with injury stats and deaths that overwhelmingly support the need for the new requirement. I do agree with some of the points made in the explanation of negative that the use of the word "impracticable" should be avoided to be in step with the style manual. Not sure if itemizing all the situations in list form is a practical approach either, as the list would surely be not inclusive. Perhaps insertion of the phrase "acceptable to the authority having jurisdiction" (which is consistent with other code sections) would be a step in the right direction. See wording below:

Exception: Where acceptable to the authority having jurisdiction, the disconnecting means shall not be required to be in sight of the motor if such a location of the disconnecting means ~~is impracticable or~~ introduces additional or increased hazards to persons or property and the disconnecting means individually capable of being locked in the open position. The provision for adding a lock to the disconnecting means shall be permanently installed on or at the switch or circuit breaker used as the disconnecting means.

It is one thing to know of the statistics of death and injury associated with these types of motor installations to help support a proposal, but having known individuals who suffered injury and been exposed to situations personally, that were uncomfortable relative to motor disconnecting means locations, justifies the need to support this proposal. I support the panel's action on this proposal and agree that it would enhance safety.

PANEL ACTION: Accept in Principle.
PANEL STATEMENT: The concerns of the submitter were addressed by panel action on Comment 11-56.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #1649)

11- 150 - (430-102(b)): Reject
SUBMITTER: Walter L. Selle, The Dow Chemical Company
COMMENT ON PROPOSAL NO: 11-68
RECOMMENDATION: The proposal should have been rejected.
SUBSTANTIATION: The existing code requirements along with the lockout/tagout procedures in NFPA 70E and OSHA allows for safe operation of electrical installations. When employees take shortcuts by not walking back and locking out a disconnect switch, people get hurt or killed. NFPA-70E, chapter 5 and OSHA section 1910-333 clearly states that circuits to be worked on must be lockout and/or tagout with few exceptions. The substantiation "When the distance is excessive, workers attempt to work the equipment hot rather than walk the distance four times" is not acceptable. The employer cannot accept this practice and fellow employee's should not accept it either.

The panel indicates "where practicable the motor disconnecting means shall be located within site from the motor, etc." This indicates to me that remote disconnecting means are acceptable and allowable if safe work procedures are in place and followed. If these practices exist, then they are acceptable for all loads and machinery devices. It will end up being very judgmental and many variations could exist between various local inspectors, thus creating more confusion. The situation could become more dangerous for maintenance personnel and contractors that work in many different localities.

Employers need to train and set expectations for employees to follow. Written safe work procedures must be documented and followed. Employees must also be accountable for their actions and understand that shortcuts to established safe work practices and procedures are prohibited.

I would suggest the code panel to communicate the use of safe work practices and procedures as stated in NFPA 70E and OSHA. If these items are followed, the number of injuries and deaths would be greatly reduced. By requiring a local disconnect in some applications does not correct the root cause of the problem.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Comment 11-44.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
THOMAS: See my explanation of negative vote on Comment 11-135.

(Log #1650)

11- 151 - (430-102(b)): Reject
SUBMITTER: Gordon Beatty, Patrick Malie, Keith Glaser, Mead Corp
COMMENT ON PROPOSAL NO: 11-68
RECOMMENDATION: Do not remove the exception in 430-102(b).
SUBSTANTIATION: The proposal does not improve safety and the original substantiation of the proposal (Log #4074) is ill founded.

- The first safety issue stated in the proposal substantiation is: "When the distance is excessive, workers attempt to work equipment "hot", rather than walk the distance four times."

This is a vague, subjective and unsubstantiated statement. There is no definition of "excessive" distance. What research or records were used to determine this? The statement generalizes that all workers will do this at some unspecified "excessive distance".

A "worker" that will not lock out a motor because the controller is "too far" away is in violation of all our safety policies and the law. This action is grounds for immediate dismissal, as it is in complete violation of our lockout/tagout procedures. We have very formal lockout/tagout procedures. These procedures have proven to be a safe way to work on equipment. Mandating retrofitting local disconnects for all motors is subscribing to an unsubstantiated unsafe "worker", not an unsafe situation.

There are instances where a local disconnect would be practical and these should be looked at on a case by case basis, not by broad brushing the NEC.

- The second safety issue stated in the proposal substantiation is: "The other issue concerns the worker who gets "hung up" and the disconnecting means is not within sight.

The NEC Article 100 defines a motor circuit switch as: "A switch rated in horsepower capable of interrupting the maximum operating overload current of a motor of the same horsepower rating as the switch at the rated voltage."

Exceptions soften this requirement, such as 430-109(e) for instance. It allows a general purpose switch to be used on an AC motor rated larger than 100 HP. The switch must be labeled "Do Not Open Under Load". This not only seems to defeat the intent of the proposed code change, but may provide a new means for injury. A switch not rated for load break on a motor could flash over, arc, and even explode if operated under load.

The proposed code change is also being substantiated on the grounds that if someone is "hung up" the disconnect could be used. If a "worker" doesn't follow the present law, and well defined lockout/tagout procedures by walking the required distance, what will prevent them from throwing the disconnect under load, in violation of the sign that says "Do Not Open Under Load".

The issue of a person getting "hung up" is quite concerning. A hardwired emergency stop pushbutton is the required way of stopping a machine in an emergency or "hung up" situation. It is normal to have several of these "E-stops" distributed around the machine for easy access. Most machinery in a manufacturing environment requires more than one motor. To quickly rescue a worker that is "hung up", the E-stop should be pressed to stop all motors on the equipment simultaneously. To attempt to select the correct motor disconnect switch from the many associated with a machine only delays the rescue attempt.

- Stated in the proposal's substantiation is: "This proposal will reduce accidental injuries and death...". Based on the above NEC exceptions this proposal has the potential of actually having injuries occur, instead of using already established, proven, safe methods.

- Stated in the proposal's substantiation is "...at very minor incremental cost to the owner." Let's take an example of a 100 hp AC motor. A 480V rated motor switch, 200 AMP (for HP rating), in a NEMA 4 enclosure, is over $4400 list (Square-D). It is 27 in. H x 18 in. W x 10 in. D. A similiar switch for a 200 hp AC motor, 400 amp rating, lists at ove $9000 and is 46 in. H x 26 in. W x 10" D.

Considering that we have thousands of motors, the cost is far from minor or incremental. Additionally, the space requirements for installation, clearances, and equipment maintenance access around these size switches can be prohibitive in existing facilities. New processes would require increasing building size and floor space, also not a minor cost.

Cost is not an argument for avoiding safety implementations. However, mandating a code change that does not improve established safety procedures, has a potential for injuries to occur, and also creates significant costs is not prudent, sensible, or warranted.

Since the proposal's substantiation is that a hypothetical "worker" won't go lock out a motor because it's "too far", indicates where the issue is. The issue is an unsafe person who won't follow established safety procedures. Putting in more equipment at the owner's expense so that an unsafe person can continue to not have a proper "safety mind set" will not guarantee that the disconnects will be properly used either.

We strongly request that the panel reconsider its action and reject this proposal to remove exemption 430-102(b) based on inadequate substantiation of the proposal, and a potential negative impact to another article of the code [430-109(e)]. The need for a field disconnect within sight of a motor should be left to the owner and not dictated by code.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel action on the proposal modified the existing exception, but did not delete it. See panel statement on Comment 11-44 and panel action and statement on Comment 11-56.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #1728)

11- 152 - (430-102(b)): Reject
SUBMITTER: Don Ganiere, Ottawa, IL
COMMENT ON PROPOSAL NO: 11-68
RECOMMENDATION: Reject this proposal.
SUBSTANTIATION: The new exception is so vague that it will completely negate the proposed change. Proper lockout/tagout "LOTO" procedures will make it safe to work on the equipment even when the disconnect is remote from the motor.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Comment 11-44.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #1840)

11- 153 - (430-102(b)): Accept in Principle
SUBMITTER: Michael I. Callanan, International Brotherhood of Electrical Workers
COMMENT ON PROPOSAL NO: 11-68
RECOMMENDATION: Continue to accept in principle Proposal 11-68.
SUBSTANTIATION: The proposal is intended to tighten the use of the exception by requiring that one of two conditions (Infeasibility/Greater Hazard) be met before it can be employed while at the same time providing sufficient latitude to designers and installers of electrical systems without the need for developing a "laundry list" of every application where the disconnecting means can be located remote from the motor.

Several concerns were raised in the negative voting on this proposal that warrant a response.

1. The term "practicable" is "unenforceable and vague". Table 3.2.1 in the NEC Style Manual lists possible unenforceable and vague terms. Note that the words "practicable" or "impracticable" do not appear in the list. One negative comment suggests that the term "practicable is synonymous with practical". That simply is not true. Annex B, Standard Terms, in the NEC Style Manual lists practicable as meaning "feasible" and practical as "useful". That is the exact context in which the terms are used in this proposal. In addition, note that terms practicable and impracticable are already in use in the Code. See for example Sections 230-54(c) Exception, and 250-52. In addition, several Code-Making Panels have accepted the use of the term in the 2002 cycle. See for example Proposal 16-192 on Section 800-5. Both uses are in the context of feasibility. Impracticable could be considered vague but it is certainly not unenforceable. The term is intentionally vague in order to provide the necessary latitude to properly apply a requirement, without placing undue restrictions on the application. In the context of this proposal, the term impracticable is intended to provide latitude to the designer and installer of the electrical system, while at the same time placing the burden on them to demonstrate that the disconnecting means cannot be located at the motor.

2. This code does not require a lockout/tagout program nor should the members of Code-Making Panel 11 assume that all maintenance/service personnel apply the lockout/tagout provisions of applicable OSHA standards. Several members expressed concerns that the existing lockout/tag provisions of OSHA are adequate for personnel safety. The fact of the matter is that every year far too many workers lose their lives from lockout/tagout related accidents. OSHA justified the original LOTO Standard as follows:

"Approximately 39 million workers are protected by this rule. (The 3 million workers who actually service equipment - i.e., craft workers, machine operators, and laborers - face the greatest risk.) OSHA estimates that compliance with the standard prevents about 122 fatalities, 28,400 lost workday injuries, and 31,900 non-lost workday injuries each year.

OSHA estimates that adherence to the requirements of this standard can eliminate nearly 2 percent of all workplace deaths in establishments affected by this rule and can have a significant impact on worker safety and health in the U.S."

Current statistics seem to support the contention that the need for effective LOTO procedures has not diminished over the past 10 years. I have provided OSHA Abstracts.

Clearly, a LOTO program cannot, in and of itself, remove the hazard. Revising this section will help to ensure that any LOTO program can be more effectively and thus more safely implemented.

3. One panel member suggested that requiring a motor disconnect at each motor location is merely a matter of "convenience". This is not about convenience. This is nothing more than a safety issue. When a disconnecting means is located within sight of the motor location, the result is a safer workplace, 95 percent of the time. In those cases where it could create a greater hazard, the exception will provide the necessary latitude to locate the disconnecting means at an alternate location.

4. The negative comment of Mr. Cox states that "It could also be argued that the addition of a local disconnect increases the hazards to persons or property for ever installation" is certainly without merit. This proposal is directed towards an increase in safety for persons. This change will not in any case decrease the level of safety presently required in the NEC.

In the end, this proposal is, as it should be, about safety, about "the practical safeguarding of persons and property from hazards arising from the use of electricity." Many will attempt to argue that this proposal will place an undue "burden" on owners or plants and facilities. In other words, that it will cost too much. The purpose of this proposal is to correct a practice that has gone array. The general rule, placing of the disconnecting means, a sound and clear rule, has been replaced by the exception which virtually eliminates the need for any disconnect to be located at the motor. I am certain that the extent to which this proposal will be opposed, will be in direct proportion to the extent to which it is used. Panel 11 took a bold step by reaffirming and clarifying that in every case except those where it is infeasible or would create a greater hazard, the motor disconnecting means shall be located within sight of the motor.

This comment represents the official position of the International Brotherhood of Electrical Workers Codes and Standards Committee.

Note: Supporting material is available for review upon request at NFPA headquarters.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Comment 11-56.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #1871)

11- 154 - (430-102(b)): Reject
SUBMITTER: Timothy M. Croushore, Allegheny Power
COMMENT ON PROPOSAL NO: 11-68
RECOMMENDATION: Code Making Panel 11 should reject Proposal 11-68.
SUBSTANTIATION: The panel should have rejected this proposal. I agree with the negative comments of Mr. Cox, Mr. Hamer, Mr. Saunders and Mr. Thomas. The current Code requirements are adequate to provide a safe installation. The current OSHA lockout/tagout requirements are adequate for worker safety. Failure to follow the proper lockout/ tagout safety procedure is not a reason to change the NEC. There is nothing in the Code to prohibit installing a disconnecting means at the motor and accomplishing what the submitter is requesting. However, a mandatory requirement of making the motor disconnecting means be within sight from the motor location and the driven machinery is unnecessary. The term "Practicable" as applied in the exception is not easily understood and is not enforceable.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Comment 11-44.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
THOMAS: See my explanation of negative vote on Comment 11-135.

(Log #1872)

11- 155 - (430-102(b)): Reject
SUBMITTER: Michael J. Marno, Haviland Enterprises, Inc.
COMMENT ON PROPOSAL NO: 11-68
RECOMMENDATION: We strongly urge the NFPA to vote AGAINST the proposal to change the National Electrical Code and require local disconnects on every motor in the workplace. The substantiation used by the submitter of the proposal is based on assumptions and inaccuracies. The safety concerns brought up are opinion and are by no means justification for such an involved change. The first safety argument suggest that employees may be tempted to work on "hot" equipment if the distance to the disconnecting means is excessive. We at Haviland Enterprises Inc. have policies and training in place to prevent any such activity. Such behavior would be dealt with in a swift and severe manner up to an including dismissal. In addition, a local disconnect would encourage the act of switching a motor under load whether or not a load-breaking type disconnect is installed - a very dangerous act in itself. Further, we question the assumption that a trained craftsperson would rather work on live voltage systems to save the effort of walking an "excessive" distance. The second safety argument suggests a local disconnect would help in the event that a worker was "hung up". The fallacy is that if you are hung up, it will be difficult to throw a disconnect switch! When proper lockout/tagout procedures are followed, the opportunity for hang-up doesn't exist. Finally, the statement that the proposal would reduce accidental injuries and death cites NO EVIDENCE or STATISTICS and is purely opinion.

The second and less important argument against this proposal is purely economical. The last part of the proposal reads "...at very

minor incremental cost to the owner." We question this as costs manifest themselves in the form of all of the following: cost of the local disconnects, labor and materials for new wire runs and installation, lost production time during changeover, labor costs for drawing revisions, procedures, training and engineering. Higher maintenance costs would also be realized. In some cases, and depending on motor size, space for a local disconnect could be a big issue - again resulting in increased cost. The statement "...at very minor incremental cost to the owner" is, in a word, wrong!
SUBSTANTIATION: The bottom line: This proposal is not justifiable through safety. There has been no research; there is no hard, accurate data - only opinion! This change will introduce some safety risks that are known and general confusion in procedure. Compliance would involve much more than "minor incremental cost." It would redirect money from more valuable projects and manpower from valuable maintenance. We urge you to REJECT the proposal.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel action did not remove the exception and would not require a disconnecting means at every motor. See panel statement on Comment 11-44 and panel action and statement on Comment 11-56.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #1878)

11- 156 - (430-102(b)): Reject
SUBMITTER: Daniel McKinney, Eastman Chemical Co.
COMMENT ON PROPOSAL NO: 11-69
RECOMMENDATION: Delete revised text and revert to original 1999 NEC text.
SUBSTANTIATION: The substantiation refers to circuit breakers that are not capable of being locked out. These are devices readily available to provide a means of locking out circuit breakers. OSHA also allows you to legally tagout a breaker without a lock.
Also mentioned was cutting a lock off to energize a fan not knowing all the details one cannot say with 100 percent assurance but it appears that the lockout regulations were being violated.
PANEL ACTION: Reject.
PANEL STATEMENT: Leaving the exception unchanged would not include the panel action on Proposal 11-70. See panel statement on Comment 11-44.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #1879)

11- 157 - (430-102(b)): Reject
SUBMITTER: Daniel McKinney, Eastman Chemical Co.
COMMENT ON PROPOSAL NO: 11-68
RECOMMENDATION: Delete revised text and revert to original 1999 NEC text.
SUBSTANTIATION: In the substantiation for the proposed revision, a "serious safety issue" was identified which stated that because of excessive distance that workers attempt to work the equipment "hot," rather than walk the distance four times. This is not a safety issue because of no local disconnect but because of a failure of the employee to comply with OSHA lockout/tagout regulations. Only a failure to do what is required by law results in a potential injuries/death and fines by OSHA not a lack of having a local disconnect
PANEL ACTION: Reject.
PANEL STATEMENT: Leaving the exception unchanged would not include the panel action on Proposal 11-70. See panel statement on Comment 11-44.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #1900)

11- 158 - (430-102(b)): Accept in Principle
SUBMITTER: Michael I. Callanan, International Brotherhood of Electrical Workers
COMMENT ON PROPOSAL NO: 11-68
RECOMMENDATION: Continue to accept in principle.
SUBSTANTIATION: Typical maintenance procedures do not widely include a working lockout/tagout program. In addition situations such as large distances or different levels are inconvenient for maintenance/service personnel, leading to unsafe work practices. The addition of a disconnect within sight of the motor will not result in a large cost to the owner. However the addition of this disconnect will result in a tremendous increase in safety for all persons involved in the maintenance/repair of the equipment.
he negative comment of Mr. Cox states that "It could also be argued that the addition of a local disconnect increases the hazards to persons or property for every installation" is certainly without merit. This proposal is directed towards an increase in safety for persons. This change will not in any case decrease the level of safety presently required in the NEC. Negative comments, which were directed towards the application of a lockout/tagout program, are not sufficient reason to reject this proposal. This code does not require a lockout/tagout program nor should the members of CMP-11 assume that all maintenance/service personnel apply the lockout/tagout provisions of applicable OSHA standards.
This is a safety driven proposal, which is directly in tune with the purpose of the NEC which "is the practical safeguarding of persons and property from hazards arising from the use of electricity."
This comment represents the official position of the International Brotherhood of Electrical Workers Codes & Standards Committee.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Comment 11-56.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #1930)

11- 159 - (430-102(b)): Accept in Principle
SUBMITTER: James T. Dollard, Jr., Philadelphia, PA
COMMENT ON PROPOSAL NO: 11-68
RECOMMENDATION: Continue to accept in principle.
SUBSTANTIATION: This safety driven proposal will at last recognize that a disconnecting means within sight of a motor is absolutely necessary for the safety of all those who maintain and service the motors. Panel 11 is to congratulated for recognizing that the purpose of the NEC is the practical safeguarding of PERSONS and property. Safety of persons is priority number one and property is number two. This proposal and others like it in this cycle and past cycles are from electricians who have been there, maintaining and servicing motors. The proposers have seen first hand the danger presented when an installation standard such as NFPA-70 permits the disconnect to be located out of sight of the motor. We are the persons that section 90-1(a) is addressing where electrical maintenance is to be performed.
Panel 11 will be inundated with proposals from a group that has formed a letter writing campaign to reverse the action on this proposal. This is unfortunate. A single proposal representing an individual group or industry segment would have been the proper method to express their interests. Letter writing campaigns only make more work for the panel.
I would like to ask the members of Panel 11 to pay close attention to the identity of those proposers who would reverse the Panel action on this proposal. Those interested in reversing your safety driven action on this proposal will not be in the field maintaining and servicing motors. We will. Those interested in reversing your safety driven action on this proposal are interested only in what they perceive as an additional cost involved in the installation. This perceived additional cost is far more important to this group than the safety of persons who will maintain the installation. This proposal will not represent a significant increase in the cost of the installation but will result in a dramatic increase in the safety of persons.
This comment is written to represent the segment of the industry whose safety and lives will one day depend on the location of this disconnecting means for motors.
The members of Panel 11 will be called upon to make a choice with all segments of the electrical industry watching when the chairman calls for a vote on proposal 11-69. The choice will be the safety of persons or the pockets of CEO's.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: The panel noted the comments in the substantiation. Most large industrial users have effective safety procedures and this is reflected in panel action on Comment 11-56.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #1973)

11- 160 - (430-102(b)): Reject
SUBMITTER: Anthony Paul Gabba, The Dow Chemical Company
COMMENT ON PROPOSAL NO: 11-68
RECOMMENDATION: This proposal should have been rejected.
SUBSTANTIATION: a) The existing Lockout/Tagout requirements in NFPA 70E are quite sufficient when followed. We do not need additional components in a circuit because a worker does not want to "walk the distance four times."

b) Additional mechanical/electrical devices will introduce more unreliability to the circuit and the user will also need to maintain the disconnect device during a maintenance outage on the motor. This would seem to imply the worker would be required to revert to the existing primary disconnect device anyway.

c) The wording as presented in the Committee Action Text is vague and in fact, quite contradictory. With statistical analysis, one could easily argue that insertion of additional series components (another disconnecting device) connected in any circuit negatively impacts reliability. Job/process hazards are easily linked statistically to unreliability. Therefore, we have "increased the hazards to persons and or property" and the Exception clause allows Owners to bypass this requirement.

d) I disagree with both of the submitters' substantiation comments: 1) "this proposal will reduce accidental injuries and death" and, 2) "This proposal will be at a very minor incremental cost to the owner." Item 1 has been refuted in my comments a, b and c above. The item 2 statement clearly demonstrates the submitter does not understand the widespread implications (cost and concern for reliability) this requirement has on owners. Retroactive implementation cost for small petrochemical complexes to large integrated sites will range between $1,000,000 to $30,000,000 by our estimate. This could hardly be described as a "minor incremental cost."

e) Operations training is also an issue and potential misuse by those unfamiliar with proper use of such devices would create additional hazards. Consider the implications of operating a no-load device under load.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Comment 11-44.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #2057)

11- 161 - (430-102(b)): Reject
SUBMITTER: Robert A. Leigh, Leigh Engineering, Inc.
COMMENT ON PROPOSAL NO: 11-68
RECOMMENDATION: Request the Panel to reconsider its action and reject this proposal to remove Exemption 430-102(b). The need for a field disconnect within sight of the motor should be left to the need of the user and not dictated by code.
SUBSTANTIATION: The problem of putting the disconnecting means in sight of each motor makes it too easy for workers not to take the time to properly shut down equipment before lockout/tagout of the disconnect. The disconnects installed in wet process areas, particularly paper and chemical mills, are more likely to be contaminated and fail during power interruption. It is even more dangerous with disconnecting means above 600 volts. The originator's substantiation was because the worker had violated legal procedures already established by OSHA 1910.147 and NFPA 70E-1995.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Comment 11-44.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #2061)

11- 162 - (430-102(b)): Reject
SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc.
COMMENT ON PROPOSAL NO: 11-68
RECOMMENDATION: Reject the proposal.
SUBSTANTIATION: The substantiation is not persuasive. Locating a disconnect because an employee is deemed unlikely to walk as far as the electrical room is a design question. The employer can choose whether to enforce worksite discipline, or install local disconnects. The answer may vary even within a given plant, but the NEC as written is safe. The second half of the substantiation is simply incorrect. Motor disconnects really shouldn't be counted on to stop motors in emergency situations. If a worker gets "hung up" a disconnect even 5 ft away won't help, but a properly designed control circuit using dead man switches and E-stop chains very well might.

I can appreciate that the panel is fatigued by the endless resubmittal of similar proposals, but they should continue to be rejected. The final panel action on the proposal showed just how unrealistic (impracticable) it is to try and write a rule that works in actual factory settings. If that rule stands, I think I could design an entire seminar on how to apply it. That's good for me, but very bad Code.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Comment 11-44.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #2076)

11- 163 - (430-102(b)): Accept in Principle
SUBMITTER: Todd Anderson, Dow Corning Coporation
COMMENT ON PROPOSAL NO: 11-69
RECOMMENDATION: Regarding Article 430-102(b): The panel needs to revise the proposed (new) Exception as shown in Proposal 11-68 to state:

The disconnecting means shall not be required to be in sight of the motor if such a location of the disconnecting means is impracticable or introduces additional or increased hazards to persons or property or on industrial premises where maintenance and supervision indicate that qualified persons will service the equipment and the disconnecting means is individually capable of being locked in the open position. The provision for locking or adding a lock to the disconnecting means shall be permanently installed on or at the switch or circuit breaker used as the disconnecting means.
SUBSTANTIATION: Problem:

The substantiation for 11-69 is not relevant when electrical work is performed in an environmental (usually Industrial and Larger firms) where Electrical Lockout/Tagout procedures are in place and enforced.

Substantiation:

Based on the OSHA report (which covers both electrical and mechanical lockouts), it documents that 90 percent of large firms (250 or more employees) were in full compliance of the OSHA lockout/tagout standard.

On the other hand, medium to small firms (250 employees or less) were less likely to apply the OSHA standard to lockout/tagout equipment.

I agree that the changes made are valid for smaller companies and commercial/residential applications where Supervision and defined electrical lockout/tagout procedures are often nonexistent.

I DO NOT AGREE that the recommendation in 11-69 applies to Large/Industrial Firms. The data shows that Large/Industrial Firms (250 or more employees) maintain and enforce defined Electrical Lockout/Tagout Procedures. These large firms also provide annual training to maintenance personal and outside contractors who are expected to apply the procedures on their sites.

Industrial electricians have a proven track record of abiding by and following the OSHA electrical lockout/tagout standard and need to be exempt from Section 430-102(b).

Note: Supporting material available for review upon request at NFPA headquarters.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Comment 11-56.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #2077)

11- 164 - (430-102(b)): Accept in Principle
SUBMITTER: Todd Anderson, Dow Corning Coporation
COMMENT ON PROPOSAL NO: 11-68
RECOMMENDATION: Regarding Article 430-102(b): The panel needs to revise the proposed (new) Exception to state:

The disconnecting means shall not be required to be in sight of the motor if such a location of the disconnecting means is impracticable or introduces additional or increased hazards to

persons or property or on industrial premises where maintenance and supervision indicate that qualified persons will service the equipment and the disconnecting means is individually capable of being locked in the open position. The provision for locking or adding a lock to the disconnecting means shall be permanently installed on or at the switch or circuit breaker used as the disconnecting means.

SUBSTANTIATION: Problem:

The substantiation for 11-68:

The concern for electriciaans opting to work on electiracl equiment "hot" are not relevant when electrical work is performed in an environment (ususually Industrial and Larger firms) where electrical lockout/tagout procedures are in place and enforced.

The concern regarding an electricain getting "hung up" is not relevant. The local stop or emergency stop control will adequately deenergize power to the equipment.

Additonal Substantiation:

Based on the OSHA report (which covers both electrical and mechanical lockouts), it documents that 90 percent of large firms (250 or more employees) were in full compliance of the OSHA lockout/tagout standard.

On the other hand, medium to small firms (250 employees or less) were less likely to apply the OSHA standard to lockout/tagout equipment.

I agree that the changes made are valid for smaller companies and commercial/residential applications where Supervision and defined electrical lockout/ tagout procedures are often nonexistent.

I DO NOT AGREE that the recommendation in 11-68 applies to Large/Industrial Firms. The data shows that Large/Industrial Firms (250 or more employees) maintain and enforce defined Electrical Lockout/Tagout Procedures. These large firms also provide annual training to maintenance personal and outside contractors who are expected to apply the procedures on their sites.

Industrial electricians have a proven track record of abiding by and following the OSHA electrical lockout/tagout standard and need to be exempt from Section 430-102(b).

Note: Supporting material available for review upon request at NFPA headquarters.

PANEL ACTION: Accept in Principle.

PANEL STATEMENT: See panel action and statement on Comment 11-56.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:

AFFIRMATIVE: 15

(Log #2125)

11- 165 - (430-102(b)): Reject

SUBMITTER: Ray Klink, ESCO Company Ltd, Partnership

COMMENT ON PROPOSAL NO: 11-68

RECOMMENDATION: We strongly urge you to not adopt this revision to the existing standard.

SUBSTANTIATION: We are a small chemical facility. We currently have most of the systems in place which would meet the revised standard. However, the revised standard would still cause us considerable expense and difficulty. There are currently laws in place to ensure that workers disconnect electrical devices and lock them out before working on them. We enforce these laws very vigorously. Anyone who would presently put their life and their job at risk will not change their habits just because the disconnect device is closer. The problem is not that the disconnects are too far away, the problem is the relationship between the employer and employee. They must reach an understanding that existing procedures must be followed every time!

The term "impracticable" in the exception is totally unenforceable and is sure to be interpreted differently by different people. One backyard electrical regulatory expert can cause severe employee relations problems with their insistence that companies are not following regulations or don't care about the safety of their employees.

Many of the existing systems which are currently being handled safely and efficiently would have to be revised. We look at some of the more obscure systems such as unit heater motors and air duct damper motors which would have to be changed. Where would you put a disconnect for an air duct damper motor in an office environment?

PANEL ACTION: Reject.

PANEL STATEMENT: Leaving the exception unchanged would not include the panel action on Proposal 11-70. See panel statement on Comment 11-44.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:

AFFIRMATIVE: 13

NEGATIVE: 1

EXPLANATION OF NEGATIVE:

THOMAS: See my explanation of negative vote on Comment 11-135.

(Log #2126)

11- 166 - (430-102(b)): Reject

SUBMITTER: Marcus C. Weikle, Westvaco Corporation, Packaging Resources Group

COMMENT ON PROPOSAL NO: 11-68

RECOMMENDATION: Request the panel to reconsider its action and reject the proposal to remove Exemption 430-102(b).

SUBSTANTIATION: This proposal will increase the possibility of personnel interrupting energized circuits which can be more dangerous than the established procedure by OSHA Regulation 1910.147 covering lockout and tagout procedures. Before any work can be performed around a motor or the driven load, lockout and tagout of the motor controller disconnect is an absolute must. Also, in addition to 480 volt motors up to 200 horsepower, very large horsepower motors are present in industrial facilities operating at 2300, 4160, 7200 and 13800 volts. Disconnect switches for these motors would be very large and impractical to mount at the motor site. These switches would be even more life threatening to operate without knowing the state of the motor controller. Again, lockout/ tagout of the motor controller disconnect is the only completely safe way to work on the motor or the driven equipment.

PANEL ACTION: Reject.

PANEL STATEMENT: The panel action on the proposal modified the existing exception, but did not delete it. See panel statement on Comment 11-44 and panel action and statement on Comment 11-56.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:

AFFIRMATIVE: 15

(Log #2130)

11- 167 - (430-102(b)): Reject

SUBMITTER: Brian J. Nenninger, The Dow Chemical Company

COMMENT ON PROPOSAL NO: 11-68

RECOMMENDATION: This proposal should be rejected.

SUBSTANTIATION: This proposal is a very expensive approach especially when considering many industrial users have a majority of their motor applications in Division 2 areas. In fact one could argue, the installation of an explosion proof disconnect at the motor is inherently less safe than the one having no local disconnect at all. As explosion proof disconnects are often not properly left with all bolts installed and tightened, Division 2 gasses could easily migrate into the switch causing a significant hazard the next time the switch is operated. Very often the milled surfaces of explosion proof enclosures are scratched rendering them unsafe for the application. Our industry has worked for many years to relocate disconnecting means out of the Division 2 areas and into an unclassified electrical room where they are not subject to the hazards associated with Division 2 gases.

The committee should also consider the additional disconnect will also reduce the overall reliability of the plant electrical system due to the addition of another component to fail. This will ultimately add to the installation cost incurred by lost production through plant outages. Often in the Chemical Industry a plant trip can additionally result in a potential environmental impact. Once again as an industry, we have worked to increase the reliability and safety of our operating plants by reducing the component count and system failure points.

It would also behoove the Panel to keep in mind, Lockout/Tagout programs have allowed the industry to safely use disconnecting means remote from the motor for many years and with thousands of motors.

PANEL ACTION: Reject.

PANEL STATEMENT: See panel statement on Comment 11-44.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:

AFFIRMATIVE: 15

(Log #2141)

11- 168 - (430-102(b)): Reject
SUBMITTER: Donald R. Bonem, II, Dow Corning Corporation
COMMENT ON PROPOSAL NO: 11-68
RECOMMENDATION: It is time to incorporate this exception that has decades of precedence, into this paragraph into positive requirements.

I suggest the following:

(b) Motor: Disconnects for motors shall be provided by either of the following means.

(1) The disconnecting means provided in Section 430.102(a) is capable of being locked in the open position.

(2) A disconnecting means located in sight from the motor location and the driven machinery location.

SUBSTANTIATION: The change in wording of the exception will invalidate time proven safe installations without substantiation. The 1997 fatalities due to occupation contact with electrical current was 297 people for all industries. The Total Deaths Due to injuries from 1994 to 1996 has decreased each year for the following categories: (1) Electric current; (2) Industrial wiring, appliances, and electrical machinery; and (3) Other and unspecified electric current. (National Safety Council, 1999 Injury Facts Report). The number of these incidences due to locks being cut off has to be small if nonexistent.

The draft statement also allows a very subjective decision making process for the Authority Having Jurisdiction. The Authority Having Jurisdiction is concerned with compliance, how can one confirm compliance with the code with statements such as "unless not practical"? Practical to whom? The electrician, operator, or owner? Adding an additional disconnect in the field adds: (1) Significant real estate due to working area about electrical equipment requirements, another two sets of terminations that can fail, as well as a host of other requirements. Also, the Authority Having Jurisdiction will usually default to the decision which will leave them with the least legal risk. The Authority Having Jurisdiction for smaller jurisdictions, (say urban/rural areas less than 50,000 people) usually only has expertise in the application of the NEC and will not be familiar with other safety issues. This division of judgment makes it difficult for the Authority Having Jurisdiction to evaluate the total impact of the safety of a given installation based on electrical components only. The text as written, is not enforceable and is vague requiring judgment which will ultimately demand that disconnects be located near motors even in locations where the increased risk. It is not practical to disagree with the Authority Having Jurisdiction. To convince the Authority Having Jurisdiction their interpretation is not correct let alone "practical" is usually not worth the time and effort on a job by job basis. Therefore, either make it a clear requirement or disregard the change. Examples of increased risk are: (1) Installations in hazardous locations increase risk of ignition. (2) Access to 480V equipment by unqualified personnel due to location near equipment where they work. People do dump things, give them access to 480V equipment and someone will open them up and get hurt. I prefer to locate disconnects in manageable areas. If the electrician is "uncomfortable" with a locked disconnect, then go one step further, pull the fuses, disconnect the motor leads, or connect them together at the motor.
PANEL ACTION: Reject.
PANEL STATEMENT: The exception is an exception because it has not been and is not now intended to be standard practice to use lockable disconnecting means for a controller that is out of sight of the motor in lieu of a disconnecting means within sight of the motor any time the installer chooses to do so. See panel statement on Comment 11-44.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #2185)

11- 169 - (430-102(b)): Reject
SUBMITTER: Mark Goodman, BP (ARCO)
COMMENT ON PROPOSAL NO: 11-68
RECOMMENDATION: Reject the proposal and maintain the text (including the exception) of the 1999 NEC as is. API supports the negative explanations of Panel 11 members Mr. Cox, Mr. Hamer, and Mr. Saunders.
SUBSTANTIATION: There are a number of reasons why the proposed changes should not be adopted. They include:

Adequate substantiation for these changes have not been given.

Adding a motor disconnect near the motor does not isolate voltage to the local control station (stop/start) at the motor or the space heaters (if applied) within the motor. The present FPN in the 1999 NEC, and using the motor controller disconnect to isolate the motor, will disconnect the auxiliary devices.

The proposal introduces an additional risk of opening a "disconnect" that is not rated to interrupt load for motors over 100 hp (see 430-109(G)), therefore one situation described in the proposal substantiation (a worker being "hung up" and being saved by opening a disconnect) is potentially unsafe, since opening a disconnect under load may result in an explosion.

"Impracticable" is not enforceable, and the explanations given in the proposed FPN are not mandatory and will create confusion for the Authority Having Jurisdiction and the user.

The risks introduced by the installation of a disconnect outdoors can be high, due to condensation buildup within the disconnect's enclosure, added exposed live terminals within the enclosure, and corrosion of the disconnect component from non-use. This can result in a fault within the enclosure.

Reliability will be reduced by the increased number of terminations on the motor feeder necessitated by the disconnect.
PANEL ACTION: Reject.
PANEL STATEMENT: Leaving the exception unchanged would not include the panel action on Proposal 11-70. See panel statement on Comment 11-44.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
THOMAS: See my explanation of negative vote on Comment 11-135.

(Log #2186)

11- 170 - (430-102(b)): Reject
SUBMITTER: Mark Goodman, BP (ARCO)
COMMENT ON PROPOSAL NO: 11-69
RECOMMENDATION: Reject the proposal and maintain the text (including the exception) of the 1999 NEC as is. API supports the negative explanations of Panel 11 members Mr. Cox, Mr. Hamer, and Mr. Saunders.
SUBSTANTIATION: There are a number of reasons why the proposed changes should not be adopted. They include:

Adequate substantiation for these changes have not been given.

Adding a motor disconnect near the motor does not isolate voltage to the local control station (stop/start) at the motor or the space heaters (if applied) within the motor. The present Exception and FPN in the 1999 NEC, and using the motor controller disconnect to isolate the motor, will disconnect the auxiliary devices.

The proposal introduces an additional risk of opening a "disconnect" that is not rated to interrupt load for motors over 100 hp (see 430-109(G)), therefore one situation described in the proposal substantiation (a worker being "hung up" and being saved by opening a disconnect) is potentially unsafe, since opening a disconnect under load may result in an explosion.

"Impracticable" is not enforceable, and the explanations given in the proposed FPN are not mandatory and will create confusion for the Authority Having Jurisdiction and the user.

The risks introduced by the installation of a disconnect outdoors can be high, due to condensation buildup within the disconnect's enclosure, added exposed live terminals within the enclosure, and corrosion of the disconnect component from non-use. This can result in a fault within the enclosure.

Reliability will be reduced by the increased number of terminations on the motor feeder necessitated by the disconnect.

Additionally, the substantiation of Proposal 11-69 suggests that it is unclear who has the authority to lock and unlock the disconnect identified in the Exception. The FPN however directs to the lockout/tagout requirements of NFPA 70E which clearly identify the methodology to ensure the safety of those working on the equipment.
PANEL ACTION: Reject.
PANEL STATEMENT: Leaving the exception unchanged would not include the panel action on Proposal 11-70. See panel statement on Comment 11-44.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
THOMAS: See my explanation of negative vote on Comment 11-135.

(Log #2204)

11- 171 - (430-102(b)): Reject
SUBMITTER: John J. Ankoviak, Dow Corning Corporation
COMMENT ON PROPOSAL NO: 11-68
RECOMMENDATION: The panel should reject the proposal.
SUBSTANTIATION: The rejection is based on the scope of the NEC.

Section 90-1(a) Purpose states "Practical Safeguarding. The purpose of this code is the practical safeguarding of persons and property from hazards arising from the use of electricity." One definition of practical is from "The American Heritage Dictionary - Second College Edition" and states "Level-headed, efficient unspeculative." Section 90-1(b) states "Adequacy. This Code contains provisions that are necessary for safety...". The first point is speculative which the dictionary states is: "...risky." Therefore, unspeculative is one who is not risky. With NFPA 70E-2000 and OSHA 1910.147 we have regulations of how a worker is to safely work when servicing or maintaining machines and equipment through the control of hazardous energy. When a worker chooses not to follow these mandatory requirements they have made an individual choice that is risky and not practical, not to say that the installation is risky. The second point is necessary for safety. The above mandatory regulations provide the necessary level of safety that has been proven time and again, for trained persons working on electrical equipment. The proposal to add a requirement for the installation of local disconnects is not necessary for safety. Instead it will add additional cost for the petrochemical industry to do business in the USA. Other codes do not require this additional device and thus the cost of doing business outside the USA would be more favorable. The FPN, though not enforceable, adds confusion to what an electrician would normally expect for typical installations in the petrochemical industry. Since the only installations this would be required are ones in a standard area, at 480V or less, non-VFD motors and less than 100HP motors. This does not seem practical.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Comment 11-44.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #2205)

11- 172 - (430-102(b)): Reject
SUBMITTER: John J. Ankoviak, Dow Corning Corporation
COMMENT ON PROPOSAL NO: 11-69
RECOMMENDATION: The panel should reject the proposal.
SUBSTANTIATION: As stated in my comments on 11-68, with NFPA 70E-2000 and OSHA 1910.147 we have regulations of how a worker is to safely work when servicing or maintaining machines and equipment through the control of hazardous energy. It also states the responsibility of the employer in 1910.147 (a)(3)(i) "...to establish a program and utilize procedures for affixing appropriate lockout devices or tagout devices to energy isolating devices, and to otherwise disable machines or equipment to prevent unexpected energization, start-up or release of stored energy in order to prevent injury to employees." It is not the responsibility of the NEC to add additional levels of protection anytime an employee or employer does not follow mandatory safety requirements. OSHA has a standard for devices that can and cannot be locked out. This lock and tag is someone's life and those that take it upon themselves to not respect that life should be disciplined. It should not be the NEC's responsibility to continue adding additional requirements to those of us who meet the standard. If the employee or employer does not follow OSHA and NFPA 70E, why would they follow the NEC and this change? The present installations are safe as stated int he NEC-1999 430-102(b) and in conjunction with OSHA and NFPA 70E provide a safe environment for a worker to perform their tasks.

In addition, the acceptance of 11-69 would only add another financial burden for those of us in the petrochemical industry that follows our national standards. Section 90-1(b) states "Adequacy. This Code contains provisions that are necessary for safety...". This additional cost of business in the USA is not necessary for safety.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Comment 11-44.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #2206)

11- 173 - (430-102(b)): Reject
SUBMITTER: Joyce Evans Blom, The Dow Chemical Company
COMMENT ON PROPOSAL NO: 11-68
RECOMMENDATION: The panel should reject the proposal.
SUBSTANTIATION: The proposed code change would be unduly burdensome to thousands of owners and users. The efficacy of this additional lock-out point is questionable for an industrial facility. Stringent lockout/tagout procedures are already required by OSHA; these procedures already include verification of de-energized condition and that a qualified person must try to operate the equipment with controls to verify that the equipment cannot be restarted, among many other requirements.

Per motor installation, the cost of this change is estimated in excess of $1,000. The Panel should consider that small industrial sites have up to 3,000 motor installations. Large industrial sites have 30,000 or more motor installations. Additionally, these sites will need to increase their maintenance costs for upkeep of these disconnects. These existing motor installations are operating without a safety problem in regard to lockout/tagout.

Existing industrial practice is that the owner, at their discretion, may add a local disconnect in specific motor applications. The owner may find that for specific maintenance and operations procedures, the extra provision for safety justifies the additional installation and maintenance costs associated with the additional disconnect.

The panel should consider the economic burden of this magnitude on small, medium and large industry. When existing regulations are in place and effective, additional equipment does not improve unacceptable work practices such as described in the proposal.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Comment 11-44.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #2257)

11- 174 - (430-102(b)): Reject
SUBMITTER: Noel Williams, Noel Williams Consulting
COMMENT ON PROPOSAL NO: 11-68
RECOMMENDATION: The proposal should be rejected.
SUBSTANTIATION: The substantiation for this proposal is entirely inadequate. The argument in the proposal and some similar proposals amounts to a plea for a rule to protect electricians from their own laziness or stupidity. The current rule permits the exclusion of a local disconnect only where the remote disconnect (at the controller) is lockable. A lockable disconnect is entirely adequate for safety if the locking feature is used. This is a major change with only hypothetical substantiation. The Code cannot be idiot-proof.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Comment 11-44.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #2258)

11- 175 - (430-102(b)): Reject
SUBMITTER: Noel Williams, Noel Williams Consulting
COMMENT ON PROPOSAL NO: 11-68
RECOMMENDATION: This proposal should be rejected.
SUBSTANTIATION: The language creates an unenforceable rule. The comment by panel member Mr. Cox covers this issue. As also pointed out by Mr. Cox, the revision is illogical and inconsistent with the stated intent of the Code. Furthermore, although "practicable" and "practical" are not really synonymous, most Code users do not recognize a difference.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Comment 11-44.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
THOMAS: See my explanation of negative vote on Comment 11-135.

(Log #2261)

11- 176 - (430-102(b)): Reject
SUBMITTER: Mark Capra, International Paper
COMMENT ON PROPOSAL NO: 11-68
RECOMMENDATION: I do not support the proposed changes of 11-68-(430-102(b)) and ask that you reject the Proposal.
SUBSTANTIATION: 1. Lockout procedures following OSHA requirements presently provide a completely safe method of lockout at the motor disconnect switches built into the motor starters. I don't know of anyone that would "attempt to work the equipment "hot," rather than walk the distance four times" to the disconnecting means.

2. Local disconnects will be exposed to the controlled atmospheres found in the Motor Control Centers where the disconnect switches built into the motor starters are located. I think there would be reduced reliability in the wide scale use of local disconnect switches.

3. The cost to install local disconnecting means would be substantial, as proposed to "at a very minor incremental cost" stated in the Proposal. The added financial burden on American industry will not result in increased safety, and will just make it more difficult to compete in the Global economy.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Comment 11-44.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #2267)

11- 177 - (430-102(b)): Reject
SUBMITTER: Marlin Holder, Inland Paperboard & Packaging-Rome Linerboard Mill
COMMENT ON PROPOSAL NO: 11-68
RECOMMENDATION: Do not remove exception in 430-102(b).
SUBSTANTIATION: The lockout/tagout procedure established by OSHA 1910-147 and NFPA 70E is the only completely safe system to prevent injuries. This is the law and must not be violated. No substitution should be made. Even if a disconnect is within sight of the motor, it is often impossible to tell whether the motor is running if the noise level is high and the rotating coupling and shaft are properly guarded. In many locations at our plant, the disconnect would have to be located outside where the person opening it would have to be standing in water when they opened the switch. In many situations, simply pulling and locking the electrical energy source will not make the motor safe to work on. In the case of pumps, valves and other energy sources must also be locked out to ensure safety. A thorough and complete lockout must be followed for each situation. Pulling a local disconnect instead of following the complete procedure would give a false sense of security. The lockout/tagout procedure must be enforced and not add another possible hazard. How many injuries have occurred when lockout/tagout procedures have been followed? Let's enforce the laws we have rather than add additional laws that are only needed if we assume the original laws will be broken.

I might also note that our plant location has more than 4000 motors. Over 200 of these are 4160 volt motors. Twenty seven motors are one thousand horsepower and above. The "minor incremental cost" of compliance at our location alone would be over $7,000,000.00. There are many plants that are well over twice as large as ours. The financial effect on commercial or very light industrial facilities might be minor, but the effect on a large industrial facility would be devastating.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel action on the proposal modified the existing exception, but did not delete it. See panel statement on Comment 11-44 and panel action and statement on Comment 11-56.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #2268)

11- 178 - (430-102(b)): Reject
SUBMITTER: Stephen Pauli, Bayer Corporation
COMMENT ON PROPOSAL NO: 11-68
RECOMMENDATION: The panel should reject this proposal. Leave 430-102(b) alone as currently written in 1999 NEC.
SUBSTANTIATION: Heavy industrial chemical plants have safely used thousands of motors installed in Class 1 Division 2 areas outdoors without disconnect switches in the past. Requirements to add disconnect switches in these wet and hazardous locations adds severe risk to the area by providing more locations for water entry to motors and live terminals, and by providing a location to generate a spark in an area that avoids electrical arcing contacts at all costs. The mandatory location of additional safety switches in all motor locations will add substantial costs to the initial installation in chemical and petrochemical industries.

Existing motor control center disconnects and safe working procedures in our facility are designed around a series of OSHA mandated lockout/tagout regulations and NFPA 70E. Shortcuts to safety for convenience are not allowed in any Bayer Corporation facility.

The wording of this proposal is far too vague to be enforceable. A word like "impracticable" will be impossible to interpret and enforce.

This proposal will also affect the cost of final manufactured product, and affecting our position in a highly competitive and global industry. This proposal could negatively affect US global competitiveness.

The negative comments expressed by Mr. Cox in Proposal 11-68 more aptly state the reasons why Bayer Corporation would not support this proposal.
PANEL ACTION: Reject.
PANEL STATEMENT: Leaving the exception unchanged would not include the panel action on Proposal 11-70. See panel statement on Comment 11-44.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
THOMAS: See my explanation of negative vote on Comment 11-135.

(Log #2269)

11- 179 - (430-102(b)): Reject
SUBMITTER: Stephen Pauli, Bayer Corporation
COMMENT ON PROPOSAL NO: 11-69
RECOMMENDATION: The panel should reject this proposal. Leave 430-102(b) alone as currently written in the 1999 NEC.
SUBSTANTIATION: Heavy industrial chemical plants use hundreds of motors installed in Class 1 Division 2 areas, installed outdoors in cramped locations without additional disconnects. Requirements to add disconnect switches in these wet and hazardous locations adds severe risk to the area by providing more locations for water entry to motors and live terminals, and by providing a location to generate a spark in an area that avoids electrical arcing contacts at all costs. The mandatory location of additional safety switches in all motor locations will add substantial costs to the initial installation in chemical and petrochemical industries.

Existing motor control center disconnects and safe working procedures in our facility are designed around a series of OSHA mandated lockout/tagout regulations and NFPA 70E. Shortcuts to safety for convenience are not allowed in any Bayer Corporation facility.

This proposal will also affect the cost of final manufactured product, and affecting our position in a highly competitive and global industry. This proposal could negatively affect US global competitiveness.

The negative comments expressed by Mr. Cox in Proposal 11-69 aptly state the reasons why Bayer Corporation would not support this proposal.
PANEL ACTION: Reject.
PANEL STATEMENT: Leaving the exception unchanged would not include the panel action on Proposal 11-70. See panel statement on Comment 11-44.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #2274)

11- 180 - (430-102(b)): Reject
SUBMITTER: G. Erich Heberlein, Jr., Rockwell Automation/Allen-Bradley Co.
COMMENT ON PROPOSAL NO: 11-68
RECOMMENDATION: Reconsider the Code Panel action and reject the proposal. Therefore, the Exception 430-102(b) in the 1999 NEC should be retained in the future.
SUBSTANTIATION: The grounds for removing the exception are flawed as it infers workers are disregarding lock-out and tag-out procedures and indicates a lack of safety procedures, i.e., the justification behind the proposal is in conflict with Federal law requiring lock-out tag-out operations. There is a need on many industrial applications requiring that the disconnect means should not be located near or "in sight" of the motor. For example: In extreme temperature, toxic or hazardous locations, locating the disconnecting means near the motor can increase the risk of additional hazards. In continuous process operations, additional disconnects will cause reduced reliability, additional infrared scan requirements, and other maintenance concerns. In addition, very large motors and complex machinery with multi-motors do not lend themselves to having disconnects near the motor locations.
PANEL ACTION: Reject.
PANEL STATEMENT: Leaving the exception unchanged would not include the panel action on Proposal 11-70. See panel statement on Comment 11-44.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #2300)

11- 181 - (430-102(b)): Reject
SUBMITTER: Rick A. Savard, Dow Corporation M/S 007
COMMENT ON PROPOSAL NO: 11-68
RECOMMENDATION: The panel should reject the proposal.
SUBSTANTIATION: My 15 years of experience working in a chemical plant, has proven to me that our OSHA based, Lockout/Tagout Program allows for a safe installation for maintenance personnel working on motor circuits, installed per the existing NEC requirements. Another disconnect installed within site of the motor would not add safety benefits. Thus, it would only serve as a convenience and in my opinion, this does not justify its requirements. I also am opposed to installing a disconnect outside of a controlled room, where they are readily accessible to everyone. Nearly all of our MCCs, disconnects and circuit breakers are located in controlled rooms, in which only qualified personnel are allowed. Qualified personnel being electricians, electrical engineers and operations personnel trained and certified in lockout/tagout procedures and electrical room safety awareness.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Comment 11-44.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #2301)

11- 182 - (430-102(B)): Reject
SUBMITTER: Rick A. Savard, Dow Corporation M/S 007
COMMENT ON PROPOSAL NO: 11-69
RECOMMENDATION: The panel should reject the proposal.
SUBSTANTIATION: My 15 years of experience working in a chemical plant, has proven to me that our OSHA based, Lockout/Tagout Program allows for a safe installation for maintenance personnel working on motor circuits, installed per the existing NEC requirements. Another disconnect installed within site of the motor would not add safety benefits. Thus, it would only serve as a convenience and in my opinion, this does not justify its requirements. I also am opposed to installing a disconnect outside of a controlled room, where they are readily accessible to everyone. Nearly all of our MCCs, disconnects and circuit breakers are located in controlled rooms, in which only qualified personnel are allowed. Qualified personnel being electricians, electrical engineers and operations personnel trained and certified in lockout/tagout procedures and electrical room safety awareness.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Comment 11-44.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #2323)

11- 183 - (430-102(b)): Reject
SUBMITTER: Mike McNeil, Rockland, ME
COMMENT ON PROPOSAL NO: 11-68
RECOMMENDATION: The panel should reject this proposal.
SUBSTANTIATION: - The substantiation of the proposal is itself a violation of NFPA 70E and OSHA lockout/tagout. This proposal requires additional equipment to protect from willful violations of accepted safety practices is illogical and reinforces unsafe work practices.
- There is no technical substantiation.
- In every case, there will be an added or increased hazard introduced by the unnecessary disconnect. There will be identification issues with multi motor applications, probable confusion over which disconnect to lockout (motor control center or the one in sight), and the introduction of another piece of equipment in the circuit to become a point of failure, maintenance issue, and another source of shock, flash burn, thermal burn, and arc blast.
- The statement "very minor incremental cost" to the owner used by the submitter is neither realistic nor accurate. The cost to owners in large commercial and industrial facilities will be huge.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Comment 11-44.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #2324)

11- 184 - (430-102(b)): Reject
SUBMITTER: Mike McNeil, Rockland, ME
COMMENT ON PROPOSAL NO: 11-69
RECOMMENDATION: There is no technical substantiation.
SUBSTANTIATION: The submitter's substantiation is a list of violations of OSHA lockout/tagout and the NFPA 70E. The NEC should not be changed to support unsafe work practices.
See my comments on 11-68.
PANEL ACTION: Reject.
PANEL STATEMENT: There is no recommendation, as required by 4-4.5 of the Regulations Governing Committee Projects.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #2349)

11- 185 - (430-102(b)): Reject
SUBMITTER: J. Richard Viel, Pharmacia, Inc.
COMMENT ON PROPOSAL NO: 11-68
RECOMMENDATION: The following argument is in objection to the proposed modifications to Article 430-120(b) in the 2002 NEC. The argument is a modification of the one being submitted by the Mead Paper Company but reflects the concerns of our Electrical Standards Committee for Pharmacia Corp.
SUBSTANTIATION: The substantiation used by the submitter of the proposal is based primarily on assumptions. The safety concerns brought up are opinion and are by no means justification for such an involved change.
The first safety argument suggests that employees may be tempted to work on "hot" equipment if the distance to the disconnecting means is excessive. We at Pharmacia Corp have policies and training procedures in place to prevent any such activity. They are SOPs and Lock Out Tag Out procedures which are required by OSHA as well as by our own safety committee. Such behavior would be dealt with immediately as a performance issue. Further, we question strongly the assumption that a trained craftsperson would rather work on a live 480 or 4160 volt system to save the effort of walking an "excessive" distance or even climbing a few flights of stairs.
The second safety argument suggests a local disconnect would help in the event that a worker was "hung up". The problem is that if you are "hung-up", it will be difficult to get to or even turn off a disconnect switch. When the proper lockout/tagout procedure is followed, the opportunity for a "hang-up" does not exist. Furthermore, in locations where "hang-up" hazards exist for operating machinery, emergency stop buttons are in place at several strategic points around the equipment, whereas a single local disconnect would do little in protection around large moving machinery (i.e., Large Chillers, Air Compressors, Process

Equipment, etc.). Finally, the statement that the proposal would reduce accidental injuries and death cites no evidence or statistics and is purely opinion.

The last part of the proposal reads: "... at very minor incremental cost to the owner". We argue the following: The proposed changes would provide a questionable reduction (no substantiated data to indicate there would be a reduction) in accidental injuries and deaths, at a large capital and operating cost to the facility. These costs would be manifest in the form of all of the following: New equipment cost of the local disconnects, labor and material cost of a new wire run and installation of the new equipment and lost production time during changeover. Labor costs for the revision of drawings, additional lockout procedures, training and engineering and higher maintenance costs would also be realized as mechanical wire connections double and more equipment is maintained. At this facility, there are thousands of electrical motors in service. A high percentage of these are in hazardous locations, which would require an additional NEMA 4X enclosed disconnect. Medium voltage motors would require extraordinary measures to comply with this proposal. Consider the act of installing a local disconnect on a 4160 volt, 2000 horsepower motor. The statement: "... at very minor incremental cost to the owner" is, in a word, wrong.

The bottom line: This proposal is not justifiable through safety. There has been no research; there is no hard accurate data, only opinion. On the contrary, this change will introduce some safety risks that are known such as the potential of switching motors off under load, and the potential for a general confusion in procedure. Compliance with this proposal would not involve a "minor incremental cost". It would result in a significant capital expenditure.

PANEL ACTION: Reject.

PANEL STATEMENT: Leaving the exception unchanged would not include the panel action on Proposal 11-70. See panel statement on Comment 11-44.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:

AFFIRMATIVE: 15

(Log #2354)

11- 186 - (430-102(b)): Accept in Principle

SUBMITTER: Clifford J. Normand, International Paper

COMMENT ON PROPOSAL NO: 11-68

RECOMMENDATION: Let the wording of 430.102(B) remain the same as in the 1999 Code. As an alternate install the following exception:

Under conditions of maintenance and supervision where formal Zero Energy State procedures exist the disconnecting means, in addition to the controller disconnecting means as required in accordance with Section 430.102(A), shall not be required for the motor where the disconnecting means for the controller is individually capable of being locked in the open position.

SUBSTANTIATION: Our company complies with the requirements of OSHA 1910.147 for lockout. Our formal policy provides for employee safety; therefore, the installation of an additional disconnect is not required. All employees and contractors are trained and required to follow the procedures of the lockout policy as a condition of employment.

We have spent years installing motor controls in environmentally protected control centers for both safety and reliability. In many cases the motor controls have been replaced where they existed in less than environmentally desirable areas. The installation of local disconnects would force us to move backward in terms of safety and reliability.

We also have many large pieces of equipment such as paper machines and conveyors where the maintenance areas are distant and not within sight of the motor and therefore the disconnect is not within sight of the work area. Situations where local disconnects deemed necessary for safety or convenience are reviewed on a case-by-case basis.

PANEL ACTION: Accept in Principle.

PANEL STATEMENT: See panel action and statement on Comment 11-56.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:

AFFIRMATIVE: 15

(Log #2370)

11- 187 - (430-102(b)): Reject

SUBMITTER: John Hayden, International Paper

COMMENT ON PROPOSAL NO: 11-68

RECOMMENDATION: International Paper has a proactive health and safety management process, however, the company does not support the promulgation of the proposed NFPA National Electrical Code change ROP 11-68-(430-102(b)), published in the NFPA 70 Report on Proposals, and strongly urges the panel to reject the proposal based on our substantiating comments.

SUBSTANTIATION: I. Evidence Does Not Support the Substantiation of the Submitter's Recommendation.

A. The submitter Indicates in his substantiation that, "When the distance is excessive, workers attempt to work the equipment "hot" rather than walk the distance 4 times". The submitter offers no data to substantiate this statement, and presumes that qualified employees are going to commit an act that is a clear and blatant violation of company policy, as well as, OSHA standard 29 CFR 1910.147. In addition, the submitter makes a general statement that when a distance becomes excessive (he does not define excessive) employees are going to "shortcut" established safety policies. In fact, there is no evidence within our company, or within industry, that employees are working on "hot" equipment to save the effort of walking to a disconnecting means. International Paper has an established formal lockout/tagout policy, in addition to starter labeling requirements, that goes beyond the requirements of the OSHA standard 29 CFR 1910.147. This policy provides for effective employee safety by requiring the lockout of the motor disconnects.

International Paper has established a system for health and safety accountability within the company. This procedure defines employee accountabilities and procedures for administering disciplinary actions aimed at addressing employee conduct issues. At International Paper, achieving our vision of injury free, requires that every employee remains committed to health and safety standards and takes responsibility for working safely every day. We tell our employees that there is no job so important that adequate time cannot be taken to do it safely. Working safely is a condition of employment. International Paper will not tolerate, nor ignore any act or behavior that places an employee or others at risk of injury, e.g. working on energized equipment because it's too far to lockout the disconnect.

B. The submitter makes a second statement in his substantiation about the worker getting "hung up" and the disconnecting means not within sight. This is the very reason why OSHA promulgated 29 CFR 1910.147 (The Control of Hazardous Energy). This standard presently provides for the correct and safe procedures to lock and tag electrical equipment to prevent the unexpected activation of equipment. OSHA and NFPA 70E already effectively protect employees from being "hung up" in equipment. In addition, local start/stops and emergency stops are located strategically on the equipment for easy access. Utilization of emergency stops is the most effective method to quickly cut power to effect rescue of a worker.

C. To Justify the premise of this proposed change, one must assume that the employer and employee are in violation with federal and state standards. These standards are in place to protect the employee from work place hazards. If situations exist where compliance is questionable, the employee has protections under OSHA regulations and a clear means to resolve the matter.

II. Other Issues as a Result of This Proposal

A. The environment at many motors is less than ideal. A local disconnect adds another potential source of failure to a motor circuit. It has taken years to move motor controls from the local area to electrical control rooms to improve the reliability of the equipment and the safety to personnel disconnecting motors or working on the motor controls. This item would move the industry in reverse.

B. Disconnects could possibly pose a hazard if opened or closed while under load as the units age, particularly in less than environmentally friendly atmospheres. Even the installation of an auxiliary interlock, while reducing the hazard, would not eliminate the situation should the interlock fail.

C. Many systems have interlocks from a starter auxiliary contact. This would require adding an interlock at the disconnect to prove the disconnect was also closed.

D. In many instances, motors on equipment are positioned such that a single disconnect would not be visible from all points where maintenance work is performed. In the case of large equipment that extends over a large area, e.g., conveyors, paper machines, and boilers, the requirement to have a disconnect within sight would conceivably add several local disconnects, thereby increasing the potential for system failure and risk to employees.

III. The Proposal Greatly Underestimates Costs Associated with the Installation of Local Disconnects.

The statement made in the substantiation, "at very minor incremental cost to the owner" has no basis in fact. The cost of the proposal is precipitously underestimated by orders of magnitude for International Paper's manufacturing locations. The cost of installing a single local disconnect is not a very minor incremental cost as stated in the substantiation of the proposal. The list price of a 60 amp NEMA 4X disconnect for a 50 hp motor is $1600 (Square D) plus installation. List for a 100 hp disconnect is $4410. Several hundred would be required in a large paper manufacturing facility. This is in addition to the disconnect and controller installed in an environmentally controlled environment. Additionally, space requirements for installation and clearance would be prohibitive in existing facilities. Mandating a code change that does not improve employee safety, or equipment reliability, and adds a financial burden to the worksite, is not warranted or prudent for the employee or employer.

IV. Conclusions

International Paper realizes that there are certain situations where a local disconnect would be practical. These situation are analyzed on a case-by-case situation. In summary, mandating a code change that all motors have disconnects in sight of the motor is not a means to improve emplyee safety. In fact, this proposal actually has the potential to increase employee risk to injury for the aforementioned reasons. Once again, International Paper does not support the promulgation of the proposed NFPA National Electrical Code change 11-68-(430-102(b)), published in the NFPA 70 Report On Proposals. An overly burdensome sweeping approach, will not only fail to improve the health and welfare of the workforce, but also it will surely adversely impact workforce opportunities. To International Paper, the proposal will not improve employee safety and has excessive cost for no benefit.

PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Comment 11-44.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #2372)

11- 188 - (430-102(b)): Reject
SUBMITTER: Robert Pratt, The Dow Chemical Company
COMMENT ON PROPOSAL NO: 11-68
RECOMMENDATION: This proposal (11-68) should have been rejected. Modification to more clearly define the types of locations (those using "Lockout/Tagout") could be considered, but not removal of the exception.
SUBSTANTIATION: In many (22) years of exposure to numerous "industrial facilities" at various companies, I have never encountered a "qualified electrician" that was concerned about the walk necessary to clear a piece of equipment. I believe that argument is inappropriate to this discussion.

If the person could get "hung-up" it would be because either the equipment was energized from a remote location or the person initiated the work on an already energized source. Both of these possibilities are thoroughly eliminated by compliance with clearing procedures of a "Lockout/Tagout" program. The idea of de-energizing a circuit, via local disconnect, after getting "hung up", is too late in the concept of a safe installation. The addition of local disconnects is unnecessary in facilities operating with "Lockout/Tagout".

Requiring the addition of a local disconnect adds more opportunities for equipment failure.

Requiring the addition of a local disconnect offers more opportunities for someone to inappropriately (by numerous definitions) interrupt equipment in operation.

PANEL ACTION: Reject.
PANEL STATEMENT: The panel action on the proposal modified the existing exception, but did not delete it. See panel statement on Comment 11-44 and panel action and statement on Comment 11-56.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #2376)

11- 189 - (430-102(b)): Reject
SUBMITTER: Terry L. Stoyek, International Paper
COMMENT ON PROPOSAL NO: 11-68
RECOMMENDATION: Recommend rejecting the proposed change.
SUBSTANTIATION: A worker inclined to violate lockout procedures is just as likely to open the motor disconnect and not lockout because the lock was left in the shop and he/she feels in control of the disconnect, thereby introducing another hazard. The addition of the motor disconnect adds an additional point of failure, exposure, and accessibility to unqualified people. In outdoor, washdown, and pump areas this additional exposure and water greatly increase hazards. This disconnect will increase the hazards of unexpected startup due to the potential of the starter being energized before the motor disconnect is closed. In conveying systems normally served by a single disconnect on a starter panel, any motor in excess of 50 feet from the panel would require a motor disconnect. Due to the necessary coordination of conveyors for safe material handling the disconnecting of a single motor rather than the system potentially increase hazards associated with material handling. Normal stop and emergency stop buttons are the appropriate method of stopping equipment. Following proper lockout procedures is the solution.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Comment 11-44.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #2388)

11- 190 - (430-102(b)): Reject
SUBMITTER: David R. White, Westvaco Corporation Packaging Resources Group
COMMENT ON PROPOSAL NO: 11-68
RECOMMENDATION: Request the panel to reconsider its action and reject this proposal to remove Exemption 430-102(b).
SUBSTANTIATION: This proposal will increase the possibility of personnel interrupting energized circuits which can be more dangerous than the established procedure by OSHA Regulations 1910.147 covering lockout and tagout procedures. Before any work can be performed around a motor or the driven load, lockout and tagout of the motor controller disconnect is an absolute must. Also, in addition to 480 volt motors up to 200 horsepower, very large horsepower motors are present in industrial facilities operating at 2300, 4160, 7200 and 13800 volts. Disconnect switches for these motors would be very large and impractical to mount at the motor site. These switches would be even more life threatening to operate without knowing the state of the motor controller. Again, lockout/tagout of the motor controller disconnect is the only completely safe way to work on the motor or the driven equipment.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Comment 11-44.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #2391)

11- 191 - (430-102(b)): Reject
SUBMITTER: Ron B. Watson, Chattanooga, TN
COMMENT ON PROPOSAL NO: 11-68
RECOMMENDATION: Leave the exception in 430-102(b) as it is that presently states:

"Exception: A disconnecting means, in addition to the controller disconnecting means as required in accordance with Section 430-102(a), shall not be required for the motor where the disconnecting means for the controller is individually capable of being locked in the open position."

SUBSTANTIATION: Removing this exception to 430-102(b) will result in unnecessary economic costs to industry users where the NEC is applied. The reasons stated for the change are not valid based on the past record within the industry. The project assumption that worker might choose to not spend the time or effort to walk to the disconnecting means to open the circuit and violate acceptable lock-out procedures, and work the circuit energized, indicates that the worker is willfully violating the requirements of OSHA 1910 subpart S, OSHA 1910-147, and NFPA 70E. This also implies that the supervision of such worker will completely ignore the requirements for lock-out as well. The Industry as a whole, design organizations, and users, have been applying the NEC Section 430-102(b) exception and have not experienced any injuries, incidents, or intentional violations of the lock-out requirement, derived from its application. The

requirements of the NEC is the "practical safeguarding of persons and property from hazards arising from the use of electricity". It is not intended to replace disciplinary action for willful violators of lock-out or replace the intelligence and common sense thinking entrained in people. The introduction of another disconnecting means in the motor circuit will add one more chance for lock-out failure and confusion.
PANEL ACTION: Reject.
PANEL STATEMENT: Leaving the exception unchanged would not include the panel action on Proposal 11-70. See panel statement on Comment 11-44.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #2392)

11- 192 - (430-102(b)): Reject
SUBMITTER: Ron B. Watson, Chattanooga, TN
COMMENT ON PROPOSAL NO: 11-69
RECOMMENDATION: Leave the current exception in 430-102(b) as it is that presently states:
"Exception: A disconnecting means, in addition to the controller disconnecting means as required in accordance with Section 430-102(a), shall not be required for the motor where the disconnecting means for the controller is individually capable of being locked in the open position."
SUBSTANTIATION: Removing this exception to 430-102(b) will result in unnecessary economic costs to industry users where the NEC is applied. The reasons stated for the change are not valid based on the past record within the industry. The project assumption that worker might choose to not spend the time or effort to walk to the disconnecting means to open the circuit and violate acceptable lock-out procedures, and work the circuit energized, indicates that the worker is willfully violating the requirements of OSHA 1910 subpart S, OSHA 1910-147, and NFPA 70E. This also implies that the supervision of such worker will completely ignore the requirements for lock-out as well. The Industry as a whole, design organizations, and users, have been applying the NEC Section 430-102(b) exception and have not experienced any injuries, incidents, or intentional violations of the lock-out requirement, derived from its application. The requirements of the NEC is the "practical safeguarding of persons and property from hazards arising from the use of electricity". It is not intended to replace disciplinary action for willful violators of lock-out or replace the intelligence and common sense thinking entrained in people. The introduction of another disconnecting means in the motor circuit will add one more chance for lock-out failure and confusion.
PANEL ACTION: Reject.
PANEL STATEMENT: Leaving the exception unchanged would not include the panel action on Proposal 11-70. See panel statement on Comment 11-44.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #2396)

11- 193 - (430-102(b)): Reject
SUBMITTER: Edward R. Nicholas, Earth Tech
COMMENT ON PROPOSAL NO: 11-68
RECOMMENDATION: I strongly urge the NFPA to reject this proposal and to let motor installations continue to be installed following the present code.
SUBSTANTIATION: As a member of the NFPA, I would like to voice my concur over a proposal by Code Making Panel 11 for NFPA 70 (National Electrical Code) seeking to make it mandatory to place a disconnect at every motor in the work place. There are several reasons why such a requirement does not enhance work place safety and another that the cost to be borne by the owners and manufacturers will be exorbitant.
The present codes and procedures more than adequately protect the workman in the work place if the codes and procedures are followed. The suggested changes to the NEC sound more like a convenience for the workman than a way to increase safety. If the Lock Out/Tag Out procedure is followed, the motor to be worked on will be disconnected from the power source, locked out, and tagged such that the power will not be restored until the workman completes his work and removes his lock and tag. In the instance quoted, where the workman may become "hung up", the procedures were obviously not followed and the workman was working on a live circuit or motor without following the safety guidelines prescribed by OSHA, and most likely, the safety procedures of the company or owner where the work is being performed.
Even assuming that there was a disconnect available at the motor, that disconnect could have been located as much as 50 feet away. Again, obviously too far for the workman to reach himself. An adequately designed E-stop system would be of more use than a disconnect out of reach of the workman, assuming that the workman had the presence of mind to react in the situation or was even able to operate the disconnect in the situation. The resultant conclusion must be that the workman was not following proper procedures, therefore exposing himself to severe consequences. Aain, assuming that a disconnect is available, and the workman ignored that safeguard and worked on a live circuit, what would the Code-Making Panel suggest next? Safeguards are in place and they work if the workman follows them. Laziness is no excuse for forcing unnecessary expense on owners.
The other compelling reason is financial. If owners are forced to add a disconnect at every motor location, the cost would be astronomical for facilities having thousands of motors. The cost to add or supply a new disconnect would include the cost of the disconnect, the labor to install it, the rerouting of the existing conduit and wire (if applicable) or additional conduit and wire in the case of a new installation. If the motor location is in a hazardous area, the cost of the disconnect could run into the thousands of dollar. One of the advantages of the present code is that a starter capable of being locked out can be located in a nonhazardous area such as a motor control center room and the wiring installed in the hazardous area without incurring the additional cost of installing an explosion-proof disconnect along with the explosion-proof motor. The disconnect cost could exceed thousands of dollars for a large sized motor and much more than that for a motor run on 4160 volts, and if the environment is NEMA 7 or 9, the cost is extremely prohibitive.
In conclusion, this proposal in no way increases the safety of the worker if he does not follow proper procedures. In addition, it might encourage known hazards such as switching off a motor under load if the disconnect is not horsepower rated. It also will incur considerable expense to the owner, especially in the case of many motors or in the case of hazardous environments.
PANEL ACTION: Reject.
PANEL STATEMENT: Leaving the exception unchanged would not include the panel action on Proposal 11-70. See panel statement on Comment 11-44.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #2397)

11- 194 - (430-102(b)): Reject
SUBMITTER: James L. Graff, Chem-Trend Incorporated
COMMENT ON PROPOSAL NO: 11-68
RECOMMENDATION: We are asking the NFPA to vote against the proposed revision to the National Electrical Code which if passed would require a disconnect on every motor in the workplace environment.
SUBSTANTIATION: The substantiation used by the submitter of the proposal is based on assumptions and inaccuracies. The safety concerns brought up are opinion and are by no means justification for such an involved change. The first safety argument suggests that employees may be tempted to work on "hot" equipment if the distance to the disconnecting means is excessive. We at Chem-Trend have policies and training in place to prevent any such activity. Such behavior would be dealt with in a swift and severe manner up to and including dismissal. In addition, a local disconnect would encourage the act of switching a motor under load whether or not a load-breaking type of disconnect is installed, a very dangerous act in and of itself. Further, I question strongly the assumption that a trained craftsperson would rather work on a live 480, 2300 or 4160 volt system to save the effort of walking an "excessive" distance or even climbing a few flights of stairs. The second safety argument suggests a local disconnect would help in the event that a worker was "hung up". The problem is that if you are "hung-up," it will be difficult to throw a disconnect switch. When the proper lockout/tagout procedure is followed, the opportunity for a "hang-up" does not exist. Furthermore, in locations where "hang-up" hazards exist for operation machinery, emergency stop buttons are in place at several strategic points

around the equipment, whereas a single locale disconnect would do little in protection around large moving machinery. Finally, the statement that the proposal would reduce accidental injuries and death cites no evidence or statistics and is purely opinion.

The second and less important argument against this proposal is purely economical. The last part of the proposal reads: "...at very minor incremental cost to the owner." I argue the following: The proposed changes would provide a questionable reduction in accidental injuries and deaths, at a large capital and operating cost to the facility. These costs would manifest in the form of all of the following: New equipment cost of the local disconnects. Labor and material cost of a new wire run and installation of the new equipment. Lost production time during changeover. Labor costs for the revision of drawings, lockout procedures, training and engineering. Higher maintenance costs would also be realized as mechanical wire connections double and more equipment is maintained. At our McPherson Park facility, the electrical motors are in hazardous locations, given the number of electrical motors present, the cost to comply with the proposal would be significant. The statement: "...at very minor incremental cost to the owner" is, in a word, wrong.

This proposal is not justifiable through safety. There has been no research; there is no hard accurate data, only opinion. On the contrary, this change will introduce some safety risks that are known such as switching motors off under load, and general confusion in procedure. Compliance with this proposal would not involve a "minor incremental cost." It would result in a huge capital expenditure, which would redirect money from valuable projects and redirect manpower from valuable maintenance.

PANEL ACTION: Reject.

PANEL STATEMENT: Leaving the exception unchanged would not include the panel action on Proposal 11-70. See panel statement on Comment 11-44.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:

AFFIRMATIVE: 15

(Log #2401)

11- 195 - (430-102(b)): Accept

SUBMITTER: Jerry Spencer, Potlatch Corporation

COMMENT ON PROPOSAL NO: 11-68

RECOMMENDATION: Reconsider Panel Action on Proposal 11-68 (430-102(b)) Log #4074.

SUBSTANTIATION: I want to recommend reconsideration of Panel Action and rejection of Proposal 11-68 (430-102(b)) Log #4074 proposal. I see nothing int he originator's substantiation to indicate a need for this change. I have not heard of any examples whatsoever of injuries or accidents preventable by the proposal that did not involve violation of the existing electrical lockout procedures outlined in 430-102(a). Both the NFPA 70E and OSHA Regulations prohibit the sort of shortcut he is talking about, and I know for a fact that the company for which I work, as well as those workers I talk to regularly believe in and enforce/comply with requirements for lockout/tagout of all energy sources.

I also disagree strongly with the submitter's assessment of the "minor incremental" cost of implementing such a proposal. We have literally thousands of electrical motors at our site, and our site is only one of 5 just in this state. The sort of disconnect that would be required will run from several hundred to several thousand dollars each, depending upon the load, plus enclosure.

The other problem which arises with disconnects within sight of motors, is that the disconnect is far from the motor controller. Mistakenly opening a disconnect on a running motor could start a serious arc fault. The only way to avoid the danger of such faults is to introduce "break-before-break" contacts to open the motor contactor before the disconnect blades clear. Such auxiliary switches run several hundred dollars each, and introduce a new possibility for control problems. I strongly recommend that the panel reject this proposal, and leave the decision of whether or not to install field disconnects to the individual sites affected, who can best evaluate the relative cost/risk/benefits of each installation.

PANEL ACTION: Accept.

PANEL STATEMENT: The panel has reconsidered the panel action on the proposal and continues to accept the proposal in principle, but with further changes. See panel action and statement on Comment 11-56, and panel statement on Comment 11-44.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:

AFFIRMATIVE: 15

(Log #2402)

11- 196 - (430-102(b)): Reject

SUBMITTER: Tim Wing

COMMENT ON PROPOSAL NO:

RECOMMENDATION: I strongly oppose the proposed code revision that will require a disconnect on every motor. This proposal will be very expensive and there is no evidence it will increase safety. I believe it will reduce safety.

SUBSTANTIATION: The substantiation used by the submitter of the proposal is based on assumptions and inaccuracies. The safety concerns brought up are opinion and are by no means justification for such an involved change. The first safety argument suggests that employees may be tempted to work on "hot" equipment if the distance to the disconnecting means is excessive. Rather, a local disconnect would encourage the act of switching a motor under load whether or not a load-breaking type disconnect is installed, a very dangerous act in and of itself. Further, I question strongly the assumption that a trained craftsperson would rather work on a live 480, 2300 or 4160 volt system to save the effort of walking an "excessive" distance or even climbing a few flights of stairs. The second safety argument suggests a local disconnect would help in the event that a worker was "hung up". The problem is that if you are "hung up", it will be difficult to throw a disconnect switch. When the proper lockout/tagout procedure is followed, the opportuity for a "hang up" does not exist. Furthermore, in locations where "hang-up" hazards exist for operation machinery, emergency stop buttons are in place at several strategic points around the equipment, whereas a single locale disconnect would do little in protection around large moving machinery. Finally, the statement that the proposal would reduce accidental injuries and death cites no evidence or statistics and is purely opinion.

The second and less important argument against this proposal is purely economical. The last part of the proposal reads: "...at very minor incremental cost to the owner." I argue the following: The proposed changes would provide a questionable reduction in accidental injuries and deaths, at a large capital and operating cost to the facility. These costs would manifest in the form of all of the following: New equipment cost of the local disconnects. Labor and material cost of a new wire run and installation of the new equipment. Lost production time during changeover. Labor costs for the revision of drawings, lockout procedures, training and engineering. Higher maintenance costs would also be realized as mechanical wire connections double and more equipment is maintained. Large motors would require extraordinary measures to comply with this proposal. The statement "...at very minor incremental cost to the owner" is, in a word, wrong.

The bottom line: This proposal is not justifiable through safety. There has been no research; there is no hard accurate data, only opinion. On the contrary, this change will introduce some safety risks that are known such as switching motors off under load, and general confusion in procedure. Compliance with this proposal would not involve a "minor incremental cost." It would result in a huge capital expenditure, which would redirect money from valuable projects and redirect manpower from valuable maintenance.

PANEL ACTION: Reject.

PANEL STATEMENT: The panel action did not remove the exception and would not require a disconnecting means at every motor. See panel statement on Comment 11-44 and panel action and statement on Comment 11-56.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:

AFFIRMATIVE: 15

(Log #241)

11- 197 - (430-102(b), Exception): Reject

SUBMITTER: Michael V. Glenn, Longview Fibre Co.

COMMENT ON PROPOSAL NO: 11-69

RECOMMENDATION: Reconsider panel action and reject the proposal.

SUBSTANTIATION: The originator of this proposal did not supply any substantiation of any accidents caused by using the disconnecting means required in accordance with 430-120(a) for electrical safety lockout. The originator's statement "how do you lockout a circuit breaker that is not capable of being locked out?" is an example of a controller disconnecting means that does not meet the requirements of the exemption. The exemption requires "the disconnecting means for the controller is individually capable of being locked in the open position." The submitter questioned who has authority to lock and unlock a disconnect. This type of requirement is adequately covered by existing laws, safety procedures, NFPA 70E requirements, and the Federal Law

Regarding lockouts. OSHA Regulations (Standards - 20 CFR) "The control of hazardous energy (lockout/tagout) - 1910.147" establishes the minimum requirement for safety lockout and tagout of all energy sources including electrical. Both OSHA and NFPA 70E provide for the correct and safe procedures to lock or tag electrical equipment. The procedures for removing a lock are covered by these codes. In the submitter's substantiation, it sounds like these procedures were followed when the electrician was notified and warned of the intended removal of his lock.

Using the disconnecting means required in 430-120(a) is a proven safe method of lock out. This is substantiated by many safe years with no accidents. Only when the law is violated has there been a problem. The submitter's statement that this change would be "at a very minor incremental cost to the owner" is incorrect. At our industrial facility we have approximately 8,000 AC and DC motors. We purchase the latest type of motor control centers with lockable devices just for the purpose of lockout and tagout. Installing disconnects in the field for every motor will increase building space and size requirements to provide the necessary space that does not interfere with operations but yet is in sight of the motor. For industrial type processes and equipment that must be coordinated and interlocked, it will require not only an interlocking scheme at the controller but at the disconnect as well. This will substantially increase the installed cost and the complexity of the equipment. This proposed requirement has a very significant impact not only on cost, but also in real estate required. I realize that cost is no substitute for safety. However, in this particular case the additional cost is not warranted when there is a proven safe means of lockout.

There are many more good reasons to use the disconnect required in 430-102(a) as the lockout device rather than a disconnect within sight of the motor. The controller disconnect is a proven safe lockout means. The controller disconnect allows for determining if the controller is open prior to opening or closing the circuit to the motor. It would be unwise to open or close a disconnect at the motor without knowing the state of the controller because the controller may be in the closed position and the motor could inadvertently start if the disconnect is closed. There are many automatic processes and equipment that for safety reasons that cannot and should not have an individual motor de-energized without shutting down the process or the equipment as a whole. Using a disconnect at the motor in lieu of the controller disconnect bypasses all safety interlocking schemes.

I strongly request the panel reconsider its action and reject this proposal based on inadequate substantiation supporting this requirement, a significant financial impact on the user, and the increased industrial safety risks just mentioned. The need for a field disconnect within sight of the motor is an engineering design consideration and safety issue that should be left to the requirement of the user and not dictated by code.

Considering that industrial facilities have their own maintenance force, purchase equipment that presently meet the requirement of the exemption in Article 430-102(b), have processes and environments that cannot tolerate a disconnect at the motor, and are more equipped to handle safety and lockout procedures, the following compromise may serve the purpose of both industry and the submitter: Change Article 430-102(b) Exemption to read as follows: "Exception: In an industrial facility or plant, a disconnecting means...". The addition of the words "In an industrial facility or plant," limits the use of this procedure to those larger facilities that are manned, organized and have better lockout and tagout control.

PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Comment 11-44.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #250)

11- 198 - (430-102(b), Exception): Reject
SUBMITTER: Louis Ward, Smurfit-Stone Container Corporation
COMMENT ON PROPOSAL NO: 11-69
RECOMMENDATION: Reconsider panel action and reject the proposal.
SUBSTANTIATION: The person submitting this proposal obviously has not received mandatory training pertaining to the 1910 OSHA Guide Sections 147 and 331-333, which cover among other things, proper lockout procedures. The answers to his questions are contained within these sections. He also did not cite any instances, where injuries were incurred by someone utilizing the lockout means required by Section 430-120(a), only an uncomfortable feeling (which may well be lack of required training).

Placing a local disconnect in sight of each motor, to be used for lockout, poses special safety concerns in an industrial facility. The lockout procedures at our plant require that after a switch is pulled off, a qualified electrician must prove with electrical measuring devices that the power has indeed been interrupted. (We have had incidences in the past where a switch handle has been pulled to the off position and the switch did not open electrically). How will the person pulling a field-mounted switch know the status of the motor contactor? (Pulling a switch underload is not a good idea and should only be done in an emergency). Placing a lockout switch in the field, would encourage unqualified personnel to attempt their own lockout or to simply forego lockout entirely, since they would be in sight of the switch feeding a motor and "feel" in control. An additional safety consideration pertains to automated processes. Most automated processes are interlocked to insure that all equipment starts or stops in a certain sequence due to process and safety requirements. Placing a means of circumventing these interlocks (i.e., the local lockout switch) in the field could potentially result in a hazardous condition due to process upset. Finally, placing switches in the field for lockout of large 2300 Volts or 4160 Volts motors, simply isn't safe or in some cases possible, due to existing space limitations.

Existing OSHA and NFPA 70E regulations have provided proven safe procedures and means for insuring the zero-energy status of electrical equipment and its lockout. If anyone has been injured due to improper lockout, it is because these procedures "laws" have been ignored or violated. I strongly urge the panel to reject this proposal based on the concerns itemized above.

PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Comment 11-44.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #258)

11- 199 - (430-102(b), Exception): Reject
SUBMITTER: Walter Bruehl, Boise Cascade Corporation
COMMENT ON PROPOSAL NO: 11-69
RECOMMENDATION: Reconsider panel action and reject the proposal. Leave this section as it appears in the 1999 code.
SUBSTANTIATION: NEC Section 430-102(b) Exception is fundamental to our lockout/tagout policy and procedure. All of our lockouts for process motors are done at the motor controller. Only a few simple stand-alone machines have local disconnects. Many of our systems have multiple sources of energy that must be verified at zero energy and locked out before the equipment can be safely worked on. In addition to a single motor there are often other motors, compressed air, steam, various fluids and other sources of energy that must be secured, locked out and verified as having zero energy and no chemicals or other hazards to the worker prior to working on the equipment. We require the lockout of the entire "system" to be complete prior to work beginning. Employee violation of this policy can result in disciplinary action including loss of employment.

The proposed change to require a local disconnect switch at the motor may result in a greater hazard to the worker by tempting the worker to short cut the lockout process that assures that all hazards are put in a safe condition prior to work. They may simply throw the local switch and forget about the other hazards associated with the equipment. Further, when the local switch is closed the machinery may restart in an undesired condition and result in additional damage or confusion.

The controls for most of our machinery would need to be modified in a manner to protect the machine and workers from an individual inadvertently opening a local disconnect switch prior to safely shutting down the machine or process and safely securing it.

Some motor driven equipment is in hazardous, corrosive or wet environments. It is desirable to keep the number of electrical components in these environments to a minimum due to the difficulty maintaining the integrity of the enclosure and its internal components under these conditions. A field mounted disconnect switch in a hazardous environment would need to be rated for the environment to avoid introducing an explosive hazard.

The author of the proposal to eliminate this exception may not be aware of the additional hazards introduced in the process industries by requiring local disconnects. These additional disconnect switches are unnecessary and undesirable from a safety standpoint in the process industries.

PANEL ACTION: Reject.

PANEL STATEMENT: Leaving the exception unchanged would not include the panel action on Proposal 11-70. See panel statement on Comment 11-44.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #277)

11- 200 - (430-102(b), Exception): Reject
SUBMITTER: Robert Huddleston, Jr., Gray, TN
COMMENT ON PROPOSAL NO: 11-69
RECOMMENDATION: Do not delete the exception in 430-102(b).
SUBSTANTIATION: Lock and tag procedures and policies adequately assure the safety of a motor lockout without the requirement of a local disconnect. While it may be less convenient to have to walk to an electric room to de-energize, lock and tag - it is no reduction in safety period. There is no substantiation that this costly change would increase safety.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel action on the proposal modified the existing exception, but did not delete it. See panel statement on Comment 11-44 and panel action and statement on Comment 11-56.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #316)

11- 201 - (430-102(b), Exception): Reject
SUBMITTER: Caroll Flournoy, Longview, TX
COMMENT ON PROPOSAL NO: 11-69
RECOMMENDATION: Please reverse the panel's decision to accept in principle the recommendation by Frank Pologruto to delete the exception in 430-102(b), Log 2926.
SUBSTANTIATION: My own experience is with companies that strictly adhere to OSHA lockout/tagout procedures where there is no possibility that an individual electrician's lock would be removed from the remote switch. Removing this exception will place an onerous and unwarranted penalty on industrial facilities that are complying with the law.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel action on the proposal modified the existing exception, but did not delete it. See panel statement on Comment 11-44 and panel action and statement on Comment 11-56.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #467)

11- 202 - (430-102(b), Exception): Reject
SUBMITTER: Anthony L. Sherrill, Batesville, AR
COMMENT ON PROPOSAL NO: 11-68
RECOMMENDATION: The panel should have rejected the proposal.
SUBSTANTIATION: • The code panel realized that this proposal was not practical in many applications. The wording in the panel's revised exception makes this proposal unenforceable. Each application could be argued as impracticable or as adding additional hazards. Every location where the local disconnect is added could present additional hazards because it could expose unqualified personnel to live circuits. Also, if more expensive "Load Break Disconnects" are not installed, additional hazards are introduced by the possibility of unqualified personnel operating the disconnects under load. If this were truly a safety issue, there should not be thousands of applications where the requirement is impracticable.

• Based on the substantiation, this proposal was written mainly for convenience. The submitter describes "working the equipment Hot" when the distance is "excessive". This is an obvious violation of OSHA standards. As already stated in the "Explanation of Negatives", the NEC is written to provide an installation free from hazards, not for convenience. This proposal is too costly to implement for convenience.

• OSHA Lockout/Tagout procdures, when properly followed, have proven adequate for many years in the chemical industry. The example in the substantiation is a severe violation of this standard. As qualified electricians, we are expected to follow OSHA safety standards. The additional local disconnect will not necessarily protect those who choose not to follow established safety standards.

• I am only familiar with working in the chemical industry where OSHA regulations are strictly enforced. If this proposal was accepted because of areas where these regulations are not strictly enforced, there should at least be an exception for areas where the conditions of maintenance and supervision esure that only qualified personnel utiziling the OSHA Lockout/Tagout procedures perform maintenance on the equipment.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Comment 11-44.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #470)

11- 203 - (430-102(b), Exception): Reject
SUBMITTER: John Leibee, PPG Industries
COMMENT ON PROPOSAL NO: 11-69
RECOMMENDATION: Leave existing text in NEC 1999 "430-102(b) Exception" as it stands.
SUBSTANTIATION: The substantiation for Proposal 11-69 is first based on circuit breakers that can't be locked out and secondly on personnel violating Lock and Tag procedure. A lot of time and imagination has been spent developing ways of locking out "unlockable" circuit breakers. These devices are available and should be part of the planning of a job. Violations of Lock and Tag Procedure can take place no matter where the disconnect is located. As a matter of fact if the disconnect is "within sight" the worker does not even have to lock it out. This poses a more serious threat because the disconnect can be closed while the workers' back is turned or while he is at break or lunch. This just happened in our area and resulted in a fatality.
PANEL ACTION: Reject.
PANEL STATEMENT: Leaving the exception unchanged would not include the panel action on Proposal 11-70. See panel statement on Comment 11-44.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #551)

11- 204 - (430-102(b), Exception): Reject
SUBMITTER: Robert A. McCullough, Ocean County Construction Insp. Dept., NJ
COMMENT ON PROPOSAL NO: 11-70
RECOMMENDATION: Revise panel action as follows:
The provision for locking or adding a lock to the disconnecting means shall ~~be permanently~~ remain installed on or at the switch or circuit breaker used as the disconnecting means when the equipment is returned to service.
SUBSTANTIATION: It is unclear if the panel action would allow any type of field installed lock-out accessory by its use of the word "permanent". It would appear that the submitter by his statement that permanent provisions are readily available from manufacturers, in his substantiation, was referring to the type of handle clip that is installed on the breaker and held in place by the panel cover. Is this the type of provision that the panel was thinking of, or does this change require the use of some sort of prefabricated assembly that is a part of the enclosure cover or deadfront? It would seem that the intent was to disallow the truly portable type that the worker carries with him or her, attaches to the breaker handle while working on the equipment and then completely removes when done. This is borne out by the last sentence in the substantiation which says that only a lock is needed to work safely. The suggested language may help to clarify this issue.
PANEL ACTION: Reject.
PANEL STATEMENT: The proposed text would apply only after some service operation. It is intended that the provision for locking be permanently installed at the time the disconnecting means is installed.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #599)

11- 205 - (430-102(b), Exception): Reject
SUBMITTER: John E. Propst, Equilon Enterprises, LLC
COMMENT ON PROPOSAL NO: 11-69
RECOMMENDATION: The purpose for this comment is to reject the action of the panel, and to reject the original proposal.
SUBSTANTIATION: As noted in the negative comments of Mr. Cox, Mr. Hamer, and Mr. Saunders, there are serious concerns about the enforceability and resulting safety of the proposed wording, and the submitter has not provided any substantiation of a problem that cannot already be effectively addressed through the application of the safety requirements of NFPA 70E.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Comment 11-44.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #650)

11- 206 - (430-102(b), Exception): Reject
SUBMITTER: Robert L. Hughes, Chattanooga, TN
COMMENT ON PROPOSAL NO: 11-68
RECOMMENDATION: Leave the current exception in 430-102(b) that states:
Exception: A disconnecting means, in addition to the controller disconnecting means as required in accordance with Section 430-102(a), shall not be required for the motor where the disconnecting means for the controller is individually capable of being locked in the open position.
SUBSTANTIATION: Removing this exception to 430-102(b) will result in astronomical and unnecessary costs to industrial users where the NEC is applied. The substantiation the proposer uses is not valid. The notion that a worker might choose to not spend the time or effort to walk to the disconnecting means to open the circuit and choose to work the circuit "hot" means that worker is really dumb and the worker is also violating the requirements of OSHA 1910 subpart S, OSHA 1910-147, and NFPA 70E. Industrial users have been applying the NEC 430-102(b) exception and have not experienced any problems derived from its application. The purpose of the NEC is for the "practical safeguarding of persons and property from hazards arising from the use of electricity". It is not intended to replace intelligence and common sense in people. The introduction of another disconnecting means in the motor circuit will add one more device that can fail, can be wired incorrectly, can fault to ground, and can be operated by unqualified persons.
PANEL ACTION: Reject.
PANEL STATEMENT: Leaving the exception unchanged would not include the panel action on Proposal 11-70. See panel statement on Comment 11-44.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #651)

11- 207 - (430-102(b), Exception): Reject
SUBMITTER: Robert L. Hughes, Chattanooga, TN
COMMENT ON PROPOSAL NO: 11-69
RECOMMENDATION: Leave the current exception in 430-102(b) that states:
Exception: A disconnecting means, in addition to the controller disconnecting means as required in accordance with Section 430-102(a), shall not be required for the motor where the disconnecting means for the controller is individually capable of being locked in the open position.
SUBSTANTIATION: Removing this exception to 430-102(b) will result in astronomical and unnecessary costs to industrial users where the NEC is applied. The substantiation the proposer uses is not valid. The notion that a worker might choose to not spend the time or effort to walk to the disconnecting means to open the circuit and choose to work the circuit "hot" means that worker is really dumb and the worker is also violating the requirements of OSHA 1910 subpart S, OSHA 1910-147, and NFPA 70E. Industrial users have been applying the NEC 430-102(b) exception and have not experienced any problems derived from its application. The purpose of the NEC is for the "practical safeguarding of persons and property from hazards arising from the use of electricity". It is not intended to replace intelligence and common sense in people. The introduction of another disconnecting means in the motor circuit will add one more device that can fail, can be wired incorrectly, can fault to ground, and can be operated by unqualified persons.
PANEL ACTION: Reject.
PANEL STATEMENT: Leaving the exception unchanged would not include the panel action on Proposal 11-70. See panel statement on Comment 11-44.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #736)

11- 208 - (430-102(b), Exception): Reject
SUBMITTER: Robert B. Alexander, Fluor Daniel
COMMENT ON PROPOSAL NO: 11-70
RECOMMENDATION: Continue to accept in principle and convert the exception to positive text as follows:
~~A disconnecting means, in addition to t~~The controller disconnecting means as required in accordance with 430-102(a) shall ~~not~~ be ~~required for~~ permitted to serve in lieu of a separate ~~the~~ motor ~~where the~~ disconnecting means ~~for~~ where the controller disconnecting means is ~~individually~~ capable of being locked in the open position. The provision for locking or adding a lock to the controller disconnecting means shall be permanently installed on or at the switch or circuit breaker used as the controller disconnecting means.
It would then read:
The controller disconnecting means as required in accordance with 430-102(a) shall be permitted to serve in lieu of a separate motor disconnecting means where the controller disconnecting means is capable of being locked in the open position. The provision for locking or adding a lock to the controller disconnecting means shall be permanently installed on or at the switch or circuit breaker used as the controller disconnecting means.
SUBSTANTIATION: The exception is, in fact, most commonly the rule. This comment converts it to positive text.
PANEL ACTION: Reject.
PANEL STATEMENT: The recommended text would require all controller disconnecting means to be capable of being locked in the open position, regardless of the location of the disconnecting means.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #813)

11- 209 - (430-102(b), Exception): Reject
SUBMITTER: William D. Glover, New Martinsville, WV
COMMENT ON PROPOSAL NO: 11-69
RECOMMENDATION: Reject the proposal.
SUBSTANTIATION: The substantiation offered for this proposal, concerning a circuit breaker that cannot be locked, is based on an incorrect premise. The existing wording of the exception in 430-102(b) does not eliminate the requirement for a disconnect in sight of the motor in situations where the disconnecting means for the controller cannot be locked in the open position. Therefore, the existing wording adequately covers this situation.
The existing wording of 430-102(b) provides requirements for motor circuit installations to have a disconnecting means that is capable of being locked in the open position. The requirement for lockout/tagout procedures and the application of these procedures is not the domain of the NEC. NFPA-70E and OSHA clearly deal with these issues. Employers and employees must be familiar with and adhere to the requirements of these standards for the safe maintenance of motor circuits.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Comment 11-44.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #870)

11- 210 - (430-102(b), Exception): Accept in Principle
SUBMITTER: Stewart Church, BAYER Corporation
COMMENT ON PROPOSAL NO: 11-69
RECOMMENDATION: Keep the exception, but add the introductory qualifying phrase "Where conditions of maintenance and supervision ensure that only qualified persons will service the systems,".
SUBSTANTIATION: Commercial and industrial electricians are well-practiced in lock-out/tag-out requirements. Proper usage of this practice at the controller disconnecting means provides a satisfaction similar to visually seeing the locked-out device. Furthermore, in a multi-load combination control panel serving complex, multi-motor machinery, it is far more gratifying and less hazardous to lock-out/tag-out the main disconnect for the entire machine (or Line) being serviced. The installation cited in the second paragraph of the original substantiation appears to be lacking in the "supervision" category, to allow cutting off of another person's lock.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Comment 11-56.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #871)

11- 211 - (430-102(b), Exception): Accept in Principle
SUBMITTER: Stewart Church, BAYER Corporation
COMMENT ON PROPOSAL NO: 11-68
RECOMMENDATION: Keep the exception, but add introductory qualifying phrase "Where conditions of maintenance and supervision ensure that only qualified persons will service the systems,".
SUBSTANTIATION: Commercial and industrial electricians are well-practiced in lock-out/tag-out requirements. Proper usage of this practice at the controller disconnecting means provides a satisfaction similar to visually seeing the locked-out device. Furthermore, in a multi-load combination control panel serving complex, multi-motor machinery, it is far more gratifying and less hazardous to lock-out/tag-out the main disconnect for the entire machine (or line) being serviced.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Comment 11-56.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #989)

11- 212 - (430-102(b), Exception): Reject
SUBMITTER: Jon C. Anderson, Cognis Corporation
COMMENT ON PROPOSAL NO: 11-69
RECOMMENDATION: The Panel should reject this proposal.
SUBSTANTIATION: At our plant, if you can't lock out a rare breaker, disconnect, etc. you remove the wires if that is the only sure way of isolation.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Comment 11-44.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #1184)

11- 213 - (430-102(b), Exception): Reject
SUBMITTER: Tim Fisher, Sr., Cognis Corporation
COMMENT ON PROPOSAL NO: 11-69
RECOMMENDATION: The Panel should reject this proposal.
SUBSTANTIATION: This proposal should be rejected by the panel. Federal Regulations are currently in place (OSHA 1910.147 and NFPA 70E) that require a disconnecting mechanism(s) be installed that allows a mechanic to lockout/tagout all sources of energy to a piece of equipment before working on that equipment. Requiring an additional means of disconnecting the power to a motor is not only cost prohibitive but it also introduces another possible failure point to that circuit. If the concern is for the safety of the mechanic on the job, which it certainly should be, it is more important to train these workers on the contents of the aforementioned regulations and ensure enforcement thereof, then it is to add disconnects.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Comment 11-44.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #1519)

11- 214 - (430-102(b), Exception): Reject
SUBMITTER: Rich Frey, Cognis Corporation
COMMENT ON PROPOSAL NO: 11-69
RECOMMENDATION: The panel should reject this proposal.
SUBSTANTIATION: The exception in 430-102(b) should remain unchanged. Permanent Manufacturer Lockouts are available, and should be installed on all breakers, to safely serve as disconnects. The OSHA Lockout/ Tagout procedure provides safe working conditions for personnel. Removing a tag and lock without notification to the tag owner, is in direct violation of OSHA safety procedures.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Comment 11-44.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #1523)

11- 215 - (430-102(b), Exception): Reject
SUBMITTER: Robert B. Alexander, Fluor Daniel
COMMENT ON PROPOSAL NO: 11-68
RECOMMENDATION: Reject the proposal.
SUBSTANTIATION: A reading of Part IX of the draft indicates that a disconnecting means "in sight" of the motor is not necessarily required to be lockable. In fact, under the proposed conditions neither disconnecting means is required to be lockable. Therefore, the proposed change is inherently less safe than the current requirements since having a disconnect "in sight" does not mean the worker will always be paying attention to its status or that the disconnecting means could not be inadvertently closed.
The commentor is aware that most devices suitable for motor disconnecting means are lockable, however, it would not be a requirement under the current proposal. Adding a requirement that the "in sight" disconnect be lockable at this stage of the code making process is "new material."
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Comment 11-44.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #1901)

11- 216 - (430-102(b), Exception): Accept in Principle
SUBMITTER: Michael I. Callanan, International Brotherhood of Electrical Workers
COMMENT ON PROPOSAL NO: 11-69
RECOMMENDATION: Continue to accept in principle.
SUBSTANTIATION: The panel action on proposal 11-68 did satisfy the intent of the submitter by requiring a disconnect within sight of the motor.
Typical maintenance procedures do not widely include a working lockout/tagout program. In addition situations such as large distances or different levels are inconvenient for maintenance/service personnel, leading to unsafe work practices. The addition of a disconnect within sight of the motor will not result in a large cost to the owner. However the addition of this disconnect will result in a tremendous increase in safety for all persons involved in the maintenance/repair of the equipment. The negative comment of Mr. Cox states that "It could also be argued that the addition of a local disconnect increases the hazards to persons or property for every installation" is certainly without merit. This proposal is directed towards an increase in safety for persons. This change will not in any case decrease the level of

safety presently required in the NEC. Negative comments, which were directed towards the application of a lockout/tagout program, are not sufficient reason to reject this proposal. This code does not require a lockout/tagout program nor should the members of CMP-11 assume that all maintenance/service personnel apply the lockout/tagout provisions of applicable OSHA standards. This is a safety driven proposal, which is directly in tune with the purpose of the NEC which "is the practical safeguarding of persons and property from hazards arising from the use of electricity."

This comment represents the official position of the International Brotherhood of Electrical Workers Codes & Standards Committee.

PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Comment 11-56.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #1902)

11- 217 - (430-102(b), Exception): Accept
SUBMITTER: Michael I. Callanan, International Brotherhood of Electrical Workers
COMMENT ON PROPOSAL NO: 11-70
RECOMMENDATION: Continue to accept in principle.
SUBSTANTIATION: The submitter's substantiation clearly explains the need for this change. Permanent provisions for the application of a lock on switches and circuit breakers used as a motor disconnect will provide maintenance personnel with the ability to readily lockout the source of supply to the motor.

This comment represents the official position of the International Brotherhood of Electrical Workers Codes & Standards Committee.

PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #2187)

11- 218 - (430-102(b), Exception): Reject
SUBMITTER: Mark Goodman, BP (ARCO)
COMMENT ON PROPOSAL NO: 11-70
RECOMMENDATION: This comment supports the proposal and panel action modification of the text to the 430-102(b) Exception in the existing 1999 NEC, instead of the text as modified in the Panel Action of Proposal 11-68.
SUBSTANTIATION: The proposed addition to the Exception requiring a permanently installed means for locking the controller clarifies the requirements of the 430-102(b) Exception. The Panel Action wording meets the intent of the proposer using positive language.

Proposal 11-68 should be rejected, and the wording of 11-70, as modified by the Panel Action, should be added to the 430-102(b) Exception as worded in the 1999 NEC.

PANEL ACTION: Reject.
PANEL STATEMENT: The substantiation does not explain why proposal 11-68 should be rejected.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #1408)

11- 219 - (430-102(b) Exception No. 2): Reject
SUBMITTER: Kari Barrett, American Chemistry Council
COMMENT ON PROPOSAL NO: 11-67
RECOMMENDATION: The panel should have rejected the proposal.
SUBSTANTIATION: The submitter did not provide any evidence that a problem exists with the present wording.
PANEL ACTION: Reject.
PANEL STATEMENT: The Panel assumes the submitter intended to reference Section 430-102(a). See Panel Statement on comment 11-46.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #340)

11- 220 - (430-109(A)(6)): Reject
SUBMITTER: Gordon T. Davis, Moeller Electric Corp.
COMMENT ON PROPOSAL NO: 11-75
RECOMMENDATION: Motor Disconnects are suitable for use on the lineside of fuses, based on the same objective criteria used to evaluate other types of disconnecting means. Restriction of the use of motor disconnects to the loadside of fuses reduces the safety of some assemblies, as most motor disconnects have recessed terminals, making them finger safe. It is our understanding that Code Panel 11 has concerns regarding the use of motor disconnects in service entrance installations. In order to address those concerns and to reach a consensus we propose the following wording to 430-109(A)(6):

"Motor disconnects may only be used on the lineside of fuses in listed assemblies, that are not marked for use as service equipment."

SUBSTANTIATION: Code Panel 11 statement to Proposal 11-75 indicates a need for clarification of the substantiation showing the suitableness of motor disconnects installed on the lineside of branch circuit overcurrent protective devices. As everyone is aware the NEC is an ANSI consensus standard. It has been the consensus for some time that the following is used to determine the suitableness of a device in an installation, 1. Sound engineering theory, 2. Scientific evidence, and 3. Statistical data. It has also been the consensus that comments negative to sound engineering theory, scientific evidence, and statistical data would have to be explained.

Motor disconnects have been proven suitable for use on the lineside of fuses by sound engineering theory, by scientific test programs, and by statistical data. Code Panel 11 restriction of motor disconnects from the lineside of fuses has gone unexplained in light of empirical evidence.

1. The basis for the dielectric values of motor disconnects used on the lineside of fuses is Insulation Coordination. This engineering theory is accepted in the USA (UL 840 and NEMA ICSI Annex A) as well as throughout the world (IEC 664). Code Panel 11 restriction of such motor disconnects (i.e., having UL 508 spacings and using Insulation Coordination to determine dielectric values) to the load side of fuses has the effect of compelling constructional requirements to product standards.

Code Panel 11 is choosing one design of a product (measured clearances) over another (insulation coordination dielectric values). It is my understanding that the NEC is an installation standard and such a compulsion of design is beyond the scope of the standard. Code Panel 11 has provided no refutation of the sound engineering theory of insulation coordination when it restricted motor disconnects to the load side of fuses.

2. The scientific evidence of the suitableness of motor disconnects used on the line side of fuses consists of test programs developed by Nationally Recognized Testing Laboratories, most notably UL. These test programs have shown that motor disconnects are suitable for use on the line side of fuses, using the same tests that Code Panel 11 had found suitable for other disconnects providing the same function. Code Panel 11 has not shown that the tests performed were inadequate for motor disconnects, especially when the Panel finds the same tests adequate for other disconnects.

3. Motor disconnects (UL 508 manual controllers which are tested to UL 98) have a significant history of use in the USA, over a decade of continuous use. There is no statistical evidence to show that when used within their ratings they fail at a greater rate than other disconnecting means, nor are there any reports of failures leading to a hazard. Indeed, the evidence would rather indicate that these motor disconnects are no less safe than other disconnecting means and may even provide a greater degree of safety due to inherent protective design features with respect to electric shock hazards. We would point out that Code Panel 11 did not make reference to any statistics that would have supported their action to restrict motor disconnects to the load side of branch circuit overcurrent protective devices.

All of the engineering, empirical, and objective evidence would indicate that motor disconnects are suitable to be used on the lineside of branch circuit overcurrent protective devices. There should be an obligation to reveal any evidence to the contrary. As stated previously, there are many motor disconnects used on the lineside of fuses in the USA and throughout the world. If Code Panel 11 or any individual on Code Panel 11 has any knowledge that motor disconnects are not suitable for this purpose then that evidence should be revealed so that users of motor disconnects may take appropriate remedial action.

It has been alleged that large spacings in field wiring terminals are required for maintenance purposes. To our knowledge, this also has not been substantiated by any scientific or statistical data.

Indeed, such assertions run counter to a growing demand in the field for these products and the successful application of numerous UL 508 motor disconnect devices already in service.

As best as we can understand Code Panel 11 feels uncomfortable about the use of motor disconnects in service entrance applications. It was for that reason that we indicated in our proposal that motor disconnects (UL 508 manual controllers tested to UL 98) are constructionally limited to 100 amps and less by the size of their field terminals. Almost all of these devices are used in industrial control panels where they can provide a degree of protection against unintentional contact with live parts; most motor disconnects are fingersafe or back of hand safe.

As a means of further addressing the concerns of Code Panel 11 and reaching a consensus we propose the additional wording:

"Motor Disconnects may only be used on the lineside of fuses in listed assemblies that are not marked for use as service equipment."

PANEL ACTION: Reject.

PANEL STATEMENT: Manual motor controllers were allowed into Section 430-109 (a)(6) in the 1999 Code cycle even though they have lesser creepage and clearances than UL 98 switches or UL 489 circuit breakers because the line side branch circuit overcurrent device is there to protect it if arcing were to occur. This proposal would allow these devices to be installed without overcurrent protection.

The tests referred to do not address line side spacings.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:

AFFIRMATIVE: 15

(Log #123)

15- 10 - (430-113 Exception No. .3 (New)):

Note: It was the action of the Technical Correlating Committee that Proposal 11-79 be reported as "Reject" because Code-Making Panel 15 has appropriately handled the exemption of fire pumps from 430-113 in Proposal 15-85.

SUBMITTER: Technical Correlating Committee National Electrical Code

COMMENT ON PROPOSAL NO: 11-79

RECOMMENDATION: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 15 for action in Article 695. This exemption to a Chapter 4 requirement should be located in the Chapter 6 article. This action will be considered by the Panel as a Public Comment.

SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.

PANEL ACTION: Accept.

PANEL STATEMENT: The panel addressed the concern in the action on Proposal 15-85.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 18

VOTE ON PANEL ACTION:

AFFIRMATIVE: 18

(Log #291)

11- 221 - (430-120(b)): Reject

SUBMITTER: Douglas J. Lauer, Boise Cascade Corporation

COMMENT ON PROPOSAL NO: 11-68

RECOMMENDATION: Reconsider panel action and reject proposal. Leave wording as in 1999 NEC.

SUBSTANTIATION: The originator lists "two serious safety issues." The first is that "when the distance is excessive, workers attempt to work the equipment "hot", rather than walk the distance four times." This substantiation is invalid since OSHA and NFPA 70E violations (particularly lockout/tagout) have occurred. NFPA 70E referenced by OSHA states lockout/tagout is required without mention of distance. The second "concerns the worker who gets "hung-up" and the disconnecting means is not within sight." Workers will not become "hung-up" if lockout/tagout rules and procedures are followed. Being within sight does not mean readily accessible, and will not provide for a safe and reliable method of disconnecting in a "hung-up" situation.

The originator does not substantiate any accidents. Most accidents relating to disconnecting means are a result of failure to follow lockout/tagout procedures. A lock on a disconnecting means and following designated safety procedures is the only way to be certain that the machinery is isolated from energy sources, regardless where the lock is. Also workers will not be looking at the disconnecting means the entire time they are performing the work at hand and therefore in sight is irrelevant.

Within sight does not mean a short travel distance, the disconnecting means can be on the opposite side of a conveyor, in sight, and visually ten feet away, but it may be 200 feet of travel distance to get to a safe crossover point and access the disconnecting means.

The originator also states that "This proposal will reduce accidental injuries and death, at very minor incremental cost to the owner." I work for a company that has one of the lowest incident rates in the wood products industry. We commonly install disconnects and safety procedures for equipment that requires frequent lockout/tagout. We never discount safety! When we install disconnects we use a common sense approach and look at the workers access to the disconnecting means in preparing to do the work safety. Often this common sense approach will locate the disconnecting means not within sight of the motor but more often along the route to access the work and/or at a disconnect station where many motors can be locked out to secure a work area. This proposal does not increase the level of safety, nor does it guarantee a convenient disconnecting means; at best it decreases the amount of time to lockout/tagout. As for "minor incremental cost", the cost of a disconnect is relatively cheap, but the installation and additional building area required commonly are significant.

Opening or closing a disconnecting means is not a safe operation without knowing the status of the controller. Therefore locking out at the controller is typically the safest since the status of the controller is easily determined.

PANEL ACTION: Reject.

PANEL STATEMENT: See panel statement on Comment 11-2.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:

AFFIRMATIVE: 15

(Log #734)

11- 222 - (430-120(b)): Reject

SUBMITTER: Robert B. Alexander, Fluor Daniel

COMMENT ON PROPOSAL NO: 11-68

RECOMMENDATION: Reject the proposal.

SUBSTANTIATION: • This proposal lacks sufficient substantiation. There is no offer for public review in either the proposal or the panel statement that establishes how many deaths or injuries, if any, would be prevented by requiring local disconnects where current installation requirements are met and safe work practices are followed.

• The assertion that current requirements are unsafe is based on the willful disregard of safe working practices.

• It is not the intent of the disconnecting means to protect a worker from being "hung up". Should it be necessary, that is the function of a local operator of the motor controller, such as an emergency push button or conveyor trip wire.

• The FPN is meaningless. A designer cannot appeal to the fine print note with certainty that it would be accepted by an authority having jurisdiction. Proper enforcement would require that the authority having jurisdiction demand that it be demonstrated that a local disconnect either could not be installed or that it would increase danger. Some jurisdictions view this from an economic perspective, which is improper if it is truly a safety issue, some do not. In any case, it is likely to be inconsistently enforced which makes it bad code.

• Splices and terminations are typically the "weak link" in electrical installations. For any installation this requirement would increase the number of terminations by two and for typical three-phase industrial systems by six; therefore this proposal is dictating a less reliable system.

• New Section 80-9(B) states: "Existing electrical installations that do not comply with the provisions of this code shall be permitted to be continued in use unless the authority having jurisdiction determines that the lack of conformity with this code presents an imminent danger to occupants." If the lack of a local disconnect did not constitute imminent danger in these cases, then there was no need for it in the first place.

PANEL ACTION: Reject.

PANEL STATEMENT: See panel statement on Comment 11-44.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:

AFFIRMATIVE: 15

(Log #124)

11- 223 - (430-121):

Note: It was the action of the Technical Correlating Committee that the Panel Action text be rejected and Proposal 11-80 be rejected, and the last sentence of 430-121 in the 1999 NEC be deleted to comply with 4.1 of the NEC Style Manual.

SUBMITTER: Technical Correlating Committee National Electrical Code

COMMENT ON PROPOSAL NO: 11-80

RECOMMENDATION: The Technical Correlating Committee directs that the Action on this Proposal be rewritten to comply with the NEC Style Manual relative to referencing entire articles. This action will be considered by the Panel as a Public Comment.

SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.

PANEL ACTION: Accept.

Make the second sentence of 430-121, as accepted by the panel action on Proposal 11-80, a FPN.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:

AFFIRMATIVE: 15

(Log #125)

11- 224 - (430-145): Accept

SUBMITTER: Technical Correlating Committee National Electrical Code

COMMENT ON PROPOSAL NO: 11-82

RECOMMENDATION: The Technical Correlating Committee directs that the Action on this Proposal be rewritten to comply with the NEC Style Manual relative to referencing entire articles. This action will be considered by the Panel as a Public Comment.

SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.

PANEL ACTION: Accept.

In 1999 NEC text, change "Article 250" to "Part E of Article 250".

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:

AFFIRMATIVE: 15

(Log #390)

11- 225 - (430-145): Accept in Part

SUBMITTER: Dan Leaf, Palmdale, CA

COMMENT ON PROPOSAL NO: 11-82

RECOMMENDATION: Accept in Principle revised:

Where used ~~required~~ ground shall be ~~done in the manner specified in Article 250~~ in accordance with applicable provisions of Part E of Article 250.

SUBSTANTIATION: Grounding is a safety issue whether required or not. If not done according to minimum requirements of Article 250 anything goes. Where not "required", this section does not invoke rules of Article 250.

PANEL ACTION: Accept in Part.

Accept only the change to reference Part E of Article 250.

PANEL STATEMENT: The submitter has not explained the potential hazard involved, as requested by the panel.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:

AFFIRMATIVE: 15

(Log #2318)

11- 226 - (430-145(b)): Reject

SUBMITTER: William M. Lewis, Eli Lilly and Co.

COMMENT ON PROPOSAL NO: 11-84

RECOMMENDATION: Reject the proposal.

SUBSTANTIATION: I am uncertain as to the origin of this requirement, however I doubt that the original intent was as stated in the substantiation. I suspect that the original intent was to only allow remote location of the connection box only if the leads were AWG 10 or smaller. (Although off hand I do not understand the technical justification for this cut off point). The effect is to limit the size of motor which could have the connection box remote. To require each strand be smaller than AWG 10 strikes me as a silly requirement for a nonexistent problem.

PANEL ACTION: Reject.

PANEL STATEMENT: The substantiation for the proposal correctly states the intent, which is to provide a vibration tolerant installation. Limiting each strand to No. 10 or smaller does not limit the size of the motor that can have a remote connection box.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:

AFFIRMATIVE: 15

(Log #447)

11- 227 - (430-152): Hold

Note: The Technical Correlating Committee understands that the "Hold" applies to Comments 11-30 and 11-227, and not to Proposal 11-89.

SUBMITTER: R. L. Nailen, Hales Corners, WI

COMMENT ON PROPOSAL NO: 11-89

RECOMMENDATION: As accepted, this proposal includes specific reference to "Design E" motors. All such references should be deleted from the Code. As of Feb. 2000, NEMA has rescinded its Design E motor standard. Furthermore, no such motors were ever offered on the market by either U.S. or foreign manufacturers, as can readily be verified through NEMA. This and any other Code references to "Design E" characteristics are therefore unnecessary and inappropriate.

SUBSTANTIATION: The problem in continuing to cite a nonexistent standard in the Code is that it inevitably casts doubt on the product knowledge of the Code-Making Panel and on the currency of the Code itself. When a product has never existed except on paper, and will not exist in the future, it need not and should not be cited in a Code of practice.

PANEL ACTION: Hold.

PANEL STATEMENT: See panel statement on 11-30.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:

AFFIRMATIVE: 15

(Log #2082)

11- 228 - (430-152): Reject

SUBMITTER: Henry A. Jenkins, Wake County

COMMENT ON PROPOSAL NO: 11-85

RECOMMENDATION: None.

SUBSTANTIATION: We support Mr. Garvey in his comments made in the explanation of his negative vote.

PANEL ACTION: Reject.

PANEL STATEMENT: There is no recommendation, as required by 4-4.5(c) of the Regulations Governing Committtee Projects.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:

AFFIRMATIVE: 15

(Log #279)

11- 229 - (430-192(b)): Reject

SUBMITTER: Ronald H. Simpson, GE Company

COMMENT ON PROPOSAL NO: 11-68

RECOMMENDATION: We strongly recommend the panel reconsider its action and reject this proposal to remove exemption 430-120(b) based on inadequate substantiation supporting this requirement. The need for a disconnect in sight of the motor should be left to the need of the user and not directed by code.

SUBSTANTIATION: This is to inform you of the position of the PPIC with respect to the proposed removal of exception 430-102(b) from the NEC. The PPIC is opposed to the removal of this exception for industrial plants.

The originator of this proposal did not supply any substantiation of any accidents caused by using the disconnecting means required in accordance with 430-120(a) for electrical safety lockout. The originator's statement that workers might attempt to work the equipment "hot" rather than walk an excessive distance is vague, a generality, and a violation of the law. The originator's substantiation stating that a worker who gets "hung up" in a piece of machinery could use a disconnect as a means of getting out of trouble clearly shows a lack of understanding of all safety procedures, NFPA 70E requirements, and the Federal Law Regarding lockouts. OSHA Regulations (Standard - 20 CFR) "The Control of Hazardous Energy (Lockout/Tag out) - 1910.147" established the minimum requirement for safety lockout and tag out of all energy sources including electrical. Both OSHA and NFPA 70E presently provide for the correct and safe procedures to lock or tag electrical equipment.

Using the disconnect means required in 430-120(a) is a proven safe method of lock out. This is substantiated by many safe years with no accidents. Only when the law is violated has there been a problem. The submitter's statement that this change would be "at a very minor cost to the owner" is incorrect. The substantial cost is not warranted when there is a proven safe means of lockout.
PANEL ACTION: Reject.
PANEL STATEMENT: The reference is incorrect. See panel statement on Comment 11-44.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

ARTICLE 440 — AIR-CONDITIONING AND REFRIGERATING EQUIPMENT

(Log #1328)

11- 230 - (440-2 and 440-65): Accept
SUBMITTER: William H. King, Jr., U.S. Consumer Product Safety Commission
COMMENT ON PROPOSAL NO: 11-104
RECOMMENDATION: I support the panel action to "Accept in Principle in Part" with the additions to Section 440-2, and by adding the new Section 440-65. I further support broadening the protection devices permitted to include arc-fault circuit-interrupter protection.
SUBSTANTIATION: Panel 11 is urged to adopt the proposal as amended by the panel and reported in the ROP, and as noted above. While the explanation offered by several panel members for their negative votes has merit, i.e., the matter is a product standard issue, and product standard developers and listing organizations have not responded to this safety issue with upgraded requirements. Therefore, it is appropriate to bring the matter before the broader electrical safety community represented by the NEC Committee.

Each year CPSC identifies fires that specifically mention the power cord attached to an air conditioner as the cause. In a check of incidents reported to the CPSC for 1999, six reports clearly state that the power cord on the air conditioner started the fire. Other reports for room air conditioners mention short circuit conditions associated with the appliance, but lack more specificity. Still other reports cite an extension cord used with a room air conditioner as the cause. While there may be multiple reasons for fires with room air conditioners, the power cord is a specific part in need of improvement.

Window-mount room air conditioners are frequently used as seasonal products, often removed from window locations and stored elsewhere when not in use. Cords used on these products (typically SP-3 type construction) are not designed to withstand mechanical stress conditions encountered as part of the removal and storage process.

Of the cost-effective technologies available today, listed arc-fault circuit interrupters and leakage current detection interrupters provide a remedy for numerous causes associated with the power cord as well as some internal appliance faults that increase the risk of fire with cord-connected air conditioners.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 4
EXPLANATION OF NEGATIVE:
BUNCH: I vote negative. The substantiation for this is not well founded. Several incidents have been referenced without any forensic support that the problem was a direct result of what this proposal is addressing. This should be examined by the manufacturers and testing agencies to first verify if these reports are accurate and if so, the product should be regulated through product standards and not the NEC. This is inappropriate and in many cases will not be enforceable by the authority having jurisdiction.

CLOSSON: While the use of cord sets with leakage current detection have merit; the requirement for the construction and performance of products belongs in the end product safety standards, not in the NEC.

COX: While I agree that the LCDI is a means to enhance safety for portable cords for air conditioners, I believe this is an issue for the product standards and should not be mandated by the NEC. If portable cords are the source of some fires as indicated by the data, then it should be the responsibility and desire of the listing agency to change the standard to eliminate the hazard. The listing agency may allow other suitable methods for alleviating the safety hazard.

SAPORITA: I vote negative on the panel action. While protection of air conditioing power cords against arcing fault and overload conditions has great merit, the proposed solution to remedy the problem is a product standards issue and should be addressed therein. The proposed requirements for LCDI and AFCI protection of specific power cords do not belong in the NEC.

Also, the inclusion of AFCI protection is new material introduced during the comment stage that has not had adequate public review. Therefore, this material should not be introduced into the 2002 NEC.
COMMENT ON AFFIRMATIVE:
HAMER: See my Affirmative Comment on Comment 11-242.

(Log #848)

11- 231 - (440-2-Leakage Current Detection and Interruption (LCDI) Protection and 440-65 Leakage Current Detection and Interruption (LCDI) and Arc Fault Circuit Interrupter (AFCI)): Accept

Note: The Technical Correlating Committee understands that the final action on this material is contained in Comment 11-242.
SUBMITTER: Larry F. Miller, National Electrical Manufacturers Association (NEMA)
COMMENT ON PROPOSAL NO: 11-104
RECOMMENDATION: Add a new definition to 440-2 as follows:

Leakage Current Detection and Interruption (LCDI) Protection. A device provided in a power supply cord or cord set that senses leakage current flowing between or from the cord conductors and interrupts the circuit at a predetermined level of leakage current.

Add a new 440-65 as follows:

Leakage Current Detection and Interruption (LCDI) and Arc Fault Circuit Interrupter (AFCI). Single-phase-cord- and plug-connected room air conditioners shall be provided with factory-installed LCDI or AFCI protection. The LCDI/AFCI protection shall be an integral part of the attachment plug or be located in the power supply cord within 300 mm (12 in). of the attachment plug.
SUBSTANTIATION: NEMA supports the Panel's action of Accept in Principle in Part with the addition of including an option for AFCI protected cord set.

A unnecessary and serious safety hazard continues to exist. An article in the March/April 2000 NFPA journal documented a room air conditione cord fire in a nursing home. Both the January/February and March/April electrical accidents section of the IAEI News also had articles on air conditioner cord fires.

Room air conditioners are used in existing homes, institutions and elderly housing which do not have requirements for AFCI protection. There are many precedents for incorporation of product and cord safety requirements in the Code. This includes:

Section 422-41 Immersion protection for cord and plug connected appliances

Section 422-45 Stands for cord-and plug-connected appliances

Section 422-46 Flatirons equipped with an identified temperature limiting means

Section 422-49 Factory installed GFCIs for High Pressure Spray Washers

Section 680-40 GFCI protection for cord-and plug-connected spas and hot tubs.

This requirement is functional in nature. It is based on the UL/CSA standards. A serious and preventable safety hazard that results in fires, injuries and deaths every year continues to exist. There are many precedents for this requirement. Economical, proven, and listed products are available that will provide the necessary safety protection.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 4
EXPLANATION OF NEGATIVE:
BUNCH: I vote negative, see my explanation of negative vote on Comment 11-230.

CLOSSON: While the use of cord connected room air conditioners provided with factory installed LCDI or AFCI protection has merit, the requirement for the construction and performance of products belongs in the end product safety standards, not in the NEC.

COX: See my Explanation of Negative on Comment 11-230.

SAPORITA: I vote negative on the panel action. While protection of air conditioing power cords against arcing fault and overload conditions has great merit, the proposed solution to remedy the problem is a product standards issue and should be addressed therein. The proposed requirements for LCDI and AFCI protection of specific power cords do not belong in the NEC.

Also, the inclusion of AFCI protection is new material introduced during the comment stage that has not had adequate public review. Therefore, this material should not be introduced into the 2002 NEC.
COMMENT ON AFFIRMATIVE:
HAMER: See my Affirmative Comment on Comment 11-242.

(Log #126)

11- 232 - (440-62(c)): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 11-101
RECOMMENDATION: The Technical Correlating Committee directs that the Panel clarify the Panel Action on this Proposal relative to the words "are supplied". This action will be considered by the Panel as a Public Comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
Revise the last sentence of the panel action on Proposal 11-101 to read as follows:
"Where the circuitry is interlocked to prevent simultaneous operation of the room air-conditioner and energization of other outlets on the same branch circuit, a cord and attachment plug-connected room air-conditioner shall not exceed 80 percent of the branch circuit rating."
PANEL STATEMENT:
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15
COMMENT ON AFFIRMATIVE:
SCHRAM: I recommend that the Technical Correlating Committee modify the revised last sentence of the text in the panel action on Proposal 11-101, as stated in the panel action on Comment 11-232, to improve the syntax, by adding "the rating of" before "a cord and attachment plug-connected room".

(Log #1347)

11- 233 - (440-65): Accept
SUBMITTER: Gale Haag, KS State Fire Marshal's Office
COMMENT ON PROPOSAL NO: 11-104
RECOMMENDATION: I encourage the Panel to accept the proposal for reconsideration under the comment period. The proposal and substantiation have been submitted previously per Log 32327.
SUBSTANTIATION: As the authority having jurisdiction for my state, I have reviewed Proposal 11-104 (Log #3327) submitted by Mr. Edward A. Schiff of TRC, Clearwater, Florida. The proposal would create a safer environment for the citizens we protect. I noticed during my review of the NEC that requirements exist for similar type of protection for certain products. Accordingly, extending requirements for protection to the power cords of air conditioners is the correct action to implement.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NEGATIVE: 2
EXPLANATION OF NEGATIVE:
BUNCH: I vote negative, see my explanation of negative vote on Comment 11-230.
SAPORITA: See my Explanation of Negative vote on Comments 11-230 and 11-231.
COMMENT ON AFFIRMATIVE:
HAMER: See my Affirmative Comment on Comment 11-242.

(Log #1516)

11- 234 - (440-65 (New)): Accept
SUBMITTER: M. Tracy Boatwright, State of Indiana
COMMENT ON PROPOSAL NO: 11-104
RECOMMENDATION: I urge the Panel to reconsider the proposal during the comment period. Both the proposal and substantiation have been submitted previously per Log #3327.
SUBSTANTIATION: The Consumer Product Safety Commission has substantive documentation of fires caused by electrical power cords for room air conditioners. The above proposal constitutes a materially positive step in the direction of helping all Americans to live in safer home environments. The Panel's approval is an essential component in the ongoing effort to reduce accidental fires in the United States, especially in residential structures. The NEC already reflects the recognition that this level of protection is critically important with similar provisions for other products. Adding a class of products, room air conditioners, is a logical and necessary step to further home fire safety.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
SAPORITA: See my Explanation of Negative vote on Comments 11-230 and 11-231.
COMMENT ON AFFIRMATIVE:
HAMER: See my Affirmative Comment on Comment 11-242.

(Log #1665)

11- 235 - (440-65 (New)): Reject
SUBMITTER: Melvin K. Sanders, TECo., Inc.
COMMENT ON PROPOSAL NO: 11-104
RECOMMENDATION: Continue to reject this proposal.
SUBSTANTIATION: It is a product issue and not facilities wiring issue.
I agree with Mr. Bunch, Mr. Cox, Mr. Hamer, Mr. Rasmussen, Mr. Schram, Mr. Sapporita, Mr. Thomas, and Mr. Wright.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel is not aware of any progress towards revising the product standard to address this issue. This is both a product issue and a premises wiring issue.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NEGATIVE: 3
EXPLANATION OF NEGATIVE:
BUNCH: I vote negative, see my explanation of negative vote on Comment 11-230.
CLOSSON: I agree that the use and performance of a component within a product should be specified by the end product standard, not the NEC.
SAPORITA: See my Explanation of Negative vote on Comments 11-230 and 11-231.

(Log #1734)

11- 236 - (440-65 (New)): Accept
SUBMITTER: Rocco J. Gabriele, State of Maryland Dept of State Police
COMMENT ON PROPOSAL NO: 11-104
RECOMMENDATION: This is to respectfully request your reconsideration of Proposal 11-104 (Log #3327), regarding "Leakage Current Detection and Interruption (LSDI) Protection" as submitted by Mr. Edward A. Schiff of Technology Research corporation, Clearwater, FL.
SUBSTANTIATION: We believe this proposal address a significant fire safety and electrical shock hazard associated with the power cord for portable room air conditioners, as documented by the U.S. Consumer Product Safety Commission.
Although there may be some debate as to whether such a device should be installed on the appliance or on the wiring serving an outlet that the appliance may be plugged into, it appears that the proposal to require it on the appliance has more merit since it would address the customer's need who has an existing home or office and, therefore, will not likely have their electrical system upgraded to install a LSDI at the outlet. As noted in the proposal, there are other sections of the NEC that requires such protection for other electrical products. We believe such a requirement in the NEC would encourage testing laboratories to incorporate such protection in their product standards.
Accordingly, extending requirements for LSDI protection to the power cords of air conditioners appears to be an appropriate means to safeguard these appliances from fire and electrical shock. We encourage the panel to accept the above proposal for reconsideration under the comment period.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NEGATIVE: 1

EXPLANATION OF NEGATIVE:
SAPORITA: See my Explanation of Negative vote on Comments 11-230 and 11-231.

(Log #1974)

11- 237 - (440-65 (New)): Accept
SUBMITTER: Daniel R. Kiley, State of Delaware Office of the State Fire Marshal
COMMENT ON PROPOSAL NO: 11-104
RECOMMENDATION: We request your reconsideration of Proposal 11-104 (Log #3327), in order to secure an affirmative acceptance for implementation of the proposal.
SUBSTANTIATION: During our review of the National Electrical Code, we have noted that requirements exist for similar type of protection for certain products. Extending such requirements for protection to the power cords of air conditioners is the appropriate action to implement. This proposal will be a significant step forward in enhancing a more fire safe environment.
The State Fire Prevention Commission and the State Fire Marshal's Office encourage the panel to accept the proposal for reconsideration, and to support an affirmative vote for implementation of the standard.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 4
EXPLANATION OF NEGATIVE:
BUNCH: I vote negative, see my explanation of negative vote on Comment 11-230.
CLOSSON: While the use of cord connected room air conditioners provided with factory installed LCDI or AFCI protection has merit, the requirement for the construction and performance of products belongs in the end product safety standards, not in the NEC.
COX: See my Explanation of Negative on Comment 11-230.
SAPORITA: See my Explanation of Negative vote on Comments 11-230 and 11-231.

(Log #2304)

11- 238 - (440-65): Accept
SUBMITTER: Walter Smittle, Ripley, WV
COMMENT ON PROPOSAL NO: 11-104
RECOMMENDATION: Recommend committee reconsider previous action on Proposal Log #3327, Page 763 of ROP and move to accept.
SUBSTANTIATION: The proposal is a significant step forward in creating a safer environment. The proposal provides for safe products as noted in other NEC sections, i.e., Sections 422-41, 422-45, 422-46, 422-49 and 680-40. Products are an extension of the branch circuits, therefore cords should be made safer with the proposed wording in Log #3327. The NEC can do more and should do more to provide a safer environment.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 4
EXPLANATION OF NEGATIVE:
BUNCH: I vote negative, in addition to my comments on 11-230, this comment states that "products are an extension of the branch circuits, therefore cords should be made safer with the proposed wording in Log #3327". I disagree that "product," equipment is considered part of the branch circuit. The definition in Article 100 clearly disagrees as well. Acceptance of this could lead to the conclusion that the panel agrees with this logic. Continuing to add product requirements such as this to the code should not be done.
CLOSSON: While the use of cord connected room air conditioners provided with factory installed LCDI or AFCI protection has merit, the requirement for the construction and performance of products belongs in the end product safety standards, not in the NEC.
COX: See my Explantion of Negative on Comment 11-230.
SAPORITA: See my Explanation of Negative vote on Comments 11-230 and 11-231.

(Log #2375)

11- 239 - (440-65 (New)): Accept
SUBMITTER: James A. Burns, New York Department of State
COMMENT ON PROPOSAL NO: 11-104
RECOMMENDATION: I encourage the Panel to accept the proposal for reconsideration under the comment period. The proposal and substantiation have been submitted previously per Log #3327.
SUBSTANTIATION: I have reviewed Proposal 11-104 (Log #3327) submitted by Mr. Edward A. Schiff of TRC. I believe the proposal merits your reconsideration during the comment period for acceptance. Fires caused by the power cord to air conditioners is well documented by the U.S. Consumer Product Safety Commission.
The proposal can be a significant step forward in creating a safer environment for the citizens we must protect. Your favorable action is necessary to help reduce unwanted fires in this country. Development of safe products through a true consensus process is the avenue to pursue in the interest of fire safety. I notice that requirements exist for similar types of protection for certain products. Accordingly, extending requirements for protection to the power cords of air conditioners is the correct action to implement.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
SAPORITA: See my Explanation of Negative vote on Comments 11-230 and 11-231.

(Log #2393)

11- 240 - (440-65): Reject
SUBMITTER: Steven R. Moses, Wood Industries, Inc.
COMMENT ON PROPOSAL NO: 11-104
RECOMMENDATION: Reject (delete) proposed wording as present in Proposal 11-104 (Log #3327) for Article 440 paragraph 45.
SUBSTANTIATION: The proposal should address specifically the power supply cord and not a cord set. The proposal is vague as to the application of the technology.
While in support of Arc Fault Circuit Interruption, the technology is not proven. There has not been enough usage of these devices to support standardization on a proprietary design. The trip levels may or may not be correct for the application causing the user frustration, which leads to circumvention of the safety device.
The proposal should not limit the protective device to the plug of the power supply cord or within 12 inches of the male fitting. Other devices exist that can offer more protection specifically in the outlet and branch circuit leading up to the plug of the air conditioner. These devices should not be precluded since they can offer protection not offered by the LCDI.
This proposal was circumvented from the normal review process at NEMA. Interested NEMA sections were not allowed the opportunity to review this proposal. Thus, the NEMA position does not necessarily reflect the industry position. The manufacturers of the flexible cord and power supply cords were made aware of this only days prior to the cut off date for comments. The flexible cord being supplied on these LCDI devices is unique and manufacturing capabilities must be considered prior to forcing an industry to use such a device.
PANEL ACTION: Reject.
PANEL STATEMENT: Protective devices in the branch circuit are the responsibility of other panels. The use of the devices noted by the commenter is not precluded by the panel action on the proposal. See panel action on Comment 11-242.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 4
EXPLANATION OF NEGATIVE:
BUNCH: I vote negative, see my explanation of negative vote on Comment 11-230. This substantiation against the proposal raises several technical issues which will have to ultimately be addressed through product standards.
CLOSSON: I agree, the use of the phrase "Cord Sets" is not appropriate, as a cord set is not always permanently connected to the end product. Separable cord sets are commonly used today on many products and would not meet the intent of the proposal.
I agree that the proposal does not specify directly or indirectly the performance characteristics of such a device employed to comply

with this proposed code requirement.
COX: See my Explanation of Negative on Comment 11-230.
SAPORITA: See my Explanation of Negative vote on Comments 11-230 and 11-231.

(Log #2400)

11- 241 - (440-65 and 440-2): Accept
SUBMITTER: George Miller
COMMENT ON PROPOSAL NO: 11-104
RECOMMENDATION: Reject the Technical Correlating Committee action on Proposal 11-104 (Log No. 3327).
SUBSTANTIATION: I have been somewhat surprised to read, in the May 2001 ROP, that the Technical Correlating Committee voted to reject (log #3327) Proposal 11-104, to add a new 440-65 requirement and a new definition to 440-2 of NFPA 70, the National Electrical Code.
This proposal, if adopted, will lead to a reduction in fire losses, both property and life. A number of articles in the NEC currently require products to take cord safety into consideration (See Sections 422-41, 422-45, 422-46, 422-49 and 680-40). This is appropriate in the NEC. To refer to the additional cost of $2 or $3 to an appliance such as a room air conditioner as a "major change" is ludicrous.
I encourage the Standards Council to favorably reconsider the Proposal.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 4
EXPLANATION OF NEGATIVE:
BUNCH: I vote negative, see my explanation of negative vote on Comment 11-230.
CLOSSON: While the use of cord connected room air conditioners provided with factory installed LCDI or AFCI protection has merit, there was insufficient evidence provided to demonstrate the need for or effectiveness of such a device.
COX: See my Explanation of Negative on Comment 11-230.
SAPORITA: See my Explanation of Negative vote on Comments 11-230 and 11-231.

(Log #1953)

11- 242 - (440-65-Leakage Current Detection and Interruption (LCDI) Protection): Accept
SUBMITTER: Edward A. Schiff, Technology Research Corp.
COMMENT ON PROPOSAL NO: 11-104
RECOMMENDATION: Add a new definition to 440-2 as follows: "Leakage Current Detection and Interruption (LCDI) Protection. A device provided in a power supply cord or cord set that senses leakage current flowing between or from the cord conductors and interrupts the circuit at a predetermined level of leakage current."
Add a new 440-65 as follows: "Leakage Current Detection and Interruption (LCDI) and Arc Fault Circuit Interrupter (AFCI). Single-phase cord- and plug-connected room air conditioners shall be provided with factory-installed LCDI or AFCI protection. The LCDI or AFCI protection shall be an integral part of the attachment plug or be located in the power supply cord within 300 mm (12 in) of the attachment plug."
SUBSTANTIATION: The submitter wishes to express his appreciation to the Chairman and Members of Panel 11 for their inputs, time, consideration, and support of this proposal. The submitter supports the Panel's action of Accept in Principle in Part with the addition of including an option for an AFCI protected cord set. This comment addresses the issues raised by some of the Panel members.
Clear evidence of cord fires
An unnecessary and serious safety hazard continues to exist. The original proposal cited 60 room air conditioner cord fires between 1997 and 1999, which resulted in 14 deaths. The list was only a sampling of incidents, not by any means a complete log. The following table lists over 25 additional cord fires, which resulted in 7 more needless fatalities. These room air conditioner cord fires occurred in nursing homes, apartments, mobile homes, and single family dwellings.
Installation of like devices on the branch circuits
Room air conditioners are used in existing homes, apartments, institutions, schools, hotels, and elderly housing which do not have requirements for AFCI protection on the branch circuit. AFCI circuit breakers only sense parallel faults in cord sets; not series faults (broken conductors). This protection will only be provided on a limited number of branch circuits in dwellings constructed after the 2002 Code is adopted.
Immersion protection on hair dryers, GFCI protection on pressure washers, snow melting equipment and hot tubs is required by the code, even though these circuits are now required to have GFCI protection. This requirement is to protect people using these products in older dwellings. Therefore LDCI or AFCI cord protection needs to be part of the product, since it is not provided on the branch circuits of existing dwellings.
Is this a Code issue or a product standard issue?
The National Electrical Code was created to address electrical safety. This proposal is will reduce electrical fires and prevent needless deaths.
The NEC has been and continues to be the catalyst for improving electrical safety. The Panels provides the complete representation of the electrical community including engineers, inspectors, contractors, electricians, users, standards development organization, testing labs, trade associations, the insurance industry, and manufactures. This complete representation creates the proper forum for safety issues.
There are many precedents for incorporation of product and cord safety requirements in the Code. This includes:
Article 422-41 Immersion protection for cord and plug connected appliances
Article 422-45 Stands for cord- and plug-connected appliances
Article 422-46 Flatirons equipped with an identified temperature limiting means
Article 422-49 Factory installed GFCI's for High Pressure Spray Washers
Article 680-40 GFCI protection for cord- and plug-connected spas and Hot Tubs
In all these cases, the NEC requirement led to the change in product standard. Had the NEC not adopted these requirements, the product standards would not have changed. The Authority Having Jurisdiction will only need to check to see that the product is Listed by a Nationally Recognized Testing Laboratory (NRTL) like any other installed appliance.
Flexible cords have always been the domain of the code (i.e. table 400-4). They are part of the branch circuit wiring, particularly in this case where the room air conditioner is often permanently mounted (hotels, schools, nursing homes, etc.). This is a continuous duty unattended application that the Code can and should anticipate.
Ability to Prevent Cord Fires
Arcing within a conductor (series fault) or arcing between conductors (parallel or ground fault) causes combustion of the cord or surrounding material. The precursor to an arc is leakage current from or between conductors.
The UL testing of the LDCI protected cord set includes a point contact (guillotine) test and rotational flex testing. These tests result in insulation degradation and damaged conductors. The testing must be completed without creating combustion to be approved. The technology has been used over 50,000 appliance and extension cords without a report cord fire occurring.
The AFCI testing includes point contact, carbonized path, and operation inhibition testing per UL 1699. This will detect both series and parallel arc faults in the cord set.
Cord damage caused by frayed or broken conductors, insulation degradation from overload and overheating, or normal aging will result in leakage current from one or both live conductors. This condition will eventually lead to an arc before combustion of the cord or surrounding materials can occur. Both technologies will prevent virtually all cord fires.
Proposal is too restrictive
This comment allows for the use of an AFCI protected cord sets, since this technology can prevent most cord fires. As previously described, AFCI branch circuit protection will only be provided on new dwellings; not existing structures.
In conclusion, a serious and preventable safety hazard that results in fires, injuries and deaths every year continues to exist. AFCI branch circuit protection will only be on new dwellings, where room air conditioners are used in existing dwellings with no protection. This is a Code issue and there are many precedents for this requirement. Economical, proven, and listed products are available that will provide this necessary safety protection.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 4
EXPLANATION OF NEGATIVE:
BUNCH: I vote negative, see my explanation of negative vote on Comment 11-230. I also oppose adding definitions within sections of the code rather than in Article 100.

CLOSSON: While the use of cord connected room air conditioners provided with factory installed LCDI or AFCI protection has merit, the requirement for the construction and perforamnce of products belongs in the end product safety standards, not in the NEC.

COX: See my Explanation of Negative on Comment 11-230.

SAPORITA: See my Explanation of Negative vote on Comments 11-230 and 11-231.

COMMENT ON AFFIRMATIVE:

HAMER: While we still believe this requirement should be in the product standards, it is disappointing that the product standards-making organizations have not yet addressed the problem. The panel comments and negative ballot explanations during the 1999 Code cycle should have initiated changes in product standards.

Date	Location	Room AC Fire Event Description	Source	Fatalities
Aug-00	Andalusia, AL	Blaze started in electrical cord of the air conditioning unit	Andalusia Star News	
Aug-00	Baton Rouge, LA	Power cord to air conditioner overheated	CPSC Reported Incidents	
Aug-00	Harrisburg, AR	Fire started in cord to an air conditioner	CPSC Reported Incidents	
Aug-00	Lansing, MI	Fire leaves woman injured; Faulty electrical cord on air conditioner sparked the blaze	Lansing State Journal	
Aug-00	San Luis Obispo, CA	Faulty electrical cord connected to the air conditioner	Tribune	
Jul-00	Alabama	Matress was ignited by heat source where power cord was plugged into the outlet	NFPA Journal	2 (60, 77)
Jul-00	Hebron, NE	Cord got hot and shorted out	Deshler Rustler & CPSC	
Jul-00	Leavenworth, KS	Overheated cord	CPSC Reported Incidents	
Jul-00	Minden, LA	Infant dies in fire started from a defected cord to an air conditioner	Minden Press-herald	1 (7 mo. old)
Jul-00	St. Louis, MO	A 5-year old and 3-year old dies in fire caused by a faulty room air conditoner cord	St. Louis Post Dispatch & CPSC	2 (3 & 5)
Jun-00	Ft. Lauderdale, FL	Spliced room ac power cord caused fire	CPSC Investigations	
Jun-00	Lansing, IL	Fire in shipping office caused by air conditioner cord	CPSC Reported Incidents	
Jun-00	Massapequa, NY	Frayed room ac power cord led to fire at nursing home; four residents and two police officers injured	CPSC Investigations	
May-00	New Iberia, LA	Electrical short in cord ignited window blinds	CPSC Reported Incidents	
May-00	Orange, TX	Fire started by a spliced electrical cord	CPSC Reported Incidents	
Apr-00	Vero Beach, FL	Apartment building fire caused by faulty power supply cord	CPSC Reported Incidents	
Mar-00	Connecticut	Nursing home fire caused by night stand set on top of cord severed neutral and ground wire and frayed positive wire	NFPA Journal	
Sep-99	Allentown, PA	Fire ignited by electrical wire leading to window air conditioner	CPSC Reported Incidents	
Sep-99	Oswego, NY	Electrical malfunction in wiring leading to older model window air conditioner	CPSC Reported Incidents	
Aug-99	Richmond, TX	Fire started in plug and wiring of window air conditioner	CPSC Reported Incidents	
Jul-99	Burlington, NC	Fire started at the power cord to the air conditioning unit in the living room	CPSC Reported Incidents	
Jul-99	Columbia, GA	Malfunctioning air conditioner electrical cord caused fire	CPSC Reported Incidents	
Jul-99	Quincy, IL	Power cord to air conditioner apparently caused apartment building fire	IAEI News/CPSC Reported Incidents	
Jul-99	Topeka, KS	House fire started when power cord ignited mini blinds	CPSC Reported Incidents	
Jul-99	Tunica, MS	Two adults were killed and two others injured in fire caused by spliced ac cord	CPSC Investigations	2 (19 & 20)
Jul-99	Washington, DC	Air Conditioner cord became overloaded and started the fire	CPSC Investigations	

ARTICLE 445 — GENERATORS

(Log #174)

15- 11 - (445-9): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 15-5
RECOMMENDATION: It was the action of the Technical Correlating Committee that further consideration be given to the comments expressed in the voting. This action will be considered by the panel as a public comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
Revise 445-9 (New 445.17) to read as follows:
445-9 Generator Terminal Housings. Generator terminal housings shall comply with 430-12. Where a horsepower rating is required to determine the required minimum size of the generator terminal housing, the full-load current of the generator shall be compared with comparable motors in Tables 430-147 through 430-150. The higher horsepower rating of Tables 430-147 through 430-150 shall be used whenever the generator selection is between two ratings.
PANEL STATEMENT: The panel action will clarify that selecting the higher horsepower rating from table 430-147 through 43-150 will ensure the generator terminal housing is adequately sized. The panel added "of the generator terminal housing" in the first sentence and added the last sentence.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19
VOTE ON PANEL ACTION:
AFFIRMATIVE: 18
NOT RETURNED: 1 Kakalec

(Log #1877)

19- 6 - (447-9(a)(6)): Accept in Part
Note: The Technical Correlating Committee understands that the wording accepted in Comment 19-19a for 547-8(a)(6) shall be used.
SUBMITTER: Ronald P. O'Riley, Innovative Education, Inc.
COMMENT ON PROPOSAL NO: 19-18a
RECOMMENDATION: ...through a grounding conductor
Revise to read:
...through a grounding electrode conductor and shall comply with 250.32(E).
SUBSTANTIATION: As per the new definition for a grounding electrode conductor in Article 100, this conductor at a separate building is now the grounding electrode conductor and not just grounding conductor. 250.32(E) covers the installation of the grounding electrode conductor at the second building.
PANEL ACTION: Accept in Part.
Revise 547-9 (a) (6) to read:
(6) Grounding. The grounded conductor of the system shall be grounded at the distribution means and be connected to a grounding electrode through a grounding <u>electrode</u> conductor.
Reference to 25032(E) is deleted.
PANEL STATEMENT: The concept is accepted and reference to 250-32 (e) is deleted, as it has been deleted by CMP 5.
The Panel does not agree that the conductor mentioned in 547-9 (a) (6) is at a separate building. It is at the distribution point.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 8
VOTE ON PANEL ACTION:
AFFIRMATIVE: 8
COMMENT ON AFFIRMATIVE:
BAUMAN: My notes indicate we should also refer to Comment 19-19a.

ARTICLE 450 — TRANSFORMERS AND TRANSFORMER VAULTS

(Log #1613)

13- 2 - (450-3(a) Note 3): Accept
SUBMITTER: Robert Molde, Xeel Energy
COMMENT ON PROPOSAL NO: 13-5
RECOMMENDATION: We agree with your rejection of this proposal, provided that what was proposed is already permitted in the existing Code.
SUBSTANTIATION: In your committee statement, you say the definition of "qualified persons" makes no reference to employment status. We take this to mean that a qualified off-site contract employee is already permitted by the existing Code to provide this service.
PANEL ACTION: Accept.
PANEL STATEMENT: The panel's intent is that qualified personnel will be readily available for monitoring and maintenance of transformers where secondary overcurrent protection is omitted. Employment status and office location are not a function of the NEC.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Davis

(Log #2121)

13- 3 - (450-23(a)(1)c):
Note: The Technical Correlating Committee directs that this comment be reported as "Reject" because less than two-thirds of the members eligible to vote have voted in the affirmative.
SUBMITTER: C. Patrick McShane, Cooper Power Systems
COMMENT ON PROPOSAL NO: 13-10
RECOMMENDATION: This is a request that Code-Making Panel 13 reconsider its action on the original proposal from "reject" to "accept".
SUBSTANTIATION: The substantiation provided by the Panel to reject the proposal does not explain what, if any, damage to property or hazard to individuals by the release of a less-flammable liquid can occur if containment is not provided.
The original reason for adding the containment requirement in Section 450-23 was based on limiting the potential hazard of burning fluid to limit the flame propagation and the propagation of flame from an ignition source back to the transformer. However, history and testing have shown the pool fire scenario to be a non-issue, and key listing NRTL proponent of this scenario has since eliminated its listing requirements based on pool fire heat release rate. In fact, the NRTL no longer even tests nor publishes the HHR of less-flammable dielectric liquids it lists. Facts and documents documenting that lack of fire hazard and the field history were incorporated in the original proposal substantiation.
The protection schemes used by FM and UL are one of the success stories for the elimination of fire risk using HFP dielectric liquids. Elimination of the containment requirement will result in greater use of the UL and FM protection methods, which will in turn result in a reduction in the overall risk of fires from transformers.
The main reason for the flawless "pool fire" safety record for the approximate 250,000 less-flammable transformers is due to the inability of even sustained arcing to ignite less-flammable fluids. Data and test reports were referenced in the original proposal. Another reason for the total lack of reports of ruptured tanks when using less flammable fluids is that the two dielectric fluid listing NRTLs' requirements focus on rupture prevention. The occurrence of significant volumes of spilled fluid in indoor applications has never been reported to our company. Only one occurrence (20 percent fluid loss) was reported out of nearly a quarter million less-flammable distribution and power transformers that are in service worldwide. This incident involved an outdoor installation adjacent to a building, resulting without fire or property damage, or personal injury.
In summary, by reversing the committee rejection of Proposal log 3744 would reflect the Code-Making Panel 13's acknowledgment of:
• The flawless safety record of a quarter century of listed less-flammable dielectric fluids.
• The now total rejection of the pool fire scenario of such fluids by the two leading fluid listing NRTLs.
• The importance of staying true to the Code mission, the <u>practical</u> safeguarding of persons and property.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 6
NEGATIVE: 4
NOT RETURNED: 1 Davis
EXPLANATION OF NEGATIVE:
BAKER: I vote to reject this change. Containment offers protection from many different dangers. Some are from electrical dangers and others from physical dangers such as slips and falls,

mechanical failure or release of dangerous liquids. These are sometimes classed as a hazardous chemical of substance. Containment provides an orderly method of clean up.

BRUNNER: The acceptance of this comment would eliminate the need for liquid containment on transformers with less than flammable fluids.

The panel should maintain the reject position of the ROP meeting.

Containment of liquids has many benefits besides flammability:

1) Fall and slip hazards from oil spills.

2) Cross contamination of water mixing with coolant and entering the waste water system.

3) A substance that is classified as nonhazardous today may not be that in the future. So containment of all liquids would be prudent.

CARROLL: The panel should maintain the position of reject that was supported at the ROP meeting for the following reasons:

1. The provisions provided for the installation of less flammable liquid transformers in indoor applications are reasonable and necessary. Additional personnel and property hazard may rise from spilled liquids such as converting a dry location to a wet location, contamination of other equipment, slippage hazards, etc.

2. There are no required markings on transformers identifying the type of liquid utilized, therefore the user/inspector has no method to determine specific installation requirements.

3. Many building codes require confinement of ANY liquid. An example is the requirement to provide a confinement area under a water heater. Transformer fluid should also be contained.

4. Transformers are not always installed in equipment rooms or vaults and may even be installed in a ceiling area or mezzanines. Additionally, transformers may also be installed in accessible areas of public buildings such as hospitals or schools. In any of the above installations, a liquid containment area is needed for the practical safeguarding of persons and property.

CRIST: I vote to reject this change. I agree with the explanations of negatives votes submitted by Mr. Baker, Mr. Brunner, and Mr. Carroll. In addition, acceptance of this proposal would permit a liquid filled tansformer with no containment in the ceiling of a hospital or directly over a fire pump. The submitter commented that this would "level the playing field" because his company did not make a dry-type transformer. Leveling playing fields is not a function of the NEC.

(Log #2371)

15- 12 - (480): Accept in Principle

SUBMITTER: Max R. Schulman, Schulman Assoc., Ltd.

COMMENT ON PROPOSAL NO: 15-10

RECOMMENDATION: This comment does not modify my previous support for the above noted proposal (et al.), but is intended to present optionally alternate wording to that I previously submitted on 23 September with respect to spillage neutralization. Note: Like wording and substantiation may be submitted by others, as the need has been recognized by many and commonly discussed.

In lieu of the new sentence originally proposed, add a new Paragraph (e) to read:

"Neutralization of spilled electrolyte and the supplemental removal and disposal of same, shall be in accordance with applicable federal regulatory criteria (i.e., EPA and DOT) as existing or as otherwise amended by the cognizant local Authority Having Jurisdiction."

SUBSTANTIATION: No other NFPA Standard or Code addresses the matter of neutralization of spilled electrolyte, and understandably the Panel may be reluctant to develop criteria for an area already pre-empted by federal mandates. The proposed new paragraph adequately covers the need for neutralization (et al.) by reference, and brings the entire matter of containment into continuity with the intent of Article 64 of the Uniform Fire Code.

PANEL ACTION: Accept in Principle.

PANEL STATEMENT: Refer to the panel action and statement on Comment 15-15.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19

VOTE ON PANEL ACTION:

AFFIRMATIVE: 18

NOT RETURNED: 1 Kakalec

ARTICLE 480 — STORAGE BATTERIES

(Log #421)

15- 13 - (480-3 Exception No. 1and 2 (new)): Accept in Principle in Part

SUBMITTER: Dan Leaf, Palmdale, CA

COMMENT ON PROPOSAL NO: 15-7

RECOMMENDATION: Accept proposal.

SUBSTANTIATION: Though batteries and cables may be a manufacturer-supplied part of prime movers they may not always be supplied, or may be part of unlisted equipment and subject to Code rules. The proposal is to simply legitimize installations made and provided by the installer. Sections 240-1, 240-3, 240-20, and 720-8 are rather inclusive and 300-1(b) and 300-3 appear to literally apply.

PANEL ACTION: Accept in Principle in Part.

Revise 480-3 to read as follows:

"480-3. Wiring and Equipment Supplied from Batteries.

Wiring and equipment supplied from storage batteries shall be subject to the requirements of this Code applying to wiring and equipment operating at the same voltage, unless otherwise permitted by 480.4."

Add new 480.4 to read as follows:

"480.4 Overcurrent Protection for Prime Movers. Overcurrent protection shall not be required for conductors from a battery rated less than 50 volts if the battery provides power for starting, ignition, or control of prime movers. Section 300-3 shall not apply to these conductors."

Retain and renumber subsequent sections accordingly.

The panel rejects the part addressing interconnected batteries.

PANEL STATEMENT: The panel rejects the part addressing interconnected batteries because this section does not apply to interconnection of batteries. The panel agrees with the submitter that there might be a few cases where the batteries and cables are not always supplied with a manufactured unit and in these cases new Section 480.4 would apply. The panel eliminated the reference to distances, because "as short as practicable" is not enforceable.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19

VOTE ON PANEL ACTION:

AFFIRMATIVE: 18

NOT RETURNED: 1 Kakalec

(Log #175)

15- 14 - (480-8(d) (New)): Accept

Note: The Technical Correlating Committee understands that the section referenced by this panel action will be renumbered 480-9(d) due to the panel action on Comment 15-13.

SUBMITTER: Technical Correlating Committee National Electrical Code

COMMENT ON PROPOSAL NO: 15-10

RECOMMENDATION: The Technical Correlating Committee directs that the Action on this Proposal be rewritten to comply with the NEC Style Manual relative to the word "such" in the last sentence of the Panel Action. This action will be considered by the Panel as a Public Comment.

SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.

PANEL ACTION: Accept.

Revise the panel action text of Proposal 15-10 to amend the second paragraph as follows:

Steel encased NiCad batteries shall have a containment system ~~such that there is no contact~~ that does not allow contact between the spilled electrolyte and the steel casing of adjacent cells.

PANEL STATEMENT: The panel revised the text to incorporate text to comply with the Manual of Style.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19

VOTE ON PANEL ACTION:

AFFIRMATIVE: 18

NOT RETURNED: 1 Kakalec

(Log #579)

15- 15 - (480-8(d) (New)): Accept in Principle

Note: The Technical Correlating Committee directs that the reference to the "EPA regulations for electrolyte disposal and" be deleted because the reference is not to a specific portion of the EPA Regulations. The Technical Correlating Committee also directs that "UFC" be changed to "Uniform Fire Code."

SUBMITTER: Max R. Schulman, Schulman Assoc., Ltd.
COMMENT ON PROPOSAL NO: 15-10
RECOMMENDATION: This transmittal is intended to reflect support for the submittal shown (Gordon S. Johnson) and the noted action of the panel. Additionally, it is intended to address the "Comment on Affirmative," directed to disposal and neutralization - an obvious problem. With respect to "disposal" the context of existing EPA regulations should be adequate; however, with respect to neutralization it is recommended that the following wording (excerpted from the UFC - Article 64, Section 6404) be added as the last sentences to proposed new paragraph (d) after the word "directions." To wit:

An approved method to neutralize spilled electrolyte shall be provided. The method shall be capable of neutralizing a spill from the largest lead-acid battery to pH between 7.0 and 9.0.

SUBSTANTIATION: The problem (disposal and neutralization) has been identified and addressed in the UFC and brought to the panel's attention through Mr. Johnson's "Comment on Affirmative" referenced above. Substantiation for the proposed new wording is supported by Article 64, Section 6404 of the UFC, a copy of the recent NFPA issued incident summary and the USDA (Forestry) mandate of December 1, 1999. Copies of the latter two documents have been provided.

As an "editorial footnote" to the action (et al.) on 15-10 as shown in the ROP (page 771), the word "Universal" shown on the last line should be "Uniform."

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

PANEL ACTION: Accept in Principle.

Add the following FPN to new Section 480-9(d):

FPN: See EPA regulations for electrolyte disposal and UFC - Article 64, Section 6404 for spilled electrolyte handling requirements.

PANEL STATEMENT: The panel feels that this information is better served as a FPN and that referring the user to the appropriate disposal and neutralization requirements meets the intention of the submitter.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19
VOTE ON PANEL ACTION:
AFFIRMATIVE: 18
NOT RETURNED: 1 Kakalec
COMMENT ON AFFIRMATIVE:
VANNICE: The Section 480-9(d) referenced here is a result of the renumbering of Section 480-8, Battery Location, caused by the action on Comment 15-13. It is not a part of Section 480-9, Vents, found in the 1999 Code.

(Log #592)

15- 16 - (480-8(d) (New)): Reject
SUBMITTER: Max R. Schulman, Schulman Assoc., Ltd.
COMMENT ON PROPOSAL NO: 15-10
RECOMMENDATION: It is recommended that the word "free" preceding electrolyte be deleted.
SUBSTANTIATION: The purpose of containment and neutralization of electrolyte has been clearly qualified and directed to "spillage" as stated in Article 64, Section 6404 of the UFC. The concern addressed by that wording was electrolyte out of a battery as opposed to that normally within. Any lead acid battery can leak or evidence spillage conditions if improperly handled, serviced, or through abnormal circumstances resulting in damage to the exterior walls of cell(s) - this includes sealed type and those utilizing metal housings.

It should be noted, that any spillage which creates a path to ground presents a common hazard - irrespective of the volume of the spillage.

If the panel formally defines "free" electrolyte to include that which may be potentially present in any spillage situation, my recommendation can be considered withdrawn.

PANEL ACTION: Reject.
PANEL STATEMENT: The term "free" electrolyte is an industrial term for a liquid electrolyte that is capable of spilling.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19
VOTE ON PANEL ACTION:
AFFIRMATIVE: 18
NOT RETURNED: 1 Kakalec
COMMENT ON AFFIRMATIVE:
JOHNSON: The word "free" was added to the UFC wording to make it clear that the requirement does not apply to VRLA batteries. Leakage from VLRA batteries is negligible. See original proposal 15-10.
KRAMER: The term >free electrolyte< and quotes need to enclose both words "free electrolyte".

(Log #808)

15- 17 - (480-8(d) (New)): Reject
SUBMITTER: Kenneth A. Cotton, Enviroguard
COMMENT ON PROPOSAL NO: 15-10
RECOMMENDATION: In the proposed new paragraph the word "free" preceding "electrolyte" should be deleted to maintain continuity with Article 64 UFC.
SUBSTANTIATION: The insertion of "free" appears to circumvent. This clearly defines intent of Article 64.01 Paragraph 6401.99.1 of the Uniform Fire Codes.
Note: Supporting material available for review upon request at NFPA headquarters.
PANEL ACTION: Reject.
PANEL STATEMENT: Refer to the panel action and statement on Comment 15-16.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19
VOTE ON PANEL ACTION:
AFFIRMATIVE: 18
NOT RETURNED: 1 Kakalec

(Log #1383)

15- 18 - (480-8(d) (New)): Accept in Principle

Note: The Technical Correlating Committee understands that the section referenced by this Panel Action will be numbered 480-9(d) due to the Panel Action on Comment 15-13.

SUBMITTER: Kari Barrett, American Chemistry Council
COMMENT ON PROPOSAL NO: 15-10
RECOMMENDATION: Reword proposal as follows:

(d) Electrolyte containment. Where the total free electrolyte in a single battery installation exceeds 190 liters (to gal), each rack of batteries, or group of racks, shall be provided with a liquid-tight~~,100 mm (4 in.)~~ spill containment barrier sized to contain the volume of free electrolyte in the single largest cell. The barrier shall be at least 100 mm (4 in.) high and shall~~which~~ extend~~s~~ at least 25 mm (1 in.) beyond the battery rack in all directions. Steel encased NiCad batteries shall have a containment system such that there is no contact between the spilled electrolyte and the steel casing of adjacent cells.

SUBSTANTIATION: The recommended revision will establish a minimum requirement for electrolyte spill containment volume, that is, the volume of the largest single cell in the battery. Such a requirement is necessary in order to verify the suitability of the actual dimensions of the spill containment. It should also be noted for information purposes that NFPA 70E Standard for Electrical Safety Requirements for Employee Workplaces - 2000 Edition, Part IV Sec. 3-4 details other alternatives for electrolyte spill containment, such as floor grading and sumps.

PANEL ACTION: Accept in Principle.

Revise the first paragraph of the panel action on Proposal 15-10 to read as follows:

"(d) Electrolyte containment. Where the total free electrolyte in a single battery installation exceeds 190 liters (50 gal), each rack of batteries, or group of racks, shall be provided with a liquid-tight spill containment barrier sized to contain the volume of free electrolyte in the single largest cell."

{The second paragraph remains unaffected by this action.}

PANEL STATEMENT: The proposed design dimensions may not be applicable to all installations.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17
NEGATIVE: 1
NOT RETURNED: 1 Kakalec
EXPLANATION OF NEGATIVE:
JOHNSON: The comment should have been rejected. The original wording was taken from section 64 of the UFC. Those dimensions have been established to be practical. The dimensions should not be left entirely to the discretion of the user.

(Log #2270)

15- 19 - (480-8(d)): Reject
SUBMITTER: Sanjay L. Deshpande, GNB Industrial Power, A Division of Exide Technologies
COMMENT ON PROPOSAL NO: 15-10
RECOMMENDATION: We recommend that the proposed text shown below be rejected.
"Where the total free electrolyte in a single battery installation exceeds 50 gallons, each rack of batteries, or group of racks, shall be provided with a liquid-tight, 100 mm spill containment barrier which extends at least 25 mm beyond the battery rack in all directions."
SUBSTANTIATION: Spill containment is covered by other specifications such as UFC 64, IFC and NFPA 76. Users of batteries are confused by multiple codes addressing the same issue but not uniformly. The proposed text in NEC will add to this. In addition, the proposed language does not adequately address the difference between flooded and sealed (VRLA) cells and their considerably different potential for spilling electrolyte.
Battery manufacturers and users under the aegis of IEEE and BCI are working together to draft acceptable uniform language that will be recommended to code bodies like UFC, IFC and NFPA for adoption in their respective sections for spill containment and safety. The said language:
- will include proper definition of flooded (vented) and sealed (VRLA) batteries,
- assess the potential or absence of electrolyte spills and other hazards for each type, and
- prescribe appropriate methods to prevent each hazard or minimize/contain its effects.

If necessary, separate sections will be recommended to address the substantially different issues that pertain to the two battery types. IFC will receive the first proposal on November 1.
At this time, we recommend that the NEC reject the new language regarding spill containment.
PANEL ACTION: Reject.
PANEL STATEMENT: Refer to panel action and statement on Comment 15-18.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19
VOTE ON PANEL ACTION:
AFFIRMATIVE: 18
NOT RETURNED: 1 Kakalec

(Log #2276)

15- 20 - (480-8(d)): Accept in Principle
SUBMITTER: Gary L. Briese, Int'l Assoc. of Fire Chiefs
COMMENT ON PROPOSAL NO: 15-10
RECOMMENDATION: Add new text as follows:
"Neutralization of spilled electrolyte and the supplemental removal and disposal of same shall be in accordance with applicable federal regulatory criteria as existing or as otherwise amended by the local Authority Having Jurisdiction."
SUBSTANTIATION: In consideration of recent major unintentional incidents (i.e., LA City 911 Center outage and US State Department Offices, Washington D.C., evacuation) resulting from standby battery networks that were not configured with containment and neutralization, and the potential of like incidents including those possibly associated with domestic terrorism, the ICHIEFS hereby expresses its support for the incorporation of such requirements in the NEC as stated in the referenced proposal. However, the proposal did not include provisions for neutralization. Accordingly, the additional wording as shown in #4 is recommended for inclusion as a new paragraph (e).
No other NFPA Standard or Code addresses the matter of neutralization of spilled electrolyte, and understandably the Panel may be reluctant to develop criteria for an area already pre-empted by federal mandates. The proposed new paragraph adequately covers the need for neutralization by reference and brings the entire matter of containment into continuity with the intent of Article 64 of the Uniform Fire Code.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Refer to the panel action and statement on Comment 15-15.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19
VOTE ON PANEL ACTION:
AFFIRMATIVE: 18
NOT RETURNED: 1 Kakalec

(Log #809)

15- 21 - (480-8(d), Exception): Reject
SUBMITTER: Kenneth A. Cotton, Enviroguard
COMMENT ON PROPOSAL NO: 15-10
RECOMMENDATION: Add an exception to the proposed paragraph to read:
"When the containment barrier is not part of the structure in which it is located, but a separately installed assembly, said barrier shall not extend more than 75 mm beyond the battery rack in all directions."
SUBSTANTIATION: The present wording allows for a potentially dangerous hazard (access impairment) to those normally servicing the batteries involved, as greater distances could require unsupported leaning (over the barrier edges) as well as requiring foot traffic on the neutralized low medium employed.
PANEL ACTION: Reject.
PANEL STATEMENT: Refer to panel action and statement on Comment 15-18.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19
VOTE ON PANEL ACTION:
AFFIRMATIVE: 18
NOT RETURNED: 1 Kakalec

ARTICLE 490 — EQUIPMENT, OVER 600 VOLTS, NOMINAL

(Log #139)

13- 4 - (490-1): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 13-18a
RECOMMENDATION: The Technical Correlating Committee advises that Article Scope statements are the responsibility of the Technical Correlating Committee and the Technical Correlating Committee accepts the Panel Action. The Technical Correlating Committee directs the panel to add a Title for the standard identified in the Fine Print Note. This action will be considered by the Panel as a Public Comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
The panel accepts the action of the Technical Correlating Committee and provides the title to the standard in the Fine Print Note to read as follows:
"FPN No. 2: For further information on hazard signs and labels see ANSI Z535-4, Product Signs and Safety Labels."
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Davis

(Log #1614)

13- 5 - (Table 490-24): Reject
SUBMITTER: Robert Molde, Xeel Energy
COMMENT ON PROPOSAL NO: 13-26
RECOMMENDATION: We do not agree with the number rounding-method used to convert from inches to millimeters in this proposed table. It is inconsistent with other parts of the Code. Please confer with the other panels to develop a consistent method for converting from inches to metric.
SUBSTANTIATION: When inches are converted to millimeters, in this table, the next value is increased to the next tens number in mm. For example, under the column heading Phase to Ground/Indoors, 4.0 in. is converted to 110 mm, 5 in. is converted to 130 mm, 6 in. to 160 mm, etc. The new metric clearances are increased slightly and not consistently. Panel 8 in Proposal 8-232, Table 346-10 converts 4 in. to 100 mm, 5 in. to 125 mm, 6 in. to 150 mm. In Proposal 8-38, Table 318-9(e). Panel 6 in Proposal 6-216, Chapter 9, Table 5A uses a consistent factor of 25.4 for converting conductor diameters in inches to mm.
There does not appear to be justification for using different and arbitrary conversion methods between separate parts of the code. However insignificant this may seem, it does stray from the goal of consistency.
PANEL ACTION: Reject.
PANEL STATEMENT: These distances are minimum electrical clearances. Rounding down the conversion to millimeters was not the intent of the panel and would cause substantive changes

without technical justification. The panel rounded up to nominal dimensions for field fabrication.

See panel action on Comment 13-6.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 10

NOT RETURNED: 1 Davis

(Log #1791)

13- 6 - (Table 490-24): Accept

SUBMITTER: Neil F. LaBrake, Jr., Baldwinsville, NY

COMMENT ON PROPOSAL NO: 13-26

RECOMMENDATION: This proposal should be accept in principle in part.

SUBSTANTIATION: CMP 13's action taken on this proposal implies a rounding of the SI equivalent values to the next highest integer by the nearest fifth multiple significance. Using a Microsoft Excel97 spreadsheet analysis and the "ceiling" math & trig function with significance of 5, the inch-pound units are multiplied by 25.4 mm/in. and the results are as shown in the proposed corrections in the comment above.

This analysis and the Panel's statement are mathematical results only and are without source document reference for the electrical B.I.L. minimum clearances with the exception of one document. The AIEE Paper 54-80, June 1954 Transactions, p. 636 is the only source I have found through the Standard Handbook for Electrical Engineers, Eleventh Edition, p. 17-20, Table 17-4 attached. This source only lists outdoor clearances in inch-pound units. Thus, the values above in the stated comment meet the Panel's implication that the metric conversions must be rounded higher to assure minimum clearances are maintained and the level of safety is as assured as the inch-pound units.

Also, the Panel's action and this comment do meet the intent of the Technical Correlating Committee's metrication proposal according to the NFPA No. 1M Manual of Style Section 4.1 with respect to the placement of units and values of measurements. Refer to a second comment by this submitter on this Proposal for correlation effect of other source documents.

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

Table 490.24. Minimum Clearance of Live Parts*

Nominal Voltage	Impulse Withstand, B.I.L. (kV)		Minimum Clearance of Live Parts							
			Phase-to-Phase				Phase-to-Ground			
Rating (kV)	Indoors	Outdoors	Indoors mm	Indoors in.	Outdoors mm	Outdoors in.	Indoors mm	Indoors in.	Outdoors mm	Outdoors in.
2.4–4.16	60	95	115	4.5	180	7	80	3.0	~~160~~155	6
7.2	75	95	140	5.5	180	7	~~110~~105	4.0	~~160~~155	6
13.8	95	110	~~190~~195	7.5	~~310~~305	12	130	5.0	180	7
14.4	110	110	230	9.0	~~310~~305	12	~~165~~170	6.5	180	7
23	125	150	270	10.5	385	15	~~190~~195	7.5	~~260~~255	10
34.5	150	150	320	12.5	385	15	~~250~~245	9.5	~~260~~255	10
	200	200	460	18.0	460	18	~~330~~335	13.0	~~330~~335	13
46	—	200	—	—	460	18	—	—	~~330~~335	13
	—	250	—	—	535	21	—	—	~~440~~435	17
69	—	250	—	—	535	21	—	—	~~440~~435	17
	—	350	—	—	~~785~~790	31	—	—	~~640~~635	25
115	—	550	—	—	1350	53	—	—	1070	42
138	—	550	—	—	1350	53	—	—	1070	42
	—	650	—	—	~~1600~~1605	63	—	—	~~1280~~1270	50
161	—	650	—	—	~~1600~~1605	63	—	—	~~1280~~1270	50
	—	750	—	—	1830	72	—	—	~~1480~~1475	58
230	—	750	—	—	1830	72	—	—	~~1480~~1475	58
	—	900	—	—	~~2270~~2265	89	—	—	~~1810~~1805	71
	—	1050	—	—	2670	105	—	—	2110	83

*The values given are the minimum clearance for rigid parts and bare conductors under favorable service conditions. They shall be increased for conductor movement or under unfavorable service conditions or wherever space limitations permit. The selection of the associated impulse withstand voltage for a particular system voltage is determined by the characteristics of the surge protective equipment.

PANEL STATEMENT: The panel's action was based on the understanding that "inch-pound units" referred to in the submitter's substantiation was defined to be "inch units" in the English system.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Davis

(Log #1792)

13- 7 - (Table 490-24): Reject
SUBMITTER: Neil F. LaBrake, Jr., Baldwinsville, NY
COMMENT ON PROPOSAL NO: 13-26
RECOMMENDATION: The proposal should be accept in principle in part.

SUBSTANTIATION: The following source documents are referenced and attached to correlate the indoor and outdoor clearances to the Panel's reason for maintaining the same metric values as used in the 1999 NEC Table 490-24:
A. 1998 Canadian Electrical Code, Part I, Table 30 for indoor clearances.
B. Table 17-4 of Standard Handbook for Electrical Engineers, 11th edition referencing AIEE Paper 54-80, June 1954 Transactions, p. 636 for outdoor clearances.
Source A was used for only evaluating the indoor clearances since Source B only covered outdoor clearances. Source A only lists metric values and Source B inch-pound units. Source A combines indoor and outdoor clearances for equivalent phase-to-ground requirements of system voltages up to 34.5kV and appear to be quite conservative from the present NEC values. Source B correlates with the present NEC values with the exception that 62 inches is required for 650kV BIL outdoor phase-to-phase clearance.

Table 490.24. Minimum Clearance of Live Parts*

Nominal Voltage Rating (kV)	Impulse Withstand, B.I.L. (kV)		Minimum Clearance of Live Parts							
			Phase-to-Phase				Phase-to-Ground			
	Indoors	Outdoors	Indoors		Outdoors **		Indoors		Outdoors **	
			mm	in.	mm	in.	mm	in.	mm	in.
2.4–4.16	60	95	~~115~~75	~~4.5~~3.0	180	7	~~80~~120	~~3.0~~5.0	~~160~~155	6
7.2	75	95	~~140~~150	~~5.5~~6.0	180	7	~~110~~190	~~4.0~~7.5	~~160~~155	6
13.8	95	110	~~190~~195	7.5	~~310~~305	12	~~130~~230	~~5.0~~9.5	180	7
14.4	110	110	230	9.0	~~310~~305	12	~~165~~260	~~6.5~~10.5	180	7
23	125	150	~~270~~330	~~10.5~~13.0	385	15	~~190~~305	~~7.5~~12.5	~~260~~255	10
34.5	150	150	~~320~~330	~~12.5~~13.0	385	15	~~250~~305	~~9.5~~12.5	~~260~~255	10
	200	200	460	18.0	460	18	~~330~~380	~~13.0~~15.0	~~330~~335	13
46	—	200	—	—	460	18	—	—	~~330~~335	13
	—	250	—	—	535	21	—	—	~~440~~435	17
69	—	250	—	—	535	21	—	—	~~440~~435	17
	—	350	—	—	~~785~~790	31	—	—	~~640~~635	25
115	—	550	—	—	1350	53	—	—	1070	42
138	—	550	—	—	1350	53	—	—	1070	42
	—	650	—	—	~~1600~~1575	~~63~~62	—	—	~~1280~~1270	50
161	—	650	—	—	~~1600~~1575	~~63~~62	—	—	~~1280~~1270	50
	—	750	—	—	1830	72	—	—	~~1480~~1475	58
230	—	750	—	—	1830	72	—	—	~~1480~~1475	58
	—	900	—	—	~~2270~~2265	89	—	—	~~1810~~1805	71
	—	1050	—	—	2670	105	—	—	2110	83

* The values given are the minimum clearance for rigid parts and bare conductors under favorable service conditions. They shall be increased for conductor movement or under unfavorable service conditions or wherever space limitations permit. The selection of the associated impulse withstand voltage for a particular system voltage is determined by the characteristics of the surge protective equipment.

** The outdoor values apply to conditions at 1010 m (3300 ft.) above sea level.

Since, CMP 13's action taken on this proposal implies a rounding of the SI equivalent values to the next highest integer by the nearest fifth multiple significance. Using a Microsoft Excel97 spreadsheet analysis and the "ceiling" math & trig function with significance of 5 (uppermost 5 mm), the Source B inch-pound units are multiplied by 25.4 mm/in. to determine the SI values for the outdoor clearances. Also, the Source A SI units for indoor clearances are divided by 25.4 mm/in. and the "ceiling" math & trig function applied with significance of 0.5 (uppermost 0.5 in.) to determine the inch-pound units. Source A did not have values for the 2.4-4.16kV and the 13.8kV system voltages, so these values were interpolated from the other values in the source table. These results are as shown in the proposed change of the comment above. Thus, these values meet the Panel's implication that the metric conversions must be rounded higher to assure minimum clearances are maintained and the level of safety is as assured as the inch-pound units.

The added double asterisk (**) note is included according to Source B to note the outdoor clearance values are based on 3300 ft. above sea level. The SI equivalent of 3300 ft. was determined by rounding up to nearest 5th multiple (5 m) of 3300 ft. multiplied by 0.3048 m/ft. resulting in 1010 m. Source A did not qualify its values in this manner.

This analysis and the Panel's statement are mathematical results of correlating with the source documents referenced above for the electrical B.I.L. minimum clearances. These results do meet the intent of the Technical Correlating Committee's metrication proposal according to the NFPA No. 1M Manual of Style Section 4.1 with respect to the placement of units and values of measurements.

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

PANEL ACTION: Reject.

PANEL STATEMENT: The submitter has proposed substantive changes without technical justification.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 10

NOT RETURNED: 1 Davis

(Log #1363)

13- 8 - (490-46 (New)): Reject

SUBMITTER: David P. Brown, Baltimore Gas and Electric Co/EEI

COMMENT ON PROPOSAL NO: 13-28

RECOMMENDATION: Accept the original proposal in principle to add a new subsection to Section C of Article 490 and rewrite as follows:

490.46(new). Metal Enclosed and Metalclad Service Equipment.

(a) General. Metal enclosed and metalclad switchgear installed as high-voltage service equipment shall have the following features in (b) and (c) below to ensure separation between service and feeder or branch circuit equipment. The high-voltage components that may be installed within this equipment are: service conductors and terminations, surge arresters, metering transformers, insulators, bus, main disconnecting device, and main overcurrent protective device, including any associated current and voltage transformers for protective relaying.

FPN: Local serving utilities may have additional requirements for high-voltage service equipment. See ANSI/IEEE C2-1997 Sections 18 and 38 for further information.

(b) Service Conductor Termination Compartment. The compartment in which the high-voltage service conductors terminate shall include the following:

(1) A hinged door with provision for padlocking.

(2) This compartment shall be identified as the service cable termination compartment.

FPN: for further information on hazard signs and labels see ANSI Z535.

(3) Live front construction shall have an inner metal barrier marked with the highest voltage present. Each phase bus shall have a bare bus bar extension for voltage testing and application of safety grounds.

(4) A ground bus extension for connection of service cable termination shields and a safety ground attachment.

(c) Service Overcurrent Protective Device. Access for maintenance of the service fuses, circuit breaker or circuit interrupter shall not expose personnel to live parts connected to the service conductors. Barriers, rack-out mechanisms and interlocks with disconnect or isolating switches are recognized safeguards to provide this isolation.

SUBSTANTIATION: This proposal should have been accepted in principal. The suggested rewording of the original proposal eliminates product requirements and provides a performance-based requirement for service equipment over 600 Volts. This will establish a minimum requirement for high-voltage service equipment. The proposal establishes the difference between high voltage equipment installed as service entrance and high voltage equipment installed for feeders and branch circuit protection.

PANEL ACTION: Reject.

PANEL STATEMENT: The requirements are still product specifications and are not universally accepted by all utilities across the country.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 9

NEGATIVE: 1

NOT RETURNED: 1 Davis

EXPLANATION OF NEGATIVE:

FOGARTY: The original proposal (13-28) attempted to provide the minimum requirements for high-voltage service equipment but was not accepted by the Panel at the January, 2000 ROP meeting. In response to this action, Comment 13-8 was submitted by the Edison Electric Institute (EEI) representative wherein the original proposal wording was further generalized to eliminate the objection of "product requirements." This comment should have at least been Accepted in Principle because it addresses a void in the NEC, and is essentially a performance-based requirement for service equipment over 600 volts. The EEI represents the input of approximately 40 utilities and is a significant cross-section summary of their individual service equipment requirements.

ARTICLE 500 — HAZARDOUS (CLASSIFIED) LOCATIONS, CLASS I, II, AND III, DIVISIONS 1 AND 2

(Log #140)

14- 4 - (500): Accept

SUBMITTER: Technical Correlating Committee National Electrical Code

COMMENT ON PROPOSAL NO: 14-2a

RECOMMENDATION: The Technical Correlating Committee advises that Article Scope statements are the responsibility of the Technical Correlating Committee and the Technical Correlating Committee accepts the Panel Action. Further, it was the action of the Technical Correlating Committee that this Proposal be reconsidered by the Panel, with further consideration given to the comments expressed in the voting, specifically with respect to comments that the accepted Proposal does not accurately reflect what was agreed upon by the Panel. It is the understanding of the Technical Correlating Committee that this proposal is modified by Proposals 14-4a, 14-6, 14-20, 14-21, 14-33, 14-34, 14-38, 14-39, 14-42, 14-43, 14-44, 14-45, 14-46, 14-47, 14-48, and 14-57a. This action will be considered by the Panel as a Public Comment.

SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.

PANEL ACTION: Accept.

See Comment 14-11.

PANEL STATEMENT: The panel action on Comment 14-11 will reflect the complete text of Article 500.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:

AFFIRMATIVE: 14

(Log #1338)

14- 5 - (500): Accept
SUBMITTER: Mike O'Meara, A.P.S.
COMMENT ON PROPOSAL NO: 14-2a
RECOMMENDATION: Revise text as follows:
I agree with the panel action to accept this proposal but feel the proposal should not incorporate the panel actions on Proposals 14-10 or 14-6.
SUBSTANTIATION: By rejecting Proposal 14-10, the proposed wording in the rewrite of Article 500 is not in compliance with the NFPA Manual of Style, Chapter 4. The definition included as a result of panel action on Proposal 14-6 is too broad and is not enforceable.
PANEL ACTION: Accept.
See Comment 14-11
PANEL STATEMENT: All metrication changes appear in the action on Comment 14-11.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #1394)

14- 6 - (500): Accept in Principle
SUBMITTER: Kari Barrett, American Chemistry Council
COMMENT ON PROPOSAL NO: 14-2a
RECOMMENDATION: Use the rewrite from Mr. Wechsler's ballot as stated in the balloting comments for this proposal, as starting textual basis for all actions on public comments to Article 500 proposals.
SUBSTANTIATION: As stated under the balloting comments of the Panel 14 committee, due to the errors that the Committee felt existed with the presented rewrite texts, that are corrected by the rewrite addressed by the Wechsler submitted ballot, this "Wechsler" rewrite should be the starting textual basis for Panel actions.
PANEL ACTION: Accept in Principle.
Use the text submitted with Comment 14-11 (Log #2228) as the working text for all amendments to Article 500.
PANEL STATEMENT: The panel action on Comment 14-11 will reflect the complete text of Article 500.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #1396)

14- 7 - (500): Accept in Principle
SUBMITTER: Kari Barrett, American Chemistry Council
COMMENT ON PROPOSAL NO: 14-3
RECOMMENDATION: Use the rewrite from Mr. Wechsler's ballot as stated in the balloting comments for 14-2a, as a starting textual basis for all actions on public comments to Article 500 proposals.
SUBSTANTIATION: As stated under the balloting comments of the Panel 14 committee, due to the errors that the Committee felt existed with the presented rewrite texts, that are corrected by the rewrite addressed by the Wechsler submitted ballot, this "Wechsler" rewrite should be the starting textual basis for Panel actions.
PANEL ACTION: Accept in Principle.
Use the text submitted with Comment 14-11 (Log #2228) as the working text for all amendments to Article 500.
PANEL STATEMENT: The panel action on Comment 14-11 will reflect the complete text of Article 500.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #1490)

14- 8 - (500): Accept
SUBMITTER: David N. Bishop, David N. Bishop, Consultant
COMMENT ON PROPOSAL NO: 14-2a
RECOMMENDATION: Delete: Nonhazardous Locations. Locations which are not required to have been evaluated by the process defined in 500-~~3~~5 (a) or 505-~~3~~5(a).
SUBSTANTIATION: Inclusion of this definition will cause a most serious safety problem. Craftsmen in the industry have used the term "nonhazardous location" to be synonymous with "unclassified location" for decades. Deletion of the term will have no deletrious effects on the otherwise excellent panel proposal. At least 99% of those in the trade would be totally mislead by the new proposed definition.
PANEL ACTION: Accept.
See Comment 14-11.
PANEL STATEMENT: The submitter's concerns have been addressed by the panel action in Comment 14-26, as reflected in Comment 14-11.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #2188)

14- 9 - (500): Accept
SUBMITTER: Mark Goodman, BP (ARCO)
COMMENT ON PROPOSAL NO: 14-2a
RECOMMENDATION: Delete the term and definition of "Nonhazardous" from the revised Article 500, Section 500-2 Definitions.
SUBSTANTIATION: This comment recommends the removal of the term, Nonhazardous, its definition, and use for the following reasons.
1. This term was added as part of the Panel Chairman assigned Task group responsible for reorganizing the information in Article 500. This term and definition are new material and beyond the scope of the Panel Chair's direction.
2. The added term and definition was not part of any proposal made to the panel and has no substantiation for its inclusion.
3. Several proposals (14-8, 14-40, and 14-315) specifically requested that the term "nonhazardous" currently used in the Article be deleted and substituted with there term "unclassified".
4. This term adds an additional area classification location that does not currently exist in related standards and practices (API 500, 505, and NFPA 497 for example) or in most company documentation systems.
5. The term is misleading. The implication of "nonhazardous" is that there are no hazards. There are hazards other than electrical area classification such as caustics, acids, radiation, etc. Using the term "unclassified" is becoming widely accepted and recognized as specific to electrical area classification. "Nonhazardous' is much too broad.
6. The term is not needed. An area is either "Classified", requiring specifically identified or approved equipment suitable for the location or "Unclassified", not requiring equipment so identified or approved. The term will only add confusion and potential misapplication.
7. By its definition, "Nonhazardous Locations. Locations which are not required to have been evaluated". Whoever makes the determination that the location is not required to be evaluated has just evaluated the location. It is also not at all clear how or who would make that determination.
For the above reasons, the term "Nonhazardous", its definition and use should be removed from Article 500 (and 505).
PANEL ACTION: Accept.
PANEL STATEMENT: This has been addressed by the action on Comment 14-26.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #2191)

14- 10 - (500): Accept in Principle
Note: The Technical Correlating Committee directs that the Panel Action be revised to delete the second sentence of the FPN. In accordance with the NEC Style Manual, FPNs are not permitted to contain recommendations.
SUBMITTER: Mark Goodman, BP (ARCO)
COMMENT ON PROPOSAL NO: 14-6
RECOMMENDATION: In the proposed new definition section, 500-2 for "Electrical and Electronic Equipment", delete the words "as well as any portable or transportable device having a battery or other electrical power source". Table the issue until further study provides greater guidance.
SUBSTANTIATION: There are several reasons why this text should not be included in the NEC at this time.
1. The NEC is an installation based document and excludes equipment that is not "installed". The specific question of whether portable equipment is within the scope of the NEC was posed to the NFPA Standards Council. In their written reply, the Standards Council stated that portable equipment is not within the scope of the NEC. Although the Technical Correlating Committee did not comment on this proposal during their review of proposals, the Standards Council direction should result in the removal of these devices as beyond the scope of the NEC.
2. The statement as written is too broad and includes everything

from wristwatches and hearing aids to test equipment.

3. An ad-hoc group (including a member of the Technical Correlating Committee) has been formed to provide testing and some basic guidelines with respect to battery powered devices. The testing of many of these is expected to yield results that the equipment has insufficient energy to cause ignition.

For the reasons stated above, it is recommended that portable and transportable equipment not be included in Article 500 of the Code at this time.

PANEL ACTION: Accept in Principle.

Delete the words indicated by the submitter and add a Fine Print Note to the definition to read as follows:

"FPN: Portable or transportable equipment having self-contained power supplies, such as battery-operated equipment, could potentially become an ignition source in hazardous (classified) locations. Equipment suitable for the location or safety procedures to ensure safe operation of this equipment should be employed."

PANEL STATEMENT: The panel agrees with the submitter, but believes that additional guidance is needed.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:

AFFIRMATIVE: 14

COMMENT ON AFFIRMATIVE:

OMEARA: The last sentence of the added fine print note contains language not permitted by the style manual ("Equipment...should be employed"). I recommend changing this sentence to make it advisory in nature as follows: "Using equipment suitable for the hazardous location or using safety procedures to ensure the safe operation of equipment in hazardous (classified) locations are two ways to ensure personnel safety."

(Log #2228)

14- 11 - (500): Accept in Principle

Note: The Technical Correlating Committee directs that the first sentence of the definition of "Nonincendive Component" in 500-2 read as follows: "A component having contacts for making or breaking an incendive circuit where the contacting mechanism is constructed so that…" to comply with 2.2.2 of the NEC Style Manual.

The Technical Correlating Committee directs that a title be added to Table 500-8(c) (2)to read: "Class II Temperatures" in accordance with 2.3.1 of the NEC Style Manual.

SUBMITTER: James D. Cospolich, Waldemar S. Nelson & Co., Inc.

COMMENT ON PROPOSAL NO: 14-2a

RECOMMENDATION: Please see the following revised text which represents what I believe to be the correct wording that Code Making Panel 14 voted on and accepted during the January 2000 ROP meeting. The shaded wording represents what I consider to be revisions and corrections. Some of this shaded wording is very important for the technical accuracy and intent of the article. Entire 500 with recommended changes would appear as follows Entire 500 with recommended changes would appear as follows [14-3, or CP140?, note ~~[500-4]~~ indicates current NEC text section and is shown only for reference and should not be part of the final text]:

ARTICLE 500 – Hazardous (Classified) Locations, Classes I, II, and III, Divisions 1 and 2

500-1. Scope — Articles 500 through 504 [no change]

Articles 500 through 504 cover the requirements for electrical and electronic equipment and wiring for all voltages in Class I, Divisions 1 and 2; Class II, Divisions 1 and 2; and Class III, Divisions 1 and 2 locations where fire or explosion hazards may exist due to flammable gases or vapors, flammable liquids, combustible dust, or ignitible fibers or flyings.

FPN: For the requirements for electrical and electronic equipment and wiring for all voltages in Class I, Zone 0, Zone 1, and Zone 2 hazardous (classified) locations where fire or explosion hazards may exist due to flammable gases or vapors, or flammable liquids, refer to Article 505.

[new] 500-2 Definitions. For purposes of Articles 500 through 504 and Articles 506 through 516, the following definitions apply.

Identified (as applied to equipment). Recognizable as suitable for the specific purpose, function, use, environment, application, etc., where prescribed in a particular Code requirement.

FPN: Suitability of equipment for a specific purpose, environment, or application may be determined by:

1. equipment listing or labeling;
2. evidence of equipment evaluation from a qualified testing laboratory or inspection agency concerned with product evaluation; or
3. other evidence acceptable to the authority having jurisdiction such as a manufacturer's self certification or an owner's engineering judgement.

(See definitions of *Labeled* and *Listed*)

[CP140?-500 rewrite, Panel action Cook actions, correlation w/500]]

Unclassified Locations. Locations that have been evaluated by the classification process defined in Section 500-5(a) or Section 505-5 (a) and determined to be neither Class I, Division 1; Class I, Division 2; Class I, Zone 0; Class I, Zone 1; Class I, Zone 2; Class II, Division 1; Class II, Division 2; Class III, Division 1; Class III, Division 2; or any combination thereof. [14-8,14-58]

Nonhazardous Locations. Locations which are not required to have been evaluated by the process defined in 500-5 (a) or 505-5(a). [14-8]

Electrical and Electronic Equipment. Materials, fittings, devices, appliances, and the like that are part of, or in connection with an electrical installation, as well as any portable or transportable device having a battery or other electrical power source. [14-6]

Dust-ignitionproof. Equipment enclosed in a manner that will exclude dusts and will not permit arcs, sparks, or heat otherwise generated or liberated inside of the enclosure to cause ignition of exterior accumulations or atmospheric suspensions of a specified dust on or in the vicinity of the enclosure. [14-15,14-203]

FPN: For further information on dust-ignitionproof enclosures, see Type 9 enclosure in Enclosures for Electrical Equipment, ANSI/NEMA 250-1991, and Explosionproof and Dust-Ignitionproof Electrical Equipment for Hazardous (Classified) Locations, ANSI/UL 1203-1994.

Dusttight. Enclosures constructed so that dust will not enter under specified test conditions. [14-18]

FPN: See Nonincendive Electrical Equipment for Use in Class I and II, Division 2, and Class III, Divisions 1 and 2 Hazardous (Classified) Locations, ANSI/ISA S12.12-1994, and Electrical Equipment for Use in Class I and II, Division 2 and Class III Hazardous (Classified) Locations, UL 1604-1994.

Explosionproof Apparatus. Apparatus enclosed in a case that is capable of withstanding an explosion of a specified gas or vapor that may occur within it and of preventing the ignition of a specified gas or vapor surrounding the enclosure by sparks, flashes, or explosion of the gas or vapor within, and that operates at such an external temperature that a surrounding flammable atmosphere will not be ignited thereby.

FPN: For further information, see Explosion-Proof and Dust-Ignition-Proof Electrical Equipment for Use in Hazardous (Classified) Locations, ANSI/UL 1203-1994. [14-13]

Purged and Pressurized. The process of supplying an enclosure with a protective gas, at a sufficient flow and positive pressure to reduce the concentration of any flammable gas or vapor initially present to an acceptable level. [14-20]

FPN: For further information, see Purged and Pressurized Enclosures for Electrical Equipment, ANSI/NFPA 496-1998.

Nonincendive Circuit. A circuit, other than field wiring, in which any arc or thermal effect produced under intended operating conditions of the equipment, is not capable, under specified test conditions, of igniting the flammable gas–, vapor–, or dust–air mixture. [14-31]

FPN: For further information see Nonincendive Electrical Equipment for Use in Class I and II, Division 2 and Class III, Divisions 1 and 2 Hazardous (Classified) Locations, ANSI/ISA-S12.12-1994.

Nonincendive Field Wiring. Wiring that enters or leaves an equipment enclosure and, under normal operating conditions of the equipment, is not capable, due to arcing or thermal effects, of igniting the flammable gas–, vapor–, or dust–air mixture. Normal operation includes opening, shorting, or grounding the field wiring. [14-30]

Nonincendive Equipment. Equipment having electrical/electronic circuitry that is incapable, under normal operating conditions, of causing ignition of a specified flammable gas–, vapor–, or dust–air mixture due to arcing or thermal means.

FPN: For further information, see Nonincendive Electrical Equipment for Use in Class I and II, Division 2, and Class III, Divisions 1 and 2 Hazardous (Classified) Locations, ANSI/ISA-S12.12-1994.

Nonincendive Component. A component having contacts for making or breaking an incendive circuit and the contacting mechanism shall be constructed so that the component is incapable of igniting the specified flammable gas– or vapor–air mixture. The housing of a nonincendive component is not intended to exclude the flammable atmosphere or contain an explosion.

FPN: For further information, see Electrical Equipment for Use in Class I and II, Division 2, and Class III Hazardous (Classified) Locations, UL 1604-1994.

Associated Nonincendive Field Wiring Apparatus - Apparatus in which the circuits are not necessarily nonincendive themselves, but that affect the energy in nonincedive field wiring circuits and are relied upon to maintain nonincendive energy levels. Associated nonincendive field wiring apparatus may be either of the following:

1. Electrical apparatus that has an alternative type of protectionfor use in the appropriate hazardous (classified) location, or

2. Electrical apparatus not so protected that shall not be used in ahazardous (classified) location.

FPN: Associated nonincendive field wiring apparatus has designated associated nonincendive field wiring apparatus connections for nonincendive field wiring apparatus and may also have connections for other electrical apparatus.
[14-30]

Nonincendive field wiring apparatus - Apparatus intended to be connected to nonincendive field wiring.

[14-31]

Oil Immersion. Electrical equipment immersed in a protective liquid in such a way that an explosive atmosphere that may be above the liquid or outside the enclosure cannot be ignited.

FPN: For further information, see Industrial Control Equipment for Use in Hazardous (Classified) Locations, ANSI/UL 698-1995.

Hermetically Sealed. Equipment sealed against the entrance of an external atmosphere where the seal is made by fusion, e.g., soldering, brazing, welding, or the fusion of glass to metal.

FPN: For further information, see Nonincendive Electrical Equipment for Use in Class I and II, Division 2, and Class III, Division 1 and 2 Hazardous (Classified) Locations, ANSI/ISA S12.12-1994.

500-3. Other Articles ~~[500-2]~~

Except as modified in Articles 500 through 504, all other applicable rules contained in this Code shall apply to electrical equipment and wiring installed in hazardous (classified) locations.

500-4 General ~~[500-3]~~

(a) Documentation. ~~[500-3(b)]~~All areas designated as hazardous (classified) locations shall be properly documented. This documentation shall be available to those authorized to design, install, inspect, maintain, or operate electrical equipment at the location.

(b) Reference Standards.~~[500-3(c)]~~

FPN No. 1: It is important that the authority having jurisdiction be familiar with recorded industrial experience as well as with the standards of the National Fire Protection Association (NFPA), the American Petroleum Institute (API), and The Instrumentation, Systems, and Automation Society (ISA) that may be of use in the classification of various locations, the determination of adequate ventilation, and the protection against static electricity and lightning hazards.

FPN No. 2: For further information on the classification of locations, see Flammable and Combustible Liquids Code, NFPA 30-1996; Standard for Drycleaning Plants, NFPA 32-1996; Standard for Spray Application Using Flammable or Combustible Materials, NFPA 33-1995; Standard for Dipping and Coating Processes Using Flammable or Combustible Liquids, NFPA 34-1995; Standard for the Manufacture of Organic Coatings, NFPA 35-1995; Standard for Solvent Extraction Plants, NFPA 36-1997; Standard on Fire Protection for Laboratories Using Chemicals, NFPA 45-1996; Standard for Gaseous Hydrogen Systems at Consumer Sites, NFPA 50A-1994; Standard for Liquefied Hydrogen Systems at Consumer Sites, NFPA 50B-1994; Liquefied Petroleum Gas Code, NFPA 58-1998; Standard for the Storage and Handling of Liquefied Petroleum Gases at Utility Gas Plants, NFPA 59-1998; Recommended Practice for the Classification of Flammable Liquids, Gases, or Vapors and of Hazardous (Classified) Locations for Electrical Installations in Chemical Process Areas, NFPA 497-1997; Recommended Practice for the Classification of Combustible Dusts and of Hazardous (Classified) Locations for Electrical Installations in Chemical Process Areas, NFPA 499-1997; Standard for Fire Protection in Wastewater Treatment and Collection Facilities, NFPA 820-1995; Recommended Practice for Classification of Locations of Electrical Installations at Petroleum Facilities Classified as Class I, Division 1 and Division 2, ANSI/API RP500-1997; Area Classification In Hazardous (Classified) Dust Locations, ANSI/ISA-S12.10-1988.

FPN No. 3: For further information on protection against static electricity and lightning hazards in hazardous (classified) locations, see Recommended Practice on Static Electricity, NFPA 77-1993; Standard for the Installation of Lightning Protection Systems, NFPA 780-1997; and Protection Against Ignitions Arising Out of Static Lightning and Stray Currents, API RP 2003-1991.

FPN No. 4: For further information on ventilation, see Flammable and Combustible Liquids Code, NFPA 30-1996; and Recommended Practice for Classification of Locations for Electrical Installations at Petroleum Facilities Classified as Class I, Division 1 and Division 2, API RP 500-1997, Section 4.6.

FPN No. 5: For further information on electrical systems for hazardous (classified) locations on offshore oil and gas producing platforms, see Recommended Practice for Design and Installation of Electrical Systems for Fixed and Floating Offshore Petroleum Facilities for Unclassified and Class I, Division 1 and Division 2 Locations, ANSI/API RP 14F-1999.

500-5. Classifications of Locations ~~[500-3(a)]~~

(a) Classifications of Locations. ~~[500-3(a)]~~Locations shall be classified depending on the properties of the flammable vapors, liquids, or gases, or combustible dusts or fibers that may be present and the likelihood that a flammable or combustible concentration or quantity is present. Where pyrophoric materials are the only materials used or handled, these locations shall not be classified.
Each room, section, or area shall be considered individually in determining its classification.

FPN: Through the exercise of ingenuity in the layout of electrical installations for hazardous (classified) locations, it is frequently possible to locate much of the equipment in a reduced level of classification or in an unclassified location and, thus, to reduce the amount of special equipment required. [14-40]

Rooms and areas containing ammonia refrigeration systems that are equipped with adequate mechanical ventilation, may be classified as "unclassified" locations. [14-37]

FPN: For further information regarding classification and ventilation of areas involving ammonia, see Safety Code for Mechanical Refrigeration, ANSI/ASHRAE 15-1994, and Safety Requirements for the Storage and Handling of Anhydrous Ammonia, ANSI/CGA G2.1-1989 (14-37)

(b) Class I Locations ~~[500-7]~~

Class I locations are those in which flammable gases or vapors are or may be present in the air in quantities sufficient to produce explosive or ignitible mixtures. Class I locations shall include those specified in

(1) and (2).

(1) Class I, Division 1. ~~[500-7(a)]~~A Class I, Division 1 location is a location
(a) ~~[500-7(a)(1)]~~In which ignitible concentrations of flammable gases or vapors can exist under normal operating conditions, or
(b) ~~[500-7(a)(2)]~~In which ignitible concentrations of such gases or vapors may exist frequently because of repair or maintenance operations or because of leakage, or
(c) ~~[500-7(a)(3)]~~In which breakdown or faulty operation of equipment or processes might release ignitible concentrations of flammable gases or vapors, and might also cause simultaneous failure of electrical equipment in such a way as to directly cause the electrical equipment to become a source of ignition.

FPN No. 1: This classification usually includes the following locations:

a. Where volatile flammable liquids or liquefied flammable gases are transferred from one container to another
b. Interiors of spray booths and areas in the vicinity of spraying and painting operations where volatile flammable solvents are used
c. Locations containing open tanks or vats of volatile flammable liquids
d. Drying rooms or compartments for the evaporation of flammable solvents
e. Locations containing fat and oil extraction equipment using volatile flammable solvents
f. Portions of cleaning and dyeing plants where flammable liquids are used
g. Gas generator rooms and other portions of gas manufacturing plants where flammable gas may escape
h. Inadequately ventilated pump rooms for flammable gas or for volatile flammable liquids
i. The interiors of refrigerators and freezers in which volatile flammable materials are stored in open, lightly stoppered, or easily ruptured containers
j. All other locations where ignitible concentrations of flammable vapors or gases are likely to occur in the course of normal operations.

FPN No. 2: In some Division 1 locations, ignitible concentrations of flammable gases or vapors may be present continuously or for long periods of time. Examples include the following:

a. The inside of inadequately vented enclosures containing instruments normally venting flammable gases or vapors to the interior of the enclosure
b. The inside of vented tanks containing volatile flammable liquids
c. The area between the inner and outer roof sections of a floating roof tank containing volatile flammable fluids
d. Inadequately ventilated areas within spraying or coating operations using volatile flammable fluids
e. The interior of an exhaust duct that is used to vent ignitible concentrations of gases or vapors.

Experience has demonstrated the prudence of avoiding the installation of instrumentation or other electric equipment in these particular areas altogether or where it cannot be avoided because it is essential to the process and other locations are not feasible [see Section 500-5(a), FPN], using electric equipment or instrumentation approved for the specific application or consisting of intrinsically safe systems as described in Article 504.

(2) Class I, Division 2. ~~[500-7(b)]~~A Class I, Division 2 location is a location
(a) ~~[500-7(b)(1)]~~In which volatile flammable liquids or flammable gases are handled, processed, or used, but in which the liquids, vapors, or gases will normally be confined within closed containers or closed systems from which they can escape only in case of accidental rupture or breakdown of such containers or systems, or in case of abnormal operation of equipment, or
(b) ~~[500-7(b)(2)]~~In which ignitible concentrations of gases or vapors are normally prevented by positive mechanical ventilation, and which might become hazardous through failure or abnormal operation of the ventilating equipment, or
(c) ~~[500-7(b)(3)]~~That is adjacent to a Class I, Division 1 location, and to which ignitible concentrations of gases or vapors might occasionally be communicated unless such communication is prevented by adequate positive-pressure ventilation from a source of clean air, and effective safeguards against ventilation failure are provided.

FPN No. 1: This classification usually includes locations where volatile flammable liquids or flammable gases or vapors are used but that, in the judgment of the authority having jurisdiction, would become hazardous only in case of an accident or of some unusual operating condition. The quantity of flammable material that might escape in case of accident, the adequacy of ventilating equipment, the total area involved, and the record of the industry or business with respect to explosions or fires are all factors that merit consideration in determining the classification and extent of each location.

FPN No. 2: Piping without valves, checks, meters, and similar devices would not ordinarily introduce a hazardous condition even though used for flammable liquids or gases. Depending on factors such as the quantity and size of the containers and ventilation, locations used for the storage of flammable liquids or liquefied or compressed gases in sealed containers may either be considered hazardous (classified) or unclassified or nonhazardous locations. See Flammable and Combustible Liquids Code, NFPA 30-1996, and Liquefied Petroleum Gas Code, NFPA 58-1998. [14-40]

(c) Class II Locations ~~[500-8]~~
Class II locations are those that are hazardous because of the presence of combustible dust. Class II locations shall include those specified in (1) and (2).
(1) ~~[500-8(a)]~~**Class II, Division 1**. A Class II, Division 1 location is a location
(a) ~~[500-8(a)(1)]~~In which combustible dust is in the air under normal operating conditions in quantities sufficient to produce explosive or ignitible mixtures, or
(b) ~~[500-8(a)(2)]~~Where mechanical failure or abnormal operation of machinery or equipment might cause such explosive or ignitible mixtures to be produced, and might also provide a source of ignition through simultaneous failure of electric equipment, operation of protection devices, or from other causes, or
(c) ~~[500-8(a)(3)]~~In which combustible dusts of an electrically conductive nature may be present in hazardous quantities.

FPN: Combustible dusts that are electrically nonconductive include dusts produced in the handling and processing of grain and grain products, pulverized sugar and cocoa, dried egg and milk powders, pulverized spices, starch and pastes, potato and wood-flour, oil meal from beans and seed, dried hay, and other organic materials that may produce combustible dusts when processed or handled. Only Group E dusts are considered to be electrically conductive for classification purposes. Dusts containing magnesium or aluminum are particularly hazardous, and the use of extreme precaution will be necessary to avoid ignition and explosion.

(2) Class II, Division 2. ~~[500-8(b)]~~A Class II, Division 2 location is a location
(a) ~~[500-8(b)(1)]~~Where combustible dust is not normally in the air in quantities sufficient to produce explosive or ignitible mixtures, and dust accumulations are normally insufficient to interfere with the normal operation of electrical equipment or other apparatus, but combustible dust may be in suspension in the air as a result of infrequent malfunctioning of handling or processing equipment and

(b) ~~[500-8(b)(2)]~~Where combustible dust accumulations on, in, or in the vicinity of the electrical equipment may be sufficient to interfere with the safe dissipation of heat from electrical equipment or may be ignitible by abnormal operation or failure of electrical equipment.

FPN No. 1: The quantity of combustible dust that may be present and the adequacy of dust removal systems are factors that merit consideration in determining the classification and may result in an unclassified or nonhazardous area. [14-40]

FPN No. 2: Where products such as seed are handled in a manner that produces low quantities of dust, the amount of dust deposited may not warrant classification.

(d) Class III Locations ~~[500-9]~~
Class III locations are those that are hazardous because of the presence of easily ignitible fibers or flyings, but in which such fibers or flyings are not likely to be in suspension in the air in quantities sufficient to produce ignitible mixtures. Class III locations shall include those specified in (a) and (b).
(1) Class III, Division 1. ~~[500-9(a)]~~A Class III, Division 1 location is a location in which easily ignitible fibers or materials producing combustible flyings are handled, manufactured, or used.

FPN No. 1: Such locations usually include some parts of rayon, cotton, and other textile mills; combustible fiber manufacturing and processing plants; cotton gins and cotton-seed mills; flax-processing plants; clothing manufacturing plants; woodworking plants; and establishments and industries involving similar hazardous processes or conditions.

FPN No. 2: Easily ignitible fibers and flyings include rayon, cotton (including cotton linters and cotton waste), sisal or henequen, istle, jute, hemp, tow, cocoa fiber, oakum, baled waste kapok, Spanish moss, excelsior, and other materials of similar nature.

(2) Class III, Division 2. ~~[500-9(b)]~~A Class III, Division 2 location is a location in which easily ignitible fibers are stored or handled other than in the process of manufacture.

500-6 Material Groups
~~[500-5(a) second paragraph]~~For purposes of testing, approval, and area classification, various air mixtures (not oxygen-enriched) shall be grouped in accordance with Sections 500-6(a) and 500-6(b).

Exception: Equipment identified for a specific gas, vapor, or dust.[14-33]

FPN: This grouping is based on the characteristics of the materials. Facilities are available for testing and identifying equipment for use in the various atmospheric groups.

(a) Class I Group Classifications. ~~[500-5(a)]~~Class I groups shall be as follows.
[x]**(1)** ~~[500-5(a)(1)]~~**Group A**. Acetylene.
[x]**(2)** ~~[500-5(a)(2)]~~**Group B**. Flammable gas, flammable liquid–produced vapor, or combustible liquid–produced vapor mixed with air that may burn or explode, having either a maximum experimental safe gap (MESG) value less than or equal to 0.45 mm or a minimum igniting current ratio (MIC ratio) less than or equal to 0.40.

FPN: A typical Class I, Group B material is hydrogen.

Exception No. 1: Group D equipment shall be permitted to be used for atmospheres containing butadiene provided all conduit and cable runs into explosionproof equipment are provided with explosionproof seals installed within 18 in. (457 mm) of the enclosure.
Exception No. 2: Group C equipment shall be permitted to be used for atmospheres containing allyl glycidyl ether, n-butyl glycidyl ether, ethylene oxide, propylene oxide, and acrolein provided all conduit and cable runs into explosionproof equipment are provided with explosionproof seals installed within 18 in. (457 mm) of the enclosure.

[x]**(3)** ~~[500-5(a)(3)]~~**Group C**. Flammable gas, flammable liquid–produced vapor, or combustible liquid–produced vapor mixed with air that may burn or explode, having either a maximum experimental safe gap (MESG) value greater than 0.45 mm and less than or equal to 0.75 mm, or a minimum igniting current ratio (MIC ratio) greater than 0.40 and less than or equal to 0.80.
FPN: A typical Class I, Group C material is ethylene.

[x]**(4)** ~~[500-5(a)(4)]~~**Group D.** Flammable gas, flammable liquid–produced vapor, or combustible liquid–produced vapor mixed with air that may burn or explode, having either a maximum experimental safe gap (MESG) value greater than 0.75 mm or a minimum igniting current ratio (MIC ratio) greater than 0.80.
FPN No. 1: A typical Class I, Group D material is propane.
FPN No. 2: For classification of areas involving ammonia atmospheres, see Safety Code for Mechanical Refrigeration, ANSI/ASHRAE 15-1994, and Safety Requirements for the Storage and Handling of Anhydrous Ammonia, ANSI/CGA G2.1-1989.
~~*Exception: For atmospheres containing ammonia, the authority having jurisdiction for enforcement of this Code shall be permitted to reclassify the location to a reduced level of classification or to an unclassified location. (14-37)*~~

~~FPN No. 1: For additional information on the properties and group classification of Class I materials, see Recommended Practice for the Classification of Flammable Liquids, Gases, or Vapors and of Hazardous (Classified) Locations for Electrical Installations in Chemical Process Areas, NFPA 497-1997, and Guide to Fire Hazard Properties of Flammable Liquids, Gases, and Volatile Solids, NFPA 325-1994.~~
The following FPN's apply to section (a):
FPN No. 1: The explosion characteristics of air mixtures of gases or vapors vary with the specific material involved. For Class I locations, Groups A, B, C, and D, the classification involves determinations of maximum explosion pressure and maximum safe clearance between parts of a clamped joint in an enclosure. It is necessary, therefore, that equipment be identified [14-38] not only for class but also for the specific group of the gas or vapor that will be present.
FPN No. 2: Certain chemical atmospheres may have characteristics that require safeguards beyond those required for any of the above groups. Carbon disulfide is one of these chemicals because of its low ignition temperature [100ºC (212ºF)] and the small joint clearance permitted to arrest its flame.

[14-37]
(b) Class II Group Classifications. ~~[500-5(b)]~~Class II groups shall be as follows.

[x]**(1)** ~~[500-5(b)(1)]~~**Group E.** Atmospheres containing combustible metal dusts, including aluminum, magnesium, and their commercial alloys, or other combustible dusts whose particle size, abrasiveness, and conductivity present similar hazards in the use of electrical equipment.

FPN: Certain metal dusts may have characteristics that require safeguards beyond those required for atmospheres containing the dusts of aluminum, magnesium, and their commercial alloys. For example, zirconium, thorium, and uranium dusts have extremely low ignition temperatures [as low as 20ºC (68ºF)] and minimum ignition energies lower than any material classified in any of the Class I or Class II Groups.

[x]**(2)** ~~[500-5(b)(2)]~~**Group F**. Atmospheres containing combustible carbonaceous dusts that have more than 8 percent total entrapped volatiles (see Standard Test Method for Volatile Material in the Analysis Sample for Coal and Coke, ASTM D3175-89, for coal and coke dusts) or that have been sensitized by other materials so that they present an explosion hazard. Coal, carbon black, charcoal, and coke dusts are examples of carbonaceous dusts.

[x]**(3)** ~~[500-5(b)(3)]~~**Group G.** Atmospheres containing combustible dusts not included in Group E or F, including flour, grain, wood, plastic, and chemicals.
FPN No. 1: For additional information on group classification of Class II materials, see Recommended Practice for the Classification of Combustible Dusts and of Hazardous (Classified) Locations for Electrical Installations in Chemical Process Areas, NFPA 499-1997.

FPN No. 2: The explosion characteristics of air mixtures of dust vary with the materials involved. For Class II locations, Groups E, F, and G, the classification involves the tightness of the joints of assembly and shaft openings to prevent the entrance of dust in the dust-ignitionproof enclosure, the blanketing effect of layers of dust on the equipment that may cause overheating, and the ignition temperature of the dust. It is necessary, therefore, that equipment be identified [14-42]not only for the class, but also for the specific group of dust that will be present.

FPN No. 3: Certain dusts may require additional precautions due to chemical phenomena that can result in the generation of ignitible gases. See National Electrical Safety Code, ANSI C2-1997, Section 127A, Coal Handling Areas.
[x Editorial note to indicate that all these definitions are extracted from NFPA 497 and 499. NFPA Staff needs to correlate these texts. Published 497 as or last "official" printing was in error. Contact EECA Panel if needed.

500 -7 Protection Techniques ~~[500-4]~~
The following shall be acceptable protection techniques for electrical and electronic equipment in hazardous (classified) locations.

(a) ~~[500-4(a)]~~**Explosionproof Apparatus**. This protection technique shall be permitted for equipment in Class I, Division 1 or 2 locations.

(b) ~~[500-4(b)]~~**Dust Ignitionproof**. This protection technique shall be permitted for equipment in Class II, Division 1 or 2 locations.

(c) ~~[500-4(c)]~~**Dusttight.** This protection technique shall be permitted for equipment in Class II, Division 2 or Class III locations.

(d) ~~[500-4(d)]~~**Purged and Pressurized.** This protection technique shall be permitted for equipment in any hazardous (classified) location for which it is identified. [Cook proposal, CP140? Panel action- correlate with Article 505]

(e) ~~[500-4(e)]~~**Intrinsic** ~~**Safe Systems**~~ **Safety**. This protection technique shall be permitted for equipment in Class I, Division 1 or 2, or Class II, Division 1 or 2, or Class III, Division 1 or 2 locations. The provisions of Articles 501 through 503 and 510 through 516 shall not be considered applicable to such installations, except as required by Article 504, and installation of intrinsically safe apparatus and wiring shall be in accordance with the requirements of Article 504. [Editorial change for new text alignment format CP-140?]

(f) Nonincendive Circuit. ~~[500-4(f)-(1)]~~This protection technique shall be permitted for equipment in Class I, Division 2, Class II, Division 2, Class III, Division 2 locations. [14-30 – note "Nonincendive" was replaced by the techniques of nonincendive circuit, nonincendive equipment, and nonincendive component. See also the new definition section 500-2, CP140?]

(g) Nonincendive Equipment. ~~[500-4(f)(2)]~~This protection technique shall be permitted for equipment in Class I, Division 2, Class II, Division 2, Class III, and Division 2 locations.

(h) Nonincendive Component. ~~[500-4(f)(2)(a)]~~This protection technique shall be permitted for equipment in Class I, Division 2, Class II, Division 2, Class III, Division 2 locations.

(i) Oil Immersion. ~~[500-4(g)]~~This protection technique shall be permitted for current-interrupting contacts in Class I, Division 2 locations as described in Section 501-6(b)(1)(b).

(j) Hermetically Sealed. ~~[500-4(h)]~~This protection technique shall be permitted for equipment in Class I and II, Division 2, and Class III, Division 1 and 2 locations.

(k) Other Protection Techniques. ~~[500-4(i)]~~Other protection techniques used in equipment identified for use in hazardous (classified) locations. [Cook correlation 14-42, 14-45, CP140?]

500 -8 Equipment

~~[500-5]~~Articles 500 through 504 require equipment construction and installation that will ensure safe performance under conditions of proper use and maintenance.

FPN No. 1: It is important that inspection authorities and users exercise more than ordinary care with regard to installation and maintenance.

FPN No. 2: Low ambient conditions require special consideration. Explosionproof or dust-ignitionproof equipment may not be suitable for use at temperatures lower than -25ºC (-13ºF) unless they are identified for low-temperature service. However, at low ambient temperatures, flammable concentrations of vapors may not exist in a location classified Class I, Division 1 at normal ambient temperature.

(a) Approval for Class and Properties. ~~[500-5(c)]~~

(1) ~~[500-5 (c) paragraph 2]~~Equipment shall be identified [14-42, with correlation CP-140? For Article 505] not only for the class of location but also for the explosive, combustible, or ignitible properties of the specific gas, vapor, dust, fiber, or flyings that will be present. In addition, Class I equipment shall not have any exposed surface that operates at a temperature in excess of the ignition temperature of the specific gas or vapor. Class II equipment shall not have an external temperature higher than that specified in Section 500-8(2). Class III equipment shall not exceed the maximum surface temperatures specified in Section 503-1.

(2) ~~[500-5 (c) paragraph 3]~~Equipment that has been identified [14-45 with correlation CP-140? For Article 505] for a Division 1 location shall be permitted in a Division 2 location of the same class and group.

(3) ~~[500-5 (c) paragraph 4]~~Where specifically permitted in Articles 501 through 503, general-purpose equipment or equipment in general-purpose enclosures shall be permitted to be installed in Division 2 locations if the equipment does not constitute a source of ignition under normal operating conditions.

(4) ~~[500-5 (c) paragraph 1]~~Equipment, regardless of the classification of the location in which it is installed, that depends on a single compression seal, diaphragm, or tube to prevent flammable or combustible fluids from entering the equipment, shall be identified [14-44]for a Class I, Division 2 location, unless the *equipment is installed in a Class I, Division 1 location. In this case, the equipment shall be identified for the Class I, Division 1 location*.

FPN: See Section 501-5(f)(3) for additional requirements.

(5) ~~[500-5 (c) paragraph 5]~~Unless otherwise specified, normal operating conditions for motors shall be assumed to be rated full-load steady conditions.

(6) ~~[500-5 (c) paragraph 6]~~Where flammable gases or combustible dusts are or may be present at the same time, the simultaneous presence of both shall be considered when determining the safe operating temperature of the electrical equipment.

FPN: The characteristics of various atmospheric mixtures of gases, vapors, and dusts depend on the specific material involved.

(b) Marking. ~~[500-5 (d)]~~Equipment shall be marked to show the class, group, and operating temperature or temperature class referenced to a 40ºC ambient. [14-50,14-51,14-52]

Exception No. 1: Equipment of the non-heat-producing type, such as junction boxes, conduit, and fittings, and equipment of the heat-producing type having a maximum temperature **(QUESTION TO CMP-14 COMMITTEE: IS THIS THE MAXIMUM TEMPERATURE OF AN INTERNAL COMPONENT WITHIN AN ENCLOSURE OR IS THIS THE ENCLOSURE SURFACE TEMPERATURE?)** *not more than 100ºC (212ºF) shall not be required to have a marked operating temperature or temperature class.*

Exception No. 2: Fixed lighting fixtures marked for use in Class I, Division 2 or Class II, Division 2 locations only shall not be required to be marked to indicate the group.

Exception No. 3: Fixed general-purpose equipment in Class I locations, other than fixed lighting fixtures, that is acceptable for use in Class I, Division 2 locations shall not be required to be marked with the class, group, division, or operating temperature.

Exception No. 4: Fixed dusttight equipment other than fixed lighting fixtures that are acceptable for use in Class II, Division 2 and Class III locations shall not be required to be marked with the class, group, division, or operating temperature.

Exception No. 5: Electric equipment suitable for ambient temperatures exceeding 40ºC (104ºF) shall be marked with both the maximum ambient temperature and the operating temperature or temperature class at that ambient temperature.

FPN: Equipment not marked to indicate a division, or marked "Division 1" or "Div. 1," is suitable for both Division 1 and 2 locations. Equipment marked "Division 2" or "Div. 2" is suitable for Division 2 locations only.

The temperature class , if provided, shall be indicated using the temperature class (T Codes) shown in Table 500-8(b).

The temperature class (T Code)marked on equipment nameplates shall be in accordance with Table 500-8(b).

Equipment for Class I and Class II shall be marked with the maximum safe operating temperature, as determined by simultaneous exposure to the combinations of Class I and Class II conditions. [14-49,14-53]

FPN: Since there is no consistent relationship between explosion properties and ignition temperature, the two are independent requirements.

Table 500-8(b)~~[500-5(d)].~~Classification of Maximum Surface Temperature ~~Identification Numbers~~

Maximum Temperature		~~Identification~~Temperature ~~Number~~Class (T Code)
ºC	ºF	
450	842	T1
300	572	T2
280	536	T2A
260	500	T2B
230	446	T2C
215	419	T2D
200	392	T3
180	356	T3A
165	329	T3B
160	320	T3C
135	275	T4
120	248	T4A
100	212	T5
85	185	T6

(c) Temperature
(1) Class I Temperature. ~~[500-5 (c)]~~The temperature marking specified in (b) ~~(d)~~ shall not exceed the ignition temperature of the specific gas or vapor to be encountered.

FPN: For information regarding ignition temperatures of gases and vapors, see Recommended Practice for the Classification of flammable gases, etc. and of Hazardous (Classified) Locations for Electrical Installations in Chemical Process Areas, NFPA 497-1997.

(2) Class II Temperature. The temperature marking specified in (b) ~~(d)~~ shall be less than the ignition temperature of the specific dust to be encountered. For organic dusts that may dehydrate or carbonize, the temperature marking shall not exceed the lower of either the ignition temperature or 165ºC (329ºF).

FPN: See Recommended Practice for the Classification of Combustible Dusts and of Hazardous (Classified) Locations for Electrical Installations in Chemical Process Areas, NFPA 499-1997, for minimum ignition temperatures of specific dusts.

The ignition temperature for which equipment was approved prior to this requirement shall be assumed to be as shown in Table 500-5(c) (2) ~~500-5(f).~~

(d) Threading ~~[500-3 (d) See CP140? Title change correlation with Article 505 CP140?]~~
All threaded conduit ~~or fittings~~ referred to herein shall be threaded with an National (American) Standard Pipe Taper (NPT) [14-11] standard conduit cutting die that provides a taper of 1 in 16 (3/4-in. taper per foot). Such conduit shall be made wrenchtight to prevent sparking when fault current flows through the conduit system, and to ensure the explosionproof or flameproof integrity of the conduit system where applicable.
Equipment provided with threaded entries for field wiring connections shall be installed in accordance with (1) or (2).

(1) Equipment Provided with Threaded Entries for NPT Threaded Conduit or Fittings. For equipment provided with threaded entries for NPT threaded conduit or fittings, listed conduit, conduit fittings, or cable fittings shall be used.

FPN: Threading specifications for NPT threads are located in Pipe Threads, General Purpose (Inch), ANSI/ASME B1.20.1-1983.

(2) Equipment Provided with Threaded Entries for Metric Threaded Conduit or Fittings. For equipment with metric threaded entries, such entries shall be identified as being metric, or listed adapters to permit connection to conduit or NPT-threaded fittings shall be provided with the equipment. Adapters shall be used for connection to conduit or NPT-threaded fittings. Listed cable fittings that have metric threads shall be permitted to be used.

FPN: Threading specifications for metric threaded entries are located in Metric Screw Threads, ISO 965/1-1980, and Metric Screw Threads, ISO 965/3-1980.

(e) Fiber Optic Cable Assembly. ~~[500-3 (e)]~~
Where a fiber optic cable assembly contains conductors that are capable of carrying current, the fiber optic cable assembly shall be installed in accordance with the requirements of Articles 500, 501, 502, or 503, as applicable.

500-9. Specific Occupancies ~~[500-6]~~
Articles 510 through 517 cover garages, aircraft hangars, gasoline dispensing and service stations, bulk storage plants, spray application, dipping and coating processes, and health care facilities.

SUBSTANTIATION: During the January 2000 ROP meeting, Code Making Panel 14 was challenged with a very difficult task due to the large number of proposals that required action, the technical content of the requested revisions, and the Technical Correlating Committee formatting changes. As a result, it was very difficult for the NEC staff assigned to Code Making Panel 14 to keep up with the actions taking place. This comment's intent is to clarify what took place and make necessary revisions.
PANEL ACTION: Accept in Principle.
Revise Article 500 to read as follows:

ARTICLE 500
[Comment 14-11]

Hazardous (Classified) Locations, Classes I, II, and III, Divisions 1 and 2

500-1 Scope — Articles 500 through 504. Articles 500 through 504 cover the requirements for electrical and electronic equipment and wiring for all voltages in Class I, Divisions 1 and 2; Class II, Divisions 1 and 2; and Class III, Divisions 1 and 2 locations where fire or explosion hazards may exist due to flammable gases or vapors, flammable liquids, combustible dust, or ignitible fibers or flyings.

FPN: For the requirements for electrical and electronic equipment and wiring for all voltages in Class I, Zone 0, Zone 1, and Zone 2 hazardous (classified) locations where fire or explosion hazards may exist due to flammable gases or vapors, or flammable liquids, refer to Article 505.

500-2 Definitions. For purposes of Articles 500 through 504 and Articles 506 through 516, the following definitions apply.

Associated Nonincendive Field Wiring Apparatus. Apparatus in which the circuits are not necessarily nonincendive themselves, but that affect the energy in nonincendive field wiring circuits and are relied upon to maintain nonincendive energy levels. Associated nonincendive field wiring apparatus may be either of the following:

1. Electrical apparatus that has an alternative type of protection for use in the appropriate hazardous (classified) location, or
2. Electrical apparatus not so protected that shall not be used in a hazardous (classified) location.

FPN: Associated nonincendive field wiring apparatus has designated associated nonincendive field wiring apparatus connections for nonincendive field wiring apparatus and may also have connections for other electrical apparatus.

Combustible Gas Detection System. A protection technique utilizing stationary gas detectors in industrial establishments which under specific conditions permits the use of equipment suitable for Class I, Division 2 locations to be used in a Class I, Division 1 location or the use of equipment suitable for unclassified locations to be used in a Class I, Division 2 locations.

Control Drawing. A drawing or other document provided by the manufacturer of the intrinsically safe or associated apparatus, or of the nonincendive field wiring apparatus or associated nonincendive field wiring apparatus, that details the allowed interconnections between the intrinsically safe and associated apparatus, or between the nonincendive field wiring apparatus or associated nonincendive field wiring apparatus.

Table 500-5(c) (2) ~~500-5(f)~~.

			Equipment (Such as Motors or Power Transformers) that May Be Overloaded			
Class II Group	Equipment that Is Not Subject to Overloading		Normal Operation		Abnormal Operation	
	ºC	ºF	ºC	ºF	ºC	ºF
E	200	392	200	392	200	392
F	200	392	150	302	200	392
G	165	329	120	248	165	329

Dust-ignitionproof. Equipment enclosed in a manner that will exclude dusts and will not permit arcs, sparks, or heat otherwise generated or liberated inside of the enclosure to cause ignition of exterior accumulations or atmospheric suspensions of a specified dust on or in the vicinity of the enclosure.

FPN: For further information on dust-ignitionproof enclosures, see Type 9 enclosure in Enclosures for Electrical Equipment, ANSI/NEMA 250-1991, and Explosionproof and Dust-Ignitionproof Electrical Equipment for Hazardous (Classified) Locations, ANSI/UL 1203-1994.

Dusttight. Enclosures constructed so that dust will not enter under specified test conditions.

FPN: See Nonincendive Electrical Equipment for Use in Class I and II, Division 2, and Class III, Divisions 1 and 2 Hazardous (Classified) Locations, ANSI/ISA — 12.12.01-2000, and Electrical Equipment for Use in Class I and II, Division 2 and Class III Hazardous (Classified) Locations, UL 1604-1994.

Electrical and Electronic Equipment. Materials, fittings, devices, appliances, and the like that are part of, or in connection with an electrical installation.

FPN: Portable or transportable equipment having self-contained power supplies, such as battery-operated equipment, could potentially become an ignition source in hazardous (classified) locations. Equipment suitable for the location or safety procedures to ensure safe operation of this equipment should be employed.

Explosionproof Apparatus. Apparatus enclosed in a case that is capable of withstanding an explosion of a specified gas or vapor that may occur within it and of preventing the ignition of a specified gas or vapor surrounding the enclosure by sparks, flashes, or explosion of the gas or vapor within, and that operates at such an external temperature that a surrounding flammable atmosphere will not be ignited thereby.

FPN: For further information, see Explosion-Proof and Dust-Ignition-Proof Electrical Equipment for Use in Hazardous (Classified) Locations, ANSI/UL 1203-1994.

Hermetically Sealed. Equipment sealed against the entrance of an external atmosphere where the seal is made by fusion, e.g., soldering, brazing, welding, or the fusion of glass to metal.

FPN: For further information, see Nonincendive Electrical Equipment for Use in Class I and II, Division 2, and Class III, Division 1 and 2 Hazardous (Classified) Locations, ANSI/ISA — 12.12.01-2000.

Nonincendive Circuit. A circuit, other than field wiring, in which any arc or thermal effect produced under intended operating conditions of the equipment, is not capable, under specified test conditions, of igniting the flammable gas–, vapor–, or dust–air mixture.

FPN: Conditions are described in Nonincendive Electrical Equipment for Use in Class I and II, Division 2, and Class III, Divisions 1 and 2 Hazardous (Classified) Locations, ANSI/ISA — 12.12.01-2000.

Nonincendive Component. A component having contacts for making or breaking an incendive circuit and the contacting mechanism shall be constructed so that the component is incapable of igniting the specified flammable gas– or vapor–air mixture. The housing of a nonincendive component is not intended to exclude the flammable atmosphere or contain an explosion.

FPN: For further information, see Electrical Equipment for Use in Class I and II, Division 2, and Class III Hazardous (Classified) Locations, UL 1604-1994.

Nonincendive Equipment. Equipment having electrical/electronic circuitry that is incapable, under normal operating conditions, of causing ignition of a specified flammable gas–, vapor–, or dust–air mixture due to arcing or thermal means.

FPN: For further information, see Nonincendive Electrical Equipment for Use in Class I and II, Division 2, and Class III, Divisions 1 and 2 Hazardous (Classified) Locations, ANSI/ISA — 12.12.01-2000.

Nonincendive Field Wiring. Wiring that enters or leaves an equipment enclosure and, under normal operating conditions of the equipment, is not capable, due to arcing or thermal effects, of igniting the flammable gas–, vapor–, or dust–air mixture. Normal operation includes opening, shorting, or grounding the field wiring.

Nonincendive Field Wiring Apparatus. Apparatus intended to be connected to nonincendive field wiring.

FPN: For further information see Nonincendive Electrical Equipment for Use in Class I and II, Division 2 and Class III, Divisions 1 and 2 Hazardous (Classified) Locations, ANSI/ISA — 12.12.01-2000.

Oil Immersion. Electrical equipment immersed in a protective liquid in such a way that an explosive atmosphere that may be above the liquid or outside the enclosure cannot be ignited.

FPN: For further information, see Industrial Control Equipment for Use in Hazardous (Classified) Locations, ANSI/UL 698-1995.

Purged and Pressurized. The process of supplying an enclosure with a protective gas, at a sufficient flow and positive pressure to reduce the concentration of any flammable gas or vapor initially present to an acceptable level.

FPN: For further information, see Purged and Pressurized Enclosures for Electrical Equipment, ANSI/NFPA 496-1998.

Unclassified Locations. Locations determined to be neither Class I, Division 1; Class I, Division 2; Class I, Zone 0; Class I, Zone 1; Class I, Zone 2; Class II, Division 1; Class II, Division 2; Class III, Division 1; Class III, Division 2; or any combination thereof.

~~**Identified (as applied to equipment).** Recognizable as suitable for the specific purpose, function, use, environment, application, etc., where prescribed in a particular Code requirement.~~

~~FPN: Suitability of equipment for a specific purpose, environment, or application may be determined by:~~

~~1.~~equipment listing or labeling;

~~2. evidence of equipment evaluation from a qualified testing laboratory or inspection agency concerned with product evaluation; or~~

~~3. other evidence acceptable to the authority having jurisdiction such as a manufacturer's self~~ evaluation ~~certification or an owner's engineering judgement.~~

~~(See definitions of *Labeled* and *Listed*)~~

500~~-23~~ Other Articles. Except as modified in Articles 500 through 504, all other applicable rules contained in this Code shall apply to electrical equipment and wiring installed in hazardous (classified) locations.

500~~-3 4~~ General

(a) Documentation. All areas designated as hazardous (classified) locations shall be properly documented. This documentation shall be available to those authorized to design, install, inspect, maintain, or operate electrical equipment at the location.

(b) Reference Standards. Important information relating to topics covered in Chapter 5 may be found in other publications.

FPN No. 1: It is important that the authority having jurisdiction be familiar with recorded industrial experience as well as with the standards of the National Fire Protection Association (NFPA), the American Petroleum Institute (API), and ~~the~~ ~~Instrument Society of America~~ ISA — Instrumentation, Systems, and Automation Society (ISA) that may be of use in the classification of various locations, the determination of adequate ventilation, and the protection against static electricity and lightning hazards.

FPN No. 2: For further information on the classification of locations, see Flammable and Combustible Liquids Code, NFPA 30-2000~~1996~~; Standard for Drycleaning Plants, NFPA 32-1996; Standard for Spray Application Using Flammable or Combustible Materials, NFPA 33-2000~~1995~~; Standard for Dipping and Coating Processes Using Flammable or Combustible Liquids, NFPA 34-2000~~1995~~; Standard for the

Manufacture of Organic Coatings, NFPA 35-1999~~1995~~; Standard for Solvent Extraction Plants, NFPA 36-2001~~1997~~; Standard on Fire Protection for Laboratories Using Chemicals, NFPA 45-1996; Standard for Gaseous Hydrogen Systems at Consumer Sites, NFPA 50A-1994; Standard for Liquefied Hydrogen Systems at Consumer Sites, NFPA 50B-1994; Liquefied Petroleum Gas Code, NFPA 58-1998; Standard for the Storage and Handling of Liquefied Petroleum Gases at Utility Gas Plants, NFPA 59-1998; Recommended Practice for the Classification of Flammable Liquids, Gases, or Vapors and of Hazardous (Classified) Locations for Electrical Installations in Chemical Process Areas, NFPA 497-1997; Recommended Practice for the Classification of Combustible Dusts and of Hazardous (Classified) Locations for Electrical Installations in Chemical Process Areas, NFPA 499-1997; Standard for Fire Protection in Wastewater Treatment and Collection Facilities, NFPA 820-1995; Recommended Practice for Classification of Locations of Electrical Installations at Petroleum Facilities Classified as Class I, Division 1 and Division 2, ANSI/API RP500-1997; Area Classification In Hazardous (Classified) Dust Locations, ~~ANSI/~~ISA — ~~S~~12.10-1988.

FPN No. 3: For further information on protection against static electricity and lightning hazards in hazardous (classified) locations, see Recommended Practice on Static Electricity, NFPA 77-2000~~1993~~; Standard for the Installation of Lightning Protection Systems, NFPA 780-1997; and Protection Against Ignitions Arising Out of Static Lightning and Stray Currents, API RP 2003-1998.

FPN No. 4: For further information on ventilation, see Flammable and Combustible Liquids Code, NFPA 30-2000~~1996~~; and Recommended Practice for Classification of Locations for Electrical Installations at Petroleum Facilities Classified as Class I, Division 1 and Division 2, API RP 500-1997~~, Section 4.6~~.

FPN No. 5: For further information on electrical systems for hazardous (classified) locations on offshore oil and gas producing platforms, see Recommended Practice for Design and Installation of Electrical Systems for Fixed and Floating Offshore Petroleum Facilities for Unclassified and Class I, Division 1 and Division 2 Locations, ANSI/API RP 14F-1999.

500-45 Classifications of Locations

(a) Classifications of Locations. Locations shall be classified depending on the properties of the flammable vapors, liquids, or gases, or combustible dusts or fibers that may be present and the likelihood that a flammable or combustible concentration or quantity is present. Where pyrophoric materials are the only materials used or handled, these locations shall not be classified. Each room, section, or area shall be considered individually in determining its classification.

FPN: Through the exercise of ingenuity in the layout of electrical installations for hazardous (classified) locations, it is frequently possible to locate much of the equipment in a reduced level of classification or in an unclassified location ~~less hazardous or in nonhazardous locations~~ and, thus, to reduce the amount of special equipment required.

Rooms and areas containing ammonia refrigeration systems that are equipped with adequate mechanical ventilation, may be classified as "unclassified" locations.

FPN: For further information regarding classification and ventilation of areas involving ammonia, see Safety Code for Mechanical Refrigeration, ANSI/ASHRAE 15-1994, and Safety Requirements for the Storage and Handling of Anhydrous Ammonia, ANSI/CGA G2.1-1989.

(b) Class I Locations

Class I locations are those in which flammable gases or vapors are or may be present in the air in quantities sufficient to produce explosive or ignitible mixtures. Class I locations shall include those specified in (1) and (2).

(1) Class I, Division 1. A Class I, Division 1 location is a location

(a) In which ignitible concentrations of flammable gases or vapors can exist under normal operating conditions, or
(b) In which ignitible concentrations of such gases or vapors may exist frequently because of repair or maintenance operations or because of leakage, or
(c) In which breakdown or faulty operation of equipment or processes might release ignitible concentrations of flammable gases or vapors, and might also cause simultaneous failure of electrical equipment in such a way as to directly cause the electrical equipment to become a source of ignition.

FPN No. 1: This classification usually includes the following locations:
a. Where volatile flammable liquids or liquefied flammable gases are transferred from one container to another;
b. Interiors of spray booths and areas in the vicinity of spraying and painting operations where volatile flammable solvents are used;
c. Locations containing open tanks or vats of volatile flammable liquids;
d. Drying rooms or compartments for the evaporation of flammable solvents;
e. Locations containing fat and oil extraction equipment using volatile flammable solvents;
f. Portions of cleaning and dyeing plants where flammable liquids are used;
g. Gas generator rooms and other portions of gas manufacturing plants where flammable gas may escape;
h. Inadequately ventilated pump rooms for flammable gas or for volatile flammable liquids;
i. The interiors of refrigerators and freezers in which volatile flammable materials are stored in open, lightly stoppered, or easily ruptured containers;
j. All other locations where ignitible concentrations of flammable vapors or gases are likely to occur in the course of normal operations.

FPN No. 2: In some Division 1 locations, ignitible concentrations of flammable gases or vapors may be present continuously or for long periods of time. Examples include the following:
a. The inside of inadequately vented enclosures containing instruments normally venting flammable gases or vapors to the interior of the enclosure;
b. The inside of vented tanks containing volatile flammable liquids;
c. The area between the inner and outer roof sections of a floating roof tank containing volatile flammable fluids;
d. Inadequately ventilated areas within spraying or coating operations using volatile flammable fluids;
e. The interior of an exhaust duct that is used to vent ignitible concentrations of gases or vapors.

Experience has demonstrated the prudence of avoiding the installation of instrumentation or other electric equipment in these particular areas altogether or where it cannot be avoided because it is essential to the process and other locations are not feasible [see Section 500-45(a), FPN], using electric equipment or instrumentation approved for the specific application or consisting of intrinsically safe systems as described in Article 504.

(2) Class I, Division 2. A Class I, Division 2 location is a location

(a) In which volatile flammable liquids or flammable gases are handled, processed, or used, but in which the liquids, vapors, or gases will normally be confined within closed containers or closed systems from which they can escape only in case of accidental rupture or breakdown of such containers or systems, or in case of abnormal operation of equipment, or
(b) In which ignitible concentrations of gases or vapors are normally prevented by positive mechanical ventilation, and which might become hazardous through failure or abnormal operation of the ventilating equipment, or
(c) That is adjacent to a Class I, Division 1 location, and to which ignitible concentrations of gases or vapors might occasionally be communicated unless such communication is prevented by adequate positive-pressure ventilation from a source of clean air, and effective safeguards against ventilation failure are provided.

FPN No. 1: This classification usually includes locations where volatile flammable liquids or flammable gases or vapors are used but that, in the judgment of the authority having jurisdiction, would become hazardous only in case of an accident or of some unusual operating condition. The quantity of flammable material that might escape in case of accident, the adequacy of ventilating equipment, the total area involved, and the record of the industry or business with respect to explosions or fires are all factors that merit consideration in determining the classification and extent of each location.

FPN No. 2: Piping without valves, checks, meters, and similar devices would not ordinarily introduce a hazardous condition even though used for flammable liquids or gases. Depending on factors such as the quantity and size of the containers and ventilation, locations used for the storage of flammable liquids or liquefied or compressed gases in sealed containers may either be considered hazardous (classified) or unclassified ~~or nonhazardous~~ locations. See Flammable and Combustible Liquids Code, NFPA 30-2000~~1996~~, and Liquefied Petroleum Gas Code, NFPA 58-1998.

(c) Class II Locations. Class II locations are those that are hazardous because of the presence of combustible dust. Class II locations shall include those specified in (a) and (b).

(1) Class II, Division 1. A Class II, Division 1 location is a location

(a) In which combustible dust is in the air under normal operating conditions in quantities sufficient to produce explosive or ignitible mixtures, or
(b) Where mechanical failure or abnormal operation of machinery or equipment might cause such explosive or ignitible mixtures to be produced, and might also provide a source of ignition through simultaneous failure of electric equipment, operation of protection devices, or from other causes, or
(c) In which combustible dusts of an electrically conductive nature may be present in hazardous quantities.

FPN: Combustible dusts that are electrically nonconductive include dusts produced in the handling and processing of grain and grain products, pulverized sugar and cocoa, dried egg and milk powders, pulverized spices, starch and pastes, potato and wood-flour, oil meal from beans and seed, dried hay, and other organic materials that may produce combustible dusts when processed or handled. Only Group E dusts are considered to be electrically conductive for classification purposes. Dusts containing magnesium or aluminum are particularly hazardous, and the use of extreme precaution will be necessary to avoid ignition and explosion.

(2) Class II, Division 2. A Class II, Division 2 location is a location

(a) Where combustible dust is not normally in the air in quantities sufficient to produce explosive or ignitible mixtures, and dust accumulations are normally insufficient to interfere with the normal operation of electrical equipment or other apparatus, but combustible dust may be in suspension in the air as a result of infrequent malfunctioning of handling or processing equipment and
(b) Where combustible dust accumulations on, in, or in the vicinity of the electrical equipment may be sufficient to interfere with the safe dissipation of heat from electrical equipment or may be ignitible by abnormal operation or failure of electrical equipment.

FPN No. 1: The quantity of combustible dust that may be present and the adequacy of dust removal systems are factors that merit consideration in determining the classification and may result in an unclassified ~~or nonhazardous~~ area.

FPN No. 2: Where products such as seed are handled in a manner that produces low quantities of dust, the amount of dust deposited may not warrant classification.

(d) Class III Locations. Class III locations are those that are hazardous because of the presence of easily ignitible fibers or flyings, but in which such fibers or flyings are not likely to be in suspension in the air in quantities sufficient to produce ignitible mixtures. Class III locations shall include those specified in (a) and (b).

(1) Class III, Division 1. A Class III, Division 1 location is a location in which easily ignitible fibers or materials producing combustible flyings are handled, manufactured, or used.

FPN No. 1: Such locations usually include some parts of rayon, cotton, and other textile mills; combustible fiber manufacturing and processing plants; cotton gins and cotton-seed mills; flax-processing plants; clothing manufacturing plants; woodworking plants; and establishments and industries involving similar hazardous processes or conditions.

FPN No. 2: Easily ignitible fibers and flyings include rayon, cotton (including cotton linters and cotton waste), sisal or henequen, istle, jute, hemp, tow, cocoa fiber, oakum, baled waste kapok, Spanish moss, excelsior, and other materials of similar nature.

(2) Class III, Division 2. A Class III, Division 2 location is a location in which easily ignitible fibers are stored or handled other than in the process of manufacture.

500~~-5~~-6 Material Groups. For purposes of testing, approval, and area classification, various air mixtures (not oxygen-enriched) shall be grouped in accordance with Sections 500-~~5~~6(a) and 500-~~5~~6(b).

Exception: Equipment identified ~~approved~~ for a specific gas, vapor, or dust.

FPN: This grouping is based on the characteristics of the materials. Facilities are available for testing and identifying equipment for use in the various atmospheric groups.

(a) Class I Group Classifications. Class I groups shall be as follows.

FPN No. 1: FPNs 2 and 3 apply to section **(a)**.

FPN No. 2: The explosion characteristics of air mixtures of gases or vapors vary with the specific material involved. For Class I locations, Groups A, B, C, and D, the classification involves determinations of maximum explosion pressure and maximum safe clearance between parts of a clamped joint in an enclosure. It is necessary, therefore, that equipment be identified not only for class but also for the specific group of the gas or vapor that will be present.

FPN No. 3: Certain chemical atmospheres may have characteristics that require safeguards beyond those required for any of the above groups. Carbon disulfide is one of these chemicals because of its low ignition temperature [100ºC (212ºF)] and the small joint clearance permitted to arrest its flame.

x**(1) Group A.** Acetylene.
x**(2) Group B.** Flammable gas, flammable liquid–produced vapor, or combustible liquid–produced vapor mixed with air that may burn or explode, having either a maximum experimental safe gap (MESG) value less than or equal to 0.45 mm or a minimum igniting current ratio (MIC ratio) less than or equal to 0.40.

FPN: A typical Class I, Group B material is hydrogen.

Exception No. 1: Group D equipment shall be permitted to be used for atmospheres containing butadiene provided all conduit ~~and cable~~ runs into explosionproof equipment are provided with explosionproof seals installed within 450 mm (18 in.)~~. (457 mm)~~ of the enclosure.

Exception No. 2: Group C equipment shall be permitted to be used for atmospheres containing allyl glycidyl ether, n-butyl glycidyl ether, ethylene oxide, propylene oxide, and acrolein provided all conduit ~~and cable~~ runs into explosionproof equipment are provided with explosionproof seals installed within 450 mm (18 in.)~~. (457 mm)~~ of the enclosure.

x**(3) Group C.** Flammable gas, flammable liquid–produced vapor, or combustible liquid–produced vapor mixed with air that may burn or explode, having either a maximum experimental safe gap (MESG) value greater than 0.45 mm and less than or equal to 0.75 mm, or a

minimum igniting current ratio (MIC ratio) greater than 0.40 and less than or equal to 0.80.

FPN: A typical Class I, Group C material is ethylene.

(4) Group D. Flammable gas, flammable liquid–produced vapor, or combustible liquid–produced vapor mixed with air that may burn or explode, having either a maximum experimental safe gap (MESG) value greater than 0.75 mm or a minimum igniting current ratio (MIC ratio) greater than 0.80.

FPN No. 1: A typical Class I, Group D material is propane.

FPN No. 2: For classification of areas involving ammonia atmospheres, see Safety Code for Mechanical Refrigeration, ANSI/ASHRAE 15-1994, and Safety Requirements for the Storage and Handling of Anhydrous Ammonia, ANSI/CGA G2.1-1989.

(b) Class II Group Classifications. Class II groups shall be as follows.

(1) Group E. Atmospheres containing combustible metal dusts, including aluminum, magnesium, and their commercial alloys, or other combustible dusts whose particle size, abrasiveness, and conductivity present similar hazards in the use of electrical equipment.

FPN: Certain metal dusts may have characteristics that require safeguards beyond those required for atmospheres containing the dusts of aluminum, magnesium, and their commercial alloys. For example, zirconium, thorium, and uranium dusts have extremely low ignition temperatures [as low as 20°C (68°F)] and minimum ignition energies lower than any material classified in any of the Class I or Class II Groups.

(2) Group F. Atmospheres containing combustible carbonaceous dusts that have more than 8 percent total entrapped volatiles (see Standard Test Method for Volatile Material in the Analysis Sample for Coal and Coke, ASTM D3175-89, for coal and coke dusts) or that have been sensitized by other materials so that they present an explosion hazard. Coal, carbon black, charcoal, and coke dusts are examples of carbonaceous dusts.

(3) Group G. Atmospheres containing combustible dusts not included in Group E or F, including flour, grain, wood, plastic, and chemicals.

FPN No. 1: For additional information on group classification of Class II materials, see Recommended Practice for the Classification of Combustible Dusts and of Hazardous (Classified) Locations for Electrical Installations in Chemical Process Areas, NFPA 499-1997.

FPN No. 2: The explosion characteristics of air mixtures of dust vary with the materials involved. For Class II locations, Groups E, F, and G, the classification involves the tightness of the joints of assembly and shaft openings to prevent the entrance of dust in the dust-ignitionproof enclosure, the blanketing effect of layers of dust on the equipment that may cause overheating, and the ignition temperature of the dust. It is necessary, therefore, that equipment be identified ~~approved~~ not only for the class, but also for the specific group of dust that will be present.

FPN No. 3: Certain dusts may require additional precautions due to chemical phenomena that can result in the generation of ignitible gases. See National Electrical Safety Code, ANSI C2-1997, Section 127A, Coal Handling Areas.

500-~~6~~7 Protection Techniques. The following shall be acceptable protection techniques for electrical and electronic equipment in hazardous (classified) locations.

(a) Explosionproof Apparatus. This protection technique shall be permitted for equipment in Class I, Division 1 or 2 locations.

(b) Dust Ignitionproof. This protection technique shall be permitted for equipment in Class II, Division 1 or 2 locations.

(c) Dusttight. This protection technique shall be permitted for equipment in Class II, Division 2 or Class III, Division 1 or 2 locations.

(d) Purged and Pressurized. This protection technique shall be permitted for equipment in any hazardous (classified) location for which it is identified~~approved~~.

(e) Intrinsic Safety. This protection technique shall be permitted for equipment in Class I, Division 1 or 2;~~, or~~ Class II, Division 1 or 2;~~,~~ or Class III, Division 1 or 2 locations. The provisions of Articles 501 through 503 and 510 through 516 shall not be considered applicable to such installations, except as required by Article 504, and installation of intrinsically safe apparatus and wiring shall be in accordance with the requirements of Article 504.

(f) Nonincendive Circuit. This protection technique shall be permitted for equipment in Class I, Division 2;~~,~~ Class II, Division 2;~~,~~ or Class III, Division 1 or 2 locations.

(g) Nonincendive Equipment. This protection technique shall be permitted for equipment in Class I, Division 2;~~,~~ Class II, Division 2;~~,~~ or Class III, ~~and~~ Division 1 or 2 locations.

(h) Nonincendive Component. This protection technique shall be permitted for equipment in Class I, Division 2;~~,~~ Class II, Division 2;~~,~~ or Class III, Division 1 or 2 locations.

(i) Oil Immersion. This protection technique shall be permitted for current-interrupting contacts in Class I, Division 2 locations as described in Section 501-6(b)(1)(b)~~501-6~~7(b)(1)(b).

(j) Hermetically Sealed. This protection technique shall be permitted for equipment in Class I, Division 2; ~~and~~ Class II, Division 2;~~,~~ or ~~and~~Class III, Division 1 or ~~and~~2 locations.

(k) Combustible Gas Detection System. A combustible gas detection system incorporating combustible gas detectors used in industrial establishments with restricted public access, where the conditions of maintenance and supervision ensure that only qualified persons will service the installation, is a protection technique permitted under the following conditions:

(1) In a Class I, Division 1 location that is so classified due to inadequate ventilation, electrical equipment suitable for Class I, Division 2 locations shall be permitted.

(2) In a building located in, or with an opening into, a Class I, Division 2 location where the interior does not contain a source of flammable gas or vapor, electrical equipment for unclassified locations shall be permitted.

(3) In the interior of a control panel containing instrumentation utilizing or measuring flammable liquids, gases or vapors, electrical equipment suitable for Class I, Division 2 locations shall be permitted.

Gas detection equipment shall be listed for detection of the specific gas or vapor to be encountered.

FPN: For further information, see ANSI/ISA — 12.13.01, Performance Requirements, Combustible Gas Detectors.

Use of this technique for each of the applications above includes adherence to established industrial practices and requirements.

FPN No. 1: For further information, see ANSI/API RP 500, Recommended Practice for Classification of Locations for Electrical Installations at Petroleum Facilities Classified as Class I, Division 1 or Division 2.

FPN No. 2: For further information, see ISA — RP12.13.02, Installation, Operation, and Maintenance of Combustible Gas Detection Instruments.

(l) Other Protection Techniques. Other protection techniques used in equipment identified ~~listed~~ for use in hazardous (classified) locations.

500-~~7~~8 Equipment. Articles 500 through 504 require equipment construction and installation that will ensure safe performance under conditions of proper use and maintenance.

FPN No. 1: It is important that inspection authorities and users exercise more than ordinary care with regard to installation and maintenance.

FPN No. 2: Low ambient conditions require special consideration. Explosionproof or dust-ignitionproof equipment may not be suitable for use at temperatures lower than -25ºC (-13ºF) unless they are identified for low-temperature service. However, at low ambient temperatures, flammable concentrations of vapors may not exist in a location classified Class I, Division 1 at normal ambient temperature.

(a) Approval for Class and Properties.

(1) Equipment shall be identified ~~approved~~ not only for the class of location but also for the explosive, combustible, or ignitible properties of the specific gas, vapor, dust, fiber, or flyings that will be present. In addition, Class I equipment shall not have any exposed surface that operates at a temperature in excess of the ignition temperature of the specific gas or vapor. Class II equipment shall not have an external temperature higher than that specified in Section 500-~~7~~8(2). Class III equipment shall not exceed the maximum surface temperatures specified in Section 503-1.

FPN: Luminaires (lighting fixtures) and other heat-producing apparatus, switches, circuit breakers, and plugs and receptacles are potential sources of ignition and are investigated for suitability in classified locations. Such types of equipment, as well as cable terminations for entry into explosionproof enclosures, are available as listed for Class I, Division 2 locations. Fixed wiring, however, may utilize wiring methods that are not evaluated with respect to classified locations. Wiring products such as cable, raceways, boxes, and fittings, therefore, are not marked as being suitable for Class I, Division 2 locations. Also see Exception No. 3 to 500-8(b).

Suitability of identified equipment shall be determined by:

1. Equipment listing or labeling, or
2. Evidence of equipment evaluation from a qualified testing laboratory or inspection agency concerned with product evaluation, or
3. Evidence acceptable to the authority having jurisdiction such as a manufacturer's self-evaluation or an owner's engineering judgment.

(2) Equipment that has been identified ~~approved~~ for a Division 1 location shall be permitted in a Division 2 location of the same class and group.

(3) Where specifically permitted in Articles 501 through 503, general-purpose equipment or equipment in general-purpose enclosures shall be permitted to be installed in Division 2 locations if the equipment does not constitute a source of ignition under normal operating conditions.

(4) Equipment, regardless of the classification of the location in which it is installed, that depends on a single compression seal, diaphragm, or tube to prevent flammable or combustible fluids from entering the equipment, shall be identified ~~approved~~ for a Class I, Division 2 location. ~~, unless the .~~
~~Exception:~~ E~~E~~equipment ~~is~~ installed in a Class I, Division 1 location~~.~~ ~~In this case, the equipment~~ shall be ~~suitable~~ identified for the Class I, Division 1 location.

FPN: See Section 501-5(f)(3) for additional requirements.

(5) Unless otherwise specified, normal operating conditions for motors shall be assumed to be rated full-load steady conditions.

(6) Where flammable gases or combustible dusts are or may be present at the same time, the simultaneous presence of both shall be considered when determining the safe operating temperature of the electrical equipment.

FPN: The characteristics of various atmospheric mixtures of gases, vapors, and dusts depend on the specific material involved.

(b) Marking. Equipment shall be marked to show the class, group, and operating temperature or temperature class ~~range~~ referenced to a 40ºC ambient.

Exception No. 1: Equipment of the non-heat-producing type, such as junction boxes, conduit, and fittings, and equipment of the heat-producing type having a maximum temperature ~~**(QUESTION TO CMP-14 COMMITTEE: IS THIS THE MAXIMUM TEMPERATURE OF AN INTERNAL COMPONENT WITHIN AN ENCLOSURE OR IS THIS THE ENCLOSURE SURFACE TEMPERATURE?)**~~ *not more than 100ºC (212ºF) shall not be required to have a marked operating temperature or temperature class~~*range*~~.*

Exception No. 2: Fixed luminaires (lighting fixtures) marked for use in Class I, Division 2 or Class II, Division 2 locations only shall not be required to be marked to indicate the group.

Exception No. 3: Fixed general-purpose equipment in Class I locations, other than fixed luminaires (lighting fixtures), that is acceptable for use in Class I, Division 2 locations shall not be required to be marked with the class, group, division, or operating temperature.

Exception No. 4: Fixed dusttight equipment other than fixed luminaires (lighting fixtures) that are acceptable for use in Class II, Division 2 and Class III locations shall not be required to be marked with the class, group, division, or operating temperature.

Exception No. 5: Electric equipment suitable for ambient temperatures exceeding 40ºC (104ºF) shall be marked with both the maximum ambient temperature and the operating temperature or temperature class ~~range~~ at that ambient temperature.

FPN: Equipment not marked to indicate a division, or marked "Division 1" or "Div. 1," is suitable for both Division 1 and 2 locations. Equipment marked "Division 2" or "Div. 2" is suitable for Division 2 locations only.

The temperature- class ~~range~~, if provided, shall be indicated using the temperature class (T Codes) ~~in identification numbers, as~~ shown in Table 500-~~7~~8(b). The temperature class (T Code) ~~Identification numbers~~ marked on equipment nameplates shall be in accordance with Table 500-~~8~~7(b). Equipment ~~that is approved~~ for Class I and Class II shall be marked with the maximum safe operating temperature, as determined by simultaneous exposure to the combinations of Class I and Class II conditions.

FPN: Since there is no consistent relationship between explosion properties and ignition temperature, the two are independent requirements.

Table 500-8(b) Classification of Maximum Surface Temperature

Maximum Temperature ºC	ºF	~~Identification Number~~ Temperature Class (T Code)
450	842	T1
300	572	T2
280	536	T2A
260	500	T2B
230	446	T2C
215	419	T2D
200	392	T3
180	356	T3A
165	329	T3B
160	320	T3C
135	275	T4
120	248	T4A
100	212	T5
85	185	T6

(c) Temperature

(1) Class I Temperature. The temperature marking specified in (b) shall not exceed the ignition temperature of the specific gas or vapor to be encountered.

FPN: For information regarding ignition temperatures of gases and vapors, see Recommended Practice for the Classification of flammable gases, etc. and of Hazardous (Classified) Locations for Electrical Installations in Chemical Process Areas, NFPA 497-1997.

(2) Class II Temperature. ~~[500-5 (f)]~~The temperature marking specified in (b) shall be less than the ignition temperature of the specific dust to be encountered. For organic dusts that may dehydrate or carbonize, the temperature marking shall not exceed the lower of either the ignition temperature or 165ºC (329ºF).

FPN: See Recommended Practice for the Classification of Combustible Dusts and of Hazardous (Classified) Locations for Electrical Installations in Chemical Process Areas, NFPA 499-1997, for minimum ignition temperatures of specific dusts.

The ignition temperature for which equipment was approved prior to this requirement shall be assumed to be as shown in Table 500-~~85~~(c)(2).

Table 500-~~85~~(c) (2)

Class II Group	Equipment that Is Not Subject to Overloading		Equipment (Such as Motors or Power Transformers) that May Be Overloaded			
			Normal Operation		Abnormal Operation	
	ºC	ºF	ºC	ºF	ºC	ºF
E	200	392	200	392	200	392
F	200	392	150	302	200	392
G	165	329	120	248	165	329

(d) Threading. All threaded conduit ~~or fittings~~ referred to herein shall be threaded with an National (American) Standard Pipe Taper (NPT) standard conduit cutting die that provides a taper of 1 in 16 (3/4-in. taper per foot). Such conduit shall be made wrenchtight to prevent sparking when fault current flows through the conduit system, and to ensure the explosionproof or flameproof integrity of the conduit system where applicable. Equipment provided with threaded entries for field wiring connections shall be installed in accordance with (1) or (2).

~~(1)~~**(1) Equipment Provided with Threaded Entries for NPT Threaded Conduit or Fittings.** For equipment provided with threaded entries for NPT threaded conduit or fittings, listed conduit, conduit fittings, or cable fittings shall be used.

FPN: Thread form~~ing~~ specifications for NPT threads are located in Pipe Threads, General Purpose (Inch), ANSI/ASME B1.20.1-1983.

(2) Equipment Provided with Threaded Entries for Metric Threaded Conduit or Fittings. For equipment with metric threaded entries, such entries shall be identified as being metric, or listed adapters to permit connection to conduit or NPT-threaded fittings shall be provided with the equipment. Adapters shall be used for connection to conduit or NPT-threaded fittings. Listed cable fittings that have metric threads shall be permitted to be used.

FPN: Threading specifications for metric threaded entries are located in Metric Screw Threads, ISO 965/1-1980, and Metric Screw Threads, ISO 965/3-1980.

(e) Fiber Optic Cable Assembly. Where a fiber optic cable assembly contains conductors that are capable of carrying current, the fiber optic cable assembly shall be installed in accordance with the requirements of Articles 500, 501, 502, or 503, as applicable.

500-9. Specific Occupancies. Articles 510 through 517 cover garages, aircraft hangars, gasoline dispensing and service stations, bulk storage plants, spray application, dipping and coating processes, and health care facilities.

PANEL STATEMENT: The action on this Comment, which is a rewrite of Article 500, incorporates all applicable panel actions on Comments 14-1 through 14-42, and 14-105, with the exception of Comment 14-3.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
COMMENT ON AFFIRMATIVE:
BRIESCH: Editorial Correction. In Section 500-8(d) in the parentheses at the end of the first sentence add "3/4" so that it reads "(3/4 in. taper per foot)." This was accepted by the panel action on comment 14-29 and was inadvertently deleted.
COOK: I agree with the reorganization of Article 500 and most of the actions taken by the panel. I do not support action on comment 14-51 and expressed the negative on that comment. I also believe that the following are typing errors:
1) page 8, Section 500-7(i), reference should be 501-6(b)(1)(b),
2) page 12, Section 500-8(d), should read; .....taper of 1 in 16 (3/4-in. taper per foot).

In Section 500-2, the definition of "Nonincendive Component", strike the words "shall be" that are between mechanism and constructed so that the definition does not contain a requirement. (to comply with style manual)
In Section 500-5(d), last sentence, change "specified in (a) and (b)" to "specified in (1) and (2)". (editorial).
In Section 500-8(a)(1), third sentence, change "specified in Section 500-8(2)" to "specified in Section 500-8(c)(2)". (editorial).
GOODMAN: Panel members Mr. Briesch, Mr. Cook, Mr. Jagunich, and Mr. O'Meara have identified typographical, syntax, cross-reference, structure, and other minor errors in the section. I support the correction of these items as "editorial" by the Panel Chair and NFPA staff, provided no changes are made to the content of the effected sections.
JAGUNICH: The definition of "Nonincendive Component" is so worded as to contain a requirement. Strike the words, "shall be", so that the definition reads as a definition.
OMEARA: See my explanation of vote on Comment 14-10. Also, recommend making editorial changes (corrections) to this rewrite of Article 500 as follows:
500-5(d): In the last sentence change, "...specified in (a) and (b)" to "...specified in (1) and (2)."
500-7(i) Change, "... as described in Section 501-6(b)(1)(2)" to "... as described in Section 501-6(b)(1)(b)."
500-8(a)(1): In the third sentence change, "... that specified in Section 500-8(2)" to "... that specified in Section 500-8(c)(2)."
Table 500-8(b). Delete lined thru "identification Number" in column heading.
500-8(d). Add "3/4" in the first sentence so that it reads, "... provides a taper of 1 in. 16 (3/4 in. taper per foot)."
SABAN: 1) I have stated that purged and pressurized equipment, control enclosures are not being maintained in the field, and that since type of pressurization I have made statements at every panel meeting that this technique is not more safe since it got into the code only to save money.
a. Maybe add wording... for further information see NFPA 70B
2) Pressurized and purged shall be identified "The draft looked good."
page 8-70/22228/pa/ROC I like

page 3 - I dislike 70/22229/PA/ROC
3) Page 9 70/2228/PA/ROC 500-8 equipment I wish to add NFPA 70B (look @ draft 324 500.8 Equip FPN No. 1.)
4) Threading missing the "3/4" pg 12 d) 70/1228/pa/ROC
5) Page 9 70/12228/pa/ROC "Gas Detector" uh! UH!?? more safe to declassify?
6) Page 12 "Fiber Optic Cable Assembly".... Energy Souce?! Dislike ... put back into 770 or inside rigid steel pipe.

(Log #141)

14- 12 - (500-2 and 505-2): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 14-4a
RECOMMENDATION: The Technical Correlating Committee directs that this Proposal be reconsidered and directs the Code-Making Panel to use the definition currently in Article 100.
The Technical Correlating Committee further directs that this Proposal be referred to Code-Making Panel 1 for action relative to the elimination of the existing Fine Print Note in the definition of "Identified" because the Fine Print Note contains permissive language and is not permitted by the NEC Style Manual. This action will be considered by Code-Making Panels 1 and 14 as a Public Comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
PANEL STATEMENT: The panel reconsidered the Proposal and has adopted language under Comment 14-19.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #141a)

1- 177 - (500-2 and 505-2): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 14-4a
RECOMMENDATION: The Technical Correlating Committee directs that this Proposal be reconsidered and directs the Code-Making Panel to use the definition currently in Article 100.
The Technical Correlating Committee further directs that this Proposal be referred to Code-Making Panel 1 for action relative to the elimination of the existing Fine Print Note in the definition of "Identified" because the Fine Print Note contains permissive language and is not permitted by the NEC Style Manual. This action will be considered by Code-Making Panels 1 and 14 as a Public Comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
Revise the Fine Print Note as follows:
FPN: Some examples of ways to determine suitability of equipment for a specific purpose, environment, or application include investigations by a qualified testing laboratory (listing and labeling), an inspection agency, or other organizations concerned with product evaluation.
PANEL STATEMENT: The panel accepts the direction to reconsider the deletion of the FPN proposal.
This revision removes the permissive language while still providing much needed explanatory information. FPNs are informative in nature, and nothing in the definition of "Identified" precludes an AHJ from approving a product on the basis of other evidence acceptable to that AHJ. See definition of "Approved."
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
PRICHARD: Elimination of the fine print note would remove an incomplete list of examples of ways to determine suitability of equipment. The incomplete list implies a limitation to only those ways in the list.

(Log #480)

14- 13 - (500-2, 505-2): Accept
SUBMITTER: William T. Fiske, Intertek Testing Services
COMMENT ON PROPOSAL NO: 14-4a
RECOMMENDATION: Proposal should be rejected.
SUBSTANTIATION: As noted by the technical correlating committee, placing permissive language in a fine print note is not allowed by the Style Manual. In addition to the Technical Correlating Committee's comment, we note that the Style Manual does not allow definitions to contain requirements, yet that is the effect of the fine print note as written.
PANEL ACTION: Accept.
PANEL STATEMENT: The Panel agrees with the comment.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #481)

14- 14 - (500-2): Accept in Principle
SUBMITTER: William T. Fiske, Intertek Testing Services
COMMENT ON PROPOSAL NO: 14-6
RECOMMENDATION: Panel should reject the proposal.
SUBSTANTIATION: Proposed definition is over broad and unenforceable. Proper use of battery-operated equipment would be better addressed by work practices than by adding material to the NEC that is outside its scope.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: The commenter's request was to remove battery-powered equipment from the definition. This was accomplished by the action on Comment 14-10.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #613)

14- 15 - (500-2 and 502-2): Reject
SUBMITTER: Glenn W. Zieseniss, Crown Point, IN
COMMENT ON PROPOSAL NO: 14-4a
RECOMMENDATION: This proposal should remain "accept."
SUBSTANTIATION: This is a step to help an Authority Having Jurisdiction who do not have ways to evaluate cables etc. for hazardous locations.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel was directed by the Technical Correlating Committee to delete a definition that conflicted with one in Article 100. The commenter is directed to Comment 14-19 and is further advised that other Code provisions require that cables used in hazardous (classified) locations be listed.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #873a)

14- 16 - (500-2and 505-2 Identified): Reject
SUBMITTER: Robert B. Alexander, Fluor Daniel
COMMENT ON PROPOSAL NO: 14-4a
RECOMMENDATION: Relocate the proposed definition to Article 100.
SUBSTANTIATION: The original proposal only recommends a revised fine print note rather than a change to the fundamental definition. While it may not say so or be the actual intent, the current fine print note in Article 100 strongly implies that listing and labeling are the exclusive methods of identifying acceptable equipment. This proposed fine print note indicates other appropriate methods that are of value throughout the NEC and not just within the scope of Code-Making Panel 14.
Since the Technical Correlating Committee has forwarded the original proposal to CMP 1, I believe there is sufficient public review to warrant the recommended relocation.
PANEL ACTION: Reject.
PANEL STATEMENT: See action on Comment 14-19.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #874)

14- 17 - (500-2 and 505-2 Nonhazardous Locations): Reject
SUBMITTER: Robert B. Alexander, Fluor Daniel
COMMENT ON PROPOSAL NO: 14-2a
RECOMMENDATION: Revise new definition of "Nonhazardous Locations" as follows:

~~Nonhazardous~~ Nonclassified Locations. Locations that, by inspection, are not required to ~~have been~~ be evaluated by the process defined in 500.5(A) or 505.5(A).

Revise the following uses of "nonhazardous" to "nonclassified:"
500.8(A)(6) FPN No. 2
501.4(B)(3)
504.60 [two places]

SUBSTANTIATION: As the submitter of Proposal 14-23 noted: "The term nonhazardous infers that the area has "no" hazards...".

Even with the term defined, it is not consistent with how it is used in the rest of the NEC including those uses in the scope of CMP 14. "Unclassified" now implies rigorous evaluation. This definition recognizes that some locations may be quickly evaluated (in this case "not classified") by inspection without implying that other hazards are not potentially present.

The term "nonhazardous" is used in places outside the scope of CMP 14; however in those cases the term indeed implies "free from hazard" rather than "nonclassified" or "unclassified".

In the three cases cited, the location may have been determined "by inspection".
PANEL ACTION: Reject.
PANEL STATEMENT: The issue raised by this comment has been addressed by the action on Comment 14-26.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #1003)

14- 18 - (500-2): Accept in Principle
SUBMITTER: Craig M. Wellman, Newark, DE
COMMENT ON PROPOSAL NO: 14-6
RECOMMENDATION: This proposal should be rejected.
SUBSTANTIATION: The proposal raises several issues that require extensive study. Are electronic watches and hearing aids which are unlisted not acceptable? If they are not, what does the panel expect users to do? If they are, what is the basis and how about key fobs, cell phones, insulin pumps, etc.

An ad hoc committee is investigating the hazards posed by consumer electronic devices for which the manufacturers have no incentive to seek approval but which are or may be used in classified areas. These are devices which may be worn on the body or carried into a classified area. Where listed products can meet the need, no study is needed, but where they are not available, users have a problem. A report and proposal should be available by the next code cycle but cannot be provided at this time.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: The commenter's request was to remove battery-powered equipment from the definition. This was accomplished by the action on Comment 14-10.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #1134)

14- 19 - (500-2 and 505-2): Accept in Principle
SUBMITTER: A.W. Ballard, Crouse-Hinds
COMMENT ON PROPOSAL NO: 14-4a
RECOMMENDATION: Delete definition. Revise and relocate fine print note as bold text under 500-8(a)(1) as follows:

"suitability of identified equipment shall be determined by:
1.
2.
3."

SUBSTANTIATION: Does not repeat the definition of "identified". Makes the means of identification mandatory.
PANEL ACTION: Accept in Principle.
Delete the definition of "Identified" and add the following sentence to 500-8(a)(1):

"Suitability of identified equipment shall be determined by:
1. equipment listing or labeling, or
2. evidence of equipment evaluation from a qualified testing laboratory or inspection agency concerned with product evaluation, or
3. evidence acceptable to the authority having jurisdiction such as a manufacturer's self-evaluation or an owner's engineering judgment."

PANEL STATEMENT: The panel action specifically indicates the means by which suitability in hazardous locations is determined and deletes the definition, as was directed by the Technical Correlating Committee.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
COMMENT ON AFFIRMATIVE:
KUCZKA: It is NEMA's understanding that the "evidence" in item #3 is based on compliance with applicable National Standards.
SABAN: (a), (b), and (b) below all pertain to the word "Identified":
(a) Pressurized and purged not working correctly in field...
(b) Owner's judgement.... [send owner to 90-4]
(c) Draft looks okay.

(Log #1337)

14- 20 - (500-2): Reject
SUBMITTER: John J. Kowal, Webster, NY
COMMENT ON PROPOSAL NO: 14-2a
RECOMMENDATION: Delete following text:

500-2 Definitions
FPN 3: - Other evidence acceptable to the authority having jurisdiction such as a manufacturer's self evaluation or an owner's engineering judgment.

SUBSTANTIATION: Self evaluation or owner's engineering "judgment" is a loosely defined criteria for safety issues. Article 100 definitions for labeled and listed is more definitive along with the FPN as it appears in 1999 version NFPA 70.
PANEL ACTION: Reject.
PANEL STATEMENT: See Comment 14-19. This information is needed and does not adversely affect safety.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
COMMENT ON AFFIRMATIVE:
COOK: Panel statement should read "see Comment 14-19" not "see Comment 14-10."
OMEARA: Panel statement should read: "See Comment 14-19. This information is needed...".
SABAN: See my affirmative comment on Comment 14-19.

(Log #2189)

14- 21 - (500-2 and 505-2): Reject
SUBMITTER: Mark Goodman, BP (ARCO)
COMMENT ON PROPOSAL NO: 14-4a
RECOMMENDATION: This comment supports the inclusion of the definition and fine print note for the term "Identified" in Article 500. (A parallel comment is also being submitted to Panel 1 in accordance with Technical Correlating Committee direction for Panel 1 consideration.) Modification of the wording of the FPN to remove the permissive language in accordance with the style manual is also recommended as follows:

"FPN: The determination of the suitability of equipment for a specific purpose, environment, or application can be made by several means such as:
1. equipment listing or labeling
2. evidence of equipment evaluation from a qualified testing laboratory or inspection agency concerned with product evaluation, or
3. Other evidence acceptable to the authority having jurisdiction such as a manufacturer's self-evaluation or an owner's engineering judgment.
(See definitions of Labeled and Listed)"

SUBSTANTIATION: The definition for the term "identified" included in the Article 500 and 505 rewrite is identical to the current definition in Article 100. The fine print note has been modified to provide additional guidance for several of the methods commonly used to determine suitability of equipment in classified locations.
PANEL ACTION: Reject.
PANEL STATEMENT: The action and statement to Comment 14-19 explain the reasons for rejecting this comment.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
COMMENT ON AFFIRMATIVE:
SABAN: See my affirmative comment on Comment 14-19.

(Log #873)

1- 178 - (500-2-Identified, 505-2): Reject
SUBMITTER: Robert B. Alexander, Fluor Daniel
COMMENT ON PROPOSAL NO: 14-4a
RECOMMENDATION: Relocate the proposed definition to Article 100.
SUBSTANTIATION: The original proposal only recommends a revised fine print note rather than a change to the fundamental definition. While it may not say so or be the actual intent, the current fine print note in Article 100 strongly implies that listing and labeling are the exclusive methods of identifying acceptable equipment. This proposed fine print note indicates other appropriate methods that are of value throughout the NEC and not just within the scope of Code-Making Panel 14.
Since the Technical Correlating Committee has forwarded the original proposal to CMP 1, I believe there is sufficient public review to warrant the recommended relocation.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Comment 1-177. The panel disagrees with the substantiation.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #1940)

14- 22 - (500-2-Identified): Accept in Part
SUBMITTER: David Wechsler, Union Carbide Corp.
COMMENT ON PROPOSAL NO: 14-4a
RECOMMENDATION: Delete the definition "identified" to 500-2 and include the original terms, of approved, listed, etc. as provided in the current NEC text.
SUBSTANTIATION: The proposed definition contains an important FPN that is fundamental to the entire reason for having this definition. This definition also differs from the Article 100 definition. It was the action of the technical Correlating Committee that the Article 100 definition be used and that the FPN be eliminated since it contains permissive language that is not permitted by the NEC Style Manual.
PANEL ACTION: Accept in Part.
The definition has been deleted, but no other changes made.
PANEL STATEMENT: See Comment 14-19 for the complete action and the Panel Statement.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
COMMENT ON AFFIRMATIVE:
SABAN: See my affirmative comment on Comment 14-19.

(Log #875)

14- 23 - (500-2-Unclassified and 505-2): Reject
SUBMITTER: Robert B. Alexander, Fluor Daniel
COMMENT ON PROPOSAL NO: 14-2a
RECOMMENDATION: Revise the definition of "unclassified" as follows:
Unclassified Locations. Locations <u>adjacent or proximate to classified locations</u> that have been evaluated by the classification process defined in 500.5(A) or 505.5(A) and determined to be neither Class I, ~~Division 1; Class I, Division 2; Class I Zone 0; Class I, Zone 1; Class I, Zone 2;~~ Class II, ~~Division 1; Class II, Division 2;~~ or Class III <u>locations,</u> ~~Division 1; Class III, Division 2;~~ or any combination thereof.
Revise the following uses of "nonhazardous" to "unclassified."
500.5(A)(2)(3) FPN No. 2
500.5(B)(2) FPN No. 1
SUBSTANTIATION: "Division" or "Zone" implies that an area has been "classified."
The new definition implies that unclassified locations have been evaluated under rigorous techniques as opposed to being evaluated "by inspection." Only areas near classified locations need such evaluation.
The two references cited imply that a rigorous evaluation has been made.
PANEL ACTION: Reject.
PANEL STATEMENT: The issue raised by this comment has been addressed by the action on Comment 14-26.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #1935)

14- 24 - (500-3(a)): Accept
SUBMITTER: David Wechsler, Union Carbide Corp.
COMMENT ON PROPOSAL NO: 14-8 and 14-2a
RECOMMENDATION: Delete the definition of "nonhazardous" and use the now defined term "unclassified".
SUBSTANTIATION: As stated in the original proposal, the term "unclassified" is the appropriate term that agrees with NFPA 497 and API terminology. The use of the term "nonhazardous" as expressed in the committee ballots should not be used, nor defined further, nor referenced within Chapter 5 articles.
PANEL ACTION: Accept.
PANEL STATEMENT: The panel agrees with this comment.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #2192)

14- 25 - (500-3(a), FPN): Accept
SUBMITTER: Mark Goodman, BP (ARCO)
COMMENT ON PROPOSAL NO: 14-8
RECOMMENDATION: Replace "Nonhazardous" with "Unclassified".
SUBSTANTIATION: This comment is in support of the original proposal and substantiation.
This proposal should have been "Accept" and not "Accept in Principle". The Panel Action is contrary to the submitter's intent and justification. The correct term is "unclassified" and should be used consistently throughout the code sections to avoid confusion and misapplication.
PANEL ACTION: Accept.
PANEL STATEMENT: The panel agrees with this comment.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #2362)

14- 26 - (500-3(a)-Unclassified Locations): Accept
SUBMITTER: David Wechsler, Union Carbide Corp.
COMMENT ON PROPOSAL NO: 14-8 and 14-2a
RECOMMENDATION: Delete the definition "nonhazardous", replace the word "nonhazardous" with "unclassified" throughout Chapter 5, and modify the defined term "unclassified" as follows:
Unclassified Locations. Locations determined to be neither Class I, Division 1; Class I, Division 2; Class I, Zone 0; Class I, Zone 1; Class I, Zone 2; Class II, Division 1; Class II, Division 2; Class III, Division 1; Class III, Division 2; or any combination thereof.
SUBSTANTIATION: As stated in the original proposal, the term "unclassified" is the appropriate term that agrees with NFPA 497 and API terminology. The use of the term "nonhazardous" as expressed in the committee ballots should not be used, nor defined further, nor referenced within Chapter 5 articles. The term "unclassified" has been slightly modified to better apply in the text where the word "nonhazardous" was used.
PANEL ACTION: Accept.
PANEL STATEMENT: The panel agrees with this Comment.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #684)

14- 27 - (500-3(b)): Reject
SUBMITTER: William E. Bickner, Stillwater, MN
COMMENT ON PROPOSAL NO: 14-9
RECOMMENDATION: This proposal should be accepted, at least in principle.
SUBSTANTIATION: This proposal does not attempt to establish area classification criteria, as stated in the panel comment. Does the present text iterate what must be "documented"? Does it mean establishment of the extent and classification of potentially hazardous areas (where hazardous materials are present, it is also important to document the limits of classified areas to avoid unnecessary costs)? Does it mean that there must be a set of plans and specifications for the installation? The present language is unenforceably vague, and the proposed change or similar language should be adopted.

PANEL ACTION: Reject.
PANEL STATEMENT: The substantiation for neither the original proposal nor for the comment are sufficient to support such a sweeping change in documentation of area classification.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
COMMENT ON AFFIRMATIVE:
SABAN: Is owner's judgement as stated?

(Log #913)

14- 28 - (500-3(b)): Reject
SUBMITTER: Richard J. Buschart, PC & E Inc.
COMMENT ON PROPOSAL NO: 14-9
RECOMMENDATION: As a replacement for this proposal, add the following after "properly documented.":
"This documentation shall define the extent of the classified location and the class, division, NEC group and "T" number or autoignition temperature of the classified location."
SUBSTANTIATION: This comment adds the basic requirements for a complete definition of the classification.
An IEEE paper, PCIC-93-01, which presented a survey of area classification industry practice, indicated that only 25% of the survey respondents included "T" numbers or autoignition temperature in their area classification documentation. This addition would define a complete description of classification.
PANEL ACTION: Reject.
PANEL STATEMENT: No technical substantiation has been provided with this comment.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
COMMENT ON AFFIRMATIVE:
SABAN: Is owner's judgement as stated?

(Log #142)

14- 29 - (500-3(d) and 500-5(a)(2)): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 14-10
RECOMMENDATION: It was the action of the Technical Correlating Committee that this Proposal be reconsidered by the Panel. The issues of raceway trade size, extracts, and use of soft versus hard metrication were all studied in detail and resolutions were communicated to the Panel prior to the Panel Meeting. It should be noted that all of the other Code-Making Panels accepted the metrication directive. This action will be considered by the Panel as a Public Comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
The panel accepts the Technical Correlating Committee direction to reconsider Proposal 14-10.
Revise the first sentence of 500-8(d) in the action to Comment 14-11 to read: "All threaded conduit or fittings referred to herein shall be threaded with a National (American) Standard Pipe Taper (NPT) standard conduit cutting die that provides a taper of 1 in 16 (3/4-in. taper per foot)."
PANEL STATEMENT: As correctly identified in the original Proposal 14-11, the term "NPT" required identification as well as the commonly-used term "3/4 in. taper per foot". These have been included in addition to the TCC requirement for the 1 in 16 taper.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
COMMENT ON AFFIRMATIVE:
COOK: I agree with panel action, however I believe the last part of panel action should read: ... taper of 1 in 16 (3/4-in. taper per foot).
OMEARA: In last sentence of panel action, change "1" to "3/4" such that the sentence would now read: "... that provides a taper of 1 in. 16 (3/4 in. taper per foot)."

(Log #670)

14- 30 - (500-3(d) and 500-5 (a) (2)): Reject
SUBMITTER: Jack A. Gruber, Wheatland Tube Co.
COMMENT ON PROPOSAL NO: 14-10
RECOMMENDATION: The metric designators should remain as presented by the NEC Metric Conversion Task Group.
SUBSTANTIATION: The metric designators submitted for the conduit are the same ones currently listed in the 1999 NEC (346-6(b), FPN, and do not represent a change or new material. These metric designators are also currently listed in the UL Standards (6, 797, 1242) and also in the ANSI documents (C80.1, C80.3 and C80.6). These are designators and should not be an exact conversion because they are dimensionless designators. The UL and ANSI documents selected these designators because they were taken from the International Electrotechnical Commission IEC 981 which is an International Standard for Extra-Heavy Duty Rigid Steel Conduits for Electrical Installations. The metric designators should remain as presented by the NEC Metric Conversion Task Group.
The finished length of the conduit is correct at 3.05 m. It is currently produced to this length by all U.S. conduit manufacturers. The NEC Metric Conversion Task Group retained the 3.05 m due to current industry practice and the finished conduit length should remain as presented by the NEC Metric Conversion Task Group.
The Metric Screw Threads in ISO 365 are true metric threads. However, all threaded domestic conduit is threaded to the ANSI/ASME B1.20.1 Standard for Pipe Threads, General Purpose (inch) and these inch-pound units have been soft converted to metric values in IEC 981 and have also been incorporated into the UL documents (UL 6, UL 797 and UL 1242, as well as the ANSI C80 documents (C80.1, C80.3 and C80.6). The IEC 981 International Standard for Extra-Heavy Duty Rigid Steel Conduits for Electrical Installations should also be referenced in the FPN as the standard to which all domestic conduit is threaded. The NEC Metric Conversion Task Group discussed this issue and the US Conduit threads are produced in conformance to the ANSI/ASME B 1.20.1 and the IEC 981 Standards.
PANEL ACTION: Reject.
PANEL STATEMENT: The referenced sections in Proposal 14-10 and in this comment do not contain metric designators.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #1944)

14- 31 - (500-3(d)): Reject
SUBMITTER: David Wechsler, Union Carbide Corp.
COMMENT ON PROPOSAL NO: 14-11
RECOMMENDATION: Delete "Identified" and use current wording.
SUBSTANTIATION: The proposed definition for "identified" contains an important FPN that is fundamental to the entire reason for having this definition. This definition also differs from the Article 100 definition. It was the action of the Technical Correlating Committee that the Article 100 definition be used and that the FPN be eliminated since it contains permissive language that is not permitted by the NEC Style Manual. With the elimination of this definition, the text must be reverted to that of the current code.
PANEL ACTION: Reject.
PANEL STATEMENT: The original wording (1999 edition of NEC) was also "identified".
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
COMMENT ON AFFIRMATIVE:
SABAN: See my affirmative comment on Comment 14-19.

(Log #482)

14- 32 - (500-4(a)): Reject
SUBMITTER: William T. Fiske, Intertek Testing Services
COMMENT ON PROPOSAL NO: 14-13
RECOMMENDATION: Revise as follows:
end with, "...for which it is ~~approved~~ listed."
SUBSTANTIATION: Listed explosion proof apparatus is readily available, and meets the submitter's intent.
PANEL ACTION: Reject.
PANEL STATEMENT: The text in question was deleted in the editorial rewrite of Article 500 (Proposal 14-2a).
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

COMMENT ON AFFIRMATIVE:
SABAN: See my affirmative comment on Comment 14-19.

(Log #1941)

14- 33 - (500-4(a)-Identified): Reject
SUBMITTER: David Wechsler, Union Carbide Corp.
COMMENT ON PROPOSAL NO: 14-14
RECOMMENDATION: Delete "Identified" and use current wording.
SUBSTANTIATION: The proposed definition for "identified" contains an important FPN that is fundamental to the entire reason for having this definition. This definition also differs from the Article 100 definition. It was the action of the Technical Correlating Committee that the Article 100 definition be used and that the FPN be eliminated since it contains permissive language that is not permitted by the NEC Style Manual. With the elimination of this definition, the text must be reverted to that of the current code.
PANEL ACTION: Reject.
PANEL STATEMENT: The text in question was deleted in the editorial rewrite of Article 500 (Proposal 14-2a).
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
COMMENT ON AFFIRMATIVE:
SABAN: See my affirmative comment on Comment 14-19.

(Log #483)

14- 34 - (500-4(b)): Reject
SUBMITTER: William T. Fiske, Intertek Testing Services
COMMENT ON PROPOSAL NO: 14-15
RECOMMENDATION: End the section with, "...locations for which it is ~~approved~~ listed."
SUBSTANTIATION: Listed dust-ignitionproof apparatus is readily available, and meets the submitter's intent.
PANEL ACTION: Reject.
PANEL STATEMENT: The text in question was deleted in the editorial rewrite of Article 500 (Proposal 14-2a).
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #1943)

14- 35 - (500-4(b)): Reject
SUBMITTER: David Wechsler, Union Carbide Corp.
COMMENT ON PROPOSAL NO: 14-16
RECOMMENDATION: Delete "Identified" and use current wording.
SUBSTANTIATION: The proposed definition for "identified" contains an important FPN that is fundamental to the entire reason for having this definition. This definition also differs from the Article 100 definition. It was the action of the Technical Correlating Committee that the Article 100 definition be used and that the FPN be eliminated since it contains permissive language that is not permitted by the NEC Style Manual. With the elimination of this definition, the text must be reverted to that of the current code.
PANEL ACTION: Reject.
PANEL STATEMENT: The text in question was deleted in the editorial rewrite of Article 500 (Proposal 14-2a).
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
COMMENT ON AFFIRMATIVE:
SABAN: See my affirmative comment on Comment 14-19.

(Log #1942)

14- 36 - (500-4(b)-Identified): Reject
SUBMITTER: David Wechsler, Union Carbide Corp.
COMMENT ON PROPOSAL NO: 14-15
RECOMMENDATION: Delete "Identified" and use current wording.
SUBSTANTIATION: The proposed definition for "identified" contains an important FPN that is fundamental to the entire reason for having this definition. This definition also differs from the Article 100 definition. It was the action of the Technical Correlating Committee that the Article 100 definition be used and that the FPN be eliminated since it contains permissive language that is not permitted by the NEC Style Manual. With the elimination of this definition, the text must be reverted to that of the current code.
PANEL ACTION: Reject.
PANEL STATEMENT: The text in question was deleted in the editorial rewrite of Article 500 (Proposal 14-2a).
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
COMMENT ON AFFIRMATIVE:
SABAN: See my affirmative comment on Comment 14-19.

(Log #1945)

14- 37 - (500-4(c)): Reject
SUBMITTER: David Wechsler, Union Carbide Corp.
COMMENT ON PROPOSAL NO: 14-18
RECOMMENDATION: Delete "Identified" and use "approved".
SUBSTANTIATION: The proposed definition for "identified" contains an important FPN that is fundamental to the entire reason for having this definition. This definition also differs from the Article 100 definition. It was the action of the Technical Correlating Committee that the Article 100 definition be used and that the FPN be eliminated since it contains permissive language that is not permitted by the NEC Style Manual. With the elimination of this definition, the text must be reverted to that of the current code.
PANEL ACTION: Reject.
PANEL STATEMENT: The action on Comment 14-19 provides the necessary criteria for the term "identified".
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #1946)

14- 38 - (500-4(d)): Reject
SUBMITTER: David Wechsler, Union Carbide Corp.
COMMENT ON PROPOSAL NO: 14-20
RECOMMENDATION: Delete "Identified" and use "approved".
SUBSTANTIATION: The proposed definition for "identified" contains an important FPN that is fundamental to the entire reason for having this definition. This definition also differs from the Article 100 definition. It was the action of the Technical Correlating Committee that the Article 100 definition be used and that the FPN be eliminated since it contains permissive language that is not permitted by the NEC Style Manual. With the elimination of this definition, the text must be reverted to that of the current code.
PANEL ACTION: Reject.
PANEL STATEMENT: The action on Comment 14-19 provides the necessary criteria for the term "identified".
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
COMMENT ON AFFIRMATIVE:
SABAN: See my affirmative comment on Comment 14-19.

(Log #1019)

14- 39 - (500-4(f)(4), FPN): Accept in Principle
SUBMITTER: Nicholas Ludlam, Factory Mutual Research
COMMENT ON PROPOSAL NO: 14-31
RECOMMENDATION: I accept the panel proposal, but the references to ISA S12.12.01:1994 is incorrect.
FPN: Conditions are described in ~~ISA S12.12:1994~~ ISA 12.12.01:2000 Nonincendive Electrical Equipment for Use in Class I and II, Division 2, and Class III, Division 1 and 2 Hazardous (Classified) Locations.
SUBSTANTIATION: ISA 12.12.01:2000 is in the process of being published. ISA has dropped the "S" from the front of all of their standards, and have reformatted the numbers.
PANEL ACTION: Accept in Principle.
Insert the correct designation and most recent revision date for this document at the time of the NFPA Annual Meeting.
PANEL STATEMENT: The panel agrees with the submitter, but can only reference the 2000 edition if this edition is published at the time of adoption of the NEC.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #1936)

14- 40 - (500-5(a)(c), FPN): Reject
SUBMITTER: David Wechsler, Union Carbide Corp.
COMMENT ON PROPOSAL NO: 14-6
RECOMMENDATION: Following this paragraph add a new FPN as follows:
(a) Approval for Class and Properties ~~[500-5(c)]~~
"Equipment shall be ...exceed the maximum surface temperatures specified in Section 503-1."
FPN: Examples of ways of identifying battery powered portable or transportable device(s) as being suitable for a specific purpose, environment, or application may be determined by:
1. equipment listing or labeling;
2. evidence of equipment evaluation from a qualified testing laboratory or inspection agency concerned with product evaluation; or
3. other evidence acceptable to the authority having jurisdiction such as a manufacturer's self-evaluation or an owner's engineering judgment.
SUBSTANTIATION: The new FPN provides needed additional clarification regarding evaluation of portable battery powered devices to enable their use within an electrically classified location. It should be noted that some portable battery powered devices such as watches, hearing aids, implanted- sub-dermal devices (such as pacemakers), etc. are considered to have a historic percent of being considered as nonincendive equipment with no documented evidence of causing a fire or explosion.
PANEL ACTION: Reject.
PANEL STATEMENT: The actions taken on Comments 14-10 and 14-19 address this issue.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #2193)

14- 41 - (500-5(a)(4)): Accept in Principle
SUBMITTER: Mark Goodman, BP (ARCO)
COMMENT ON PROPOSAL NO: 14-40
RECOMMENDATION: Replace "Nonhazardous" with "Unclassified".
SUBSTANTIATION: This comment is in support of the original proposal and substantiation.
This proposal should have been "Accept" and not "Accept in Principle". The Panel Action is contrary to the submitter's intent and justification. The correct term is "unclassified" and should be used consistently throughout the code sections to avoid confusion and misapplication.
PANEL ACTION: Accept in Principle.
The text in question has been deleted. The term, therefore, does not exist.
PANEL STATEMENT: The panel agrees with this comment, but the text no longer exists.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #867)

14- 42 - (500-8(d)(2), FPN): Accept in Principle
SUBMITTER: Steven Blais, EGS Electrical Group
COMMENT ON PROPOSAL NO: 14-2a
RECOMMENDATION: Revise Section 500-8(d)(2) FPN to read:
"NPT Thread Construction Specifications are located in...".
SUBSTANTIATION: Fine print note implies any thread to the ANSI/ASME B1.20 1-1983 Standard are suitable. This is not entirely true. The ANSI Standard only governs the "construction" of the threads not what the L_1 Tolerance should be. Manufacturers are aware of the proper tolerance to obtain required fit. Where field threading is encountered, it should be done in accordance to manufacturers' instructions.
PANEL ACTION: Accept in Principle.
Change the Fine Print Note to 500-8(d)(1) (see Comment 14-11) to read: "Thread form specifications for NPT threads are located in Pipe Threads, General Purpose (Inch), ANSI/ASME B1.20.1-1983."
PANEL STATEMENT: The panel action satisfies the intent of the submitter. The paragraph reference is the new number according to the Article 500 rewrite.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

ARTICLE 501 — CLASS I LOCATIONS

(Log #143)

14- 43 - (501): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 14-59
RECOMMENDATION: It was the action of the Technical Correlating Committee that this Proposal be reconsidered by the Panel. The issues of raceway trade size, extracts, and use of soft versus hard metrication were all studied in detail and resolutions were communicated to the Panel prior to the Panel Meeting. It should be noted that all of the other Code-Making Panels accepted the metrication directive. This action will be considered by the Panel as a Public Comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
The panel accepts the Technical Correlating Committee direction to reconsider Proposal 14-59. The original Proposal 14-59 is accepted in principle with the following changes (all section numbers are 1999 NEC):
-In Section 501-5(a)(1), change "2 in." to "(b) the entry is metric designator 53 (trade size 2) or larger"
-In Section 501-5(a)(4), change "10 ft (3.05m)" to "3.05m (10 ft.)"
-In Section 501-5(b)(2), change "10 ft. (3.05m)" to "3.05m (10 ft.)"
PANEL STATEMENT: The revised text provides more consistent use of metric units from Article 500 through 516 and consistency with CMP-8 action on conduit. CMP-14 recognizes that some changes involve extracted material, however changes were made based on Standards Council direction provided at their October 6, 2000 meeting.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #144)

14- 44 - (501): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 14-59a
RECOMMENDATION: The Technical Correlating Committee advises that Article Scope statements are the responsibility of the Technical Correlating Committee and the Technical Correlating Committee accepts the Panel Action. Further, it was the action of the Technical Correlating Committee that this Proposal be reconsidered by the Panel, with further consideration given to the comments expressed in the voting, specifically with respect to comments that the accepted Proposal does not accurately reflect what was agreed upon by the Panel. It is the understanding of the Technical Correlating Committee that this proposal is modified by Proposals 14-61, 14-62, 14-64, 14-66, 14-67, 14-68, 14-69, 14-70, 14-71, 14-72, 14-75, 14-77, 14-92, 14-93, 14-94, 14-95, 14-96, 14-98, 14-100, 14-101, 14-102, 14-103, 14-106, 14-107, 14-108, 14-109, 14-110, 14-111, 14-116, 14-117, 14-118, 14-119, 14-130, 14-131, 14-132, 14-133, 14-134, 14-135, 14-140, 14-141, 14-142, 14-143, 14-144, 14-145, 14-146, 14-147, 14-149, 14-150, 14-151, 14-152, 14-153, 14-154, 14-155, 14-156, 14-157, 14-158, 14-162, 14-164, 14-165, 14-166, 14-168, 14-169, 14-170, 14-171, 14-172, 14-174, 14-175, 14-178, 14-179, 14-184, 14-185, 14-186, 14-187, 14-194, 14-195, 14-196, and 14-197. This action will be considered by the Panel as a Public Comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
PANEL STATEMENT: See action on Comment 14-48.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #1339)

14- 45 - (501): Accept
SUBMITTER: Mike O'Meara, A.P.S.
COMMENT ON PROPOSAL NO: 14-59a
RECOMMENDATION: Revise text as follows:
I agree with the panel action to accept this proposal but feel the proposal should not incorporate the panel actions on Proposal 14-59.
SUBSTANTIATION: By rejecting Proposal 14-59, the proposed wording in the rewrite of Article 501 is not in compliance with the NFPA Manual of Style, Chapter 4.
PANEL ACTION: Accept.
PANEL STATEMENT: See action on Comment 14-43.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #1393)

14- 46 - (501): Accept in Principle
SUBMITTER: Kari Barrett, American Chemistry Council
COMMENT ON PROPOSAL NO: 14-59a
RECOMMENDATION: Use the rewrite from Mr. Wechsler's ballot as stated in the balloting comments for this proposal, as starting textual basis for all actions on public comments to Article 501 proposals.
SUBSTANTIATION: As stated under the balloting comments of the Panel 14 committee, due to the errors that the Committee felt existed with the presented rewrite texts, that are corrected by the rewrite addressed by the Wechsler submitted ballot, this "Wechsler" rewrite should be the starting textual basis for Panel actions.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See action on Comment 14-48.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #1947)

14- 47 - (501): Reject
SUBMITTER: David Wechsler, Union Carbide Corp.
COMMENT ON PROPOSAL NO: 14-59a
RECOMMENDATION: Replace "identified" with the prior NEC wording.
SUBSTANTIATION: The proposed definition for "identified" contains an important FPN that is fundamental to the entire reason for having this definition. This definition also differs from the Article 100 definition. It was the action of the Technical Correlating Committee that the Article 100 definition be used and that the FPN be eliminated since it contains permissive language that is not permitted by the NEC Style Manual. With the elimination of this definition, the text must be reverted to that of the current code.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel has concluded that the correct terms are now being used.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #2230)

14- 48 - (501): Accept in Principle
Note: The Technical Correlating Committee directs that 501-5(a)(1)(1) and (b) be shown in list format.
The Technical Correlating Committee directs that 501-5(a)(1) Exception be revised to read as follows: "Exception to 501-5(a)(1)(a) Seals shall not be required for conduit entering…".
Move "d. In nonincendive circuits" up following "c."
Move the paragraph shown under the Exception that begins with "Factory-sealed enclosures…" out of the Exception and make it regular text under 501-5(a)(1) as it existed in the 1999 NEC
The Technical Correlating Committee directs that in Section 501-5(d)(1) of the Panel Action, third sentence, the word "aluminum" be changed to "metallic" to provide correlation with the revision made in Section 501-4(a)(1)(c) in accordance with Proposal 14-78.
The Technical Correlating Committee directs that the 501-5(e)(4), FPN be deleted because it contains permissive language.
The Technical Correlating Committee directsthat the last paragraph of 501-8(a) be revised to read as follows: "Totally enclosed motors of the types specified in 501-8(a)(2) or (3) shall have no external surface…" to provide clarity
SUBMITTER: James D. Cospolich, Waldemar S. Nelson & Co., Inc.
COMMENT ON PROPOSAL NO: 14-59a
RECOMMENDATION: Please see the following revised text which represents what I believe to be the correct wording that Code Making Panel 14 voted on and accepted during the January 2000 ROP meeting. The shaded wording represents what I consider to be revisions and corrections. Some of this shaded wording is very important for the technical accuracy and intent of the article.

ARTICLE 501 -- Class I Locations

501-1. General. The general rules of this Code shall apply to the electric wiring and equipment in locations classified as Class I in Section 500-~~75~~.

Equipment listed and marked in accordance with Section 505-10 for use in Class I, Zone 0, 1, or 2 locations shall be permitted in Class I, Division 2 locations for the same gas and with a suitable temperature ~~rating~~classification.
Exception: As modified by this article.

501-2. Transformers and Capacitors

(a) Class I, Division 1. In Class I, Division 1 locations, transformers and capacitors shall comply with the following.

(1) Containing Liquid that Will Burn. Transformers and capacitors containing a liquid that will burn shall be installed only in ~~approved~~ [14-61,14-62]vaults that comply with Sections 450-41 through 450-48, and, in addition,

a. There shall be no door or other communicating opening between the vault and the Division 1 location, and
b. Ample ventilation shall be provided for the continuous removal of flammable gases or vapors, and
c. Vent openings or ducts shall lead to a safe location outside of buildings, and
d. Vent ducts and openings shall be of sufficient area to relieve explosion pressures within the vault, and all portions of vent ducts within the buildings shall be of reinforced concrete construction.

(2) Not Containing Liquid that Will Burn. Transformers and capacitors that do not contain a liquid that will burn shall be installed in vaults complying with (a)(1) or be approved for Class I locations.

(b) Class I, Division 2. In Class I, Division 2 locations, transformers and capacitors shall comply with Sections 450-21 through 450-27.

501-3. Meters, Instruments, and Relays

(a) Class I, Division 1. In Class I, Division 1 locations, meters, instruments, and relays, including kilowatt-hour meters, instrument transformers, resistors, rectifiers, and thermionic tubes, shall be provided with enclosures approved for Class I, Division 1 locations. Enclosures ~~approved~~ [14-66] for Class I, Division 1 locations include explosionproof enclosures and purged and pressurized enclosures.

FPN: See Standard for Purged and Pressurized Enclosures for Electrical Equipment, NFPA 496-1998.

(b) Class I, Division 2. In Class I, Division 2 locations, meters, instruments, and relays shall comply with the following.

(1) Contacts. Switches, circuit breakers, and make-and-break contacts of pushbuttons, relays, alarm bells, and horns shall have enclosures approved [14-67,14-68] for Class I, Division 1 locations in accordance with Section 501-3(a).

Exception: General-purpose enclosures shall be permitted, if current-interrupting contacts are
a. Immersed in oil, or
b. Enclosed within a chamber that is hermetically sealed against the entrance of gases or vapors, or
c. In nonincendive circuits, or
d. Part of a listed nonincendive component.

(2) Resistors and Similar Equipment. Resistors, resistance devices, thermionic tubes, rectifiers, and similar equipment that are used in or in connection with meters, instruments, and relays shall comply with Section 501-3(a).
Exception: General-purpose–type enclosures shall be permitted if such equipment is without make-and-break or sliding contacts [other than as provided in (b)(1)] and if the maximum operating temperature of any exposed surface will not exceed 80 percent of the ignition temperature in degrees Celsius of the gas or vapor involved or has been tested and found incapable of igniting the gas or vapor. This exception shall not apply to thermionic tubes.

(3) Without Make-or-Break Contacts. Transformer windings, impedance coils, solenoids, and other windings that do not incorporate sliding or make-or-break contacts shall be provided with enclosures. General-purpose–type enclosures shall be permitted.

(4) General-Purpose Assemblies. Where an assembly is made up of components for which general-purpose enclosures are acceptable as provided in (b)(1), (b)(2), and (b)(3), a single general-purpose enclosure shall be acceptable for the assembly. Where such an assembly includes any of the equipment described in (b)(2), the maximum obtainable surface temperature of any component of the assembly shall be clearly and permanently indicated on the outside of the enclosure. Alternatively, ~~approved~~ [14-69,14-70] equipment shall be permitted to be marked to indicate the temperature ~~range~~class~~-~~ for which it is suitable, using the temperature class (T Code)~~identification numbers~~ of Table 500-8 (b)~~5(d)~~.

(5) Fuses. Where general-purpose enclosures are permitted in (b)(1), (b)(2), (b)(3), and (b)(4), fuses for overcurrent protection of instrument circuits not subject to overloading in normal use shall be permitted to be mounted in general-purpose enclosures if each such fuse is preceded by a switch complying with (b)(1).

(6) Connections. To facilitate replacements, process control instruments shall be permitted to be connected through flexible cord, attachment plug, and receptacle, provided the following:

1. A switch complying with (b)(1) is provided so that the attachment plug is not depended on to interrupt current; and
2. The current does not exceed 3 amperes at 120 volts, nominal; and
3. The power-supply cord does not exceed 3 ft (914 mm), is of a type listed ~~approved~~[14-71,14-72]~~-~~for extra-hard usage or for hard usage if protected by location, and is supplied through an attachment plug and receptacle of the locking and grounding type; and
4. Only necessary receptacles are provided; and
5. The receptacle carries a label warning against unplugging under load.

501-4. Wiring Methods. Wiring methods shall comply with (a) or (b). [14-73, 14-75,14-76,14-79]

(a) Class I, Division 1.
(1) In Class I, Division 1 locations, the following wiring methods shall be permitted:

a) Threaded rigid metal conduit or threaded steel intermediate metal conduit. Threaded joints shall be made up with at least five threads fully engaged.

Exception No. 1: Rigid nonmetallic conduit complying with Article 347 shall be permitted where encased in a concrete envelope a minimum of 2 in. (50.8 mm) thick and provided with not less than 24 in. (610 mm) of cover measured from the top of the conduit to grade. The concrete encasement shall be permitted to be omitted where subject to the provisions of Section 511-4, Exception; 514-8, Exception No. 2; and Section 515-5(a). Threaded rigid metal conduit or threaded steel intermediate metal conduit shall be used for the last 24 in. (610 mm) of the underground run to emergence or to the point of connection to the aboveground raceway. An equipment grounding conductor shall be included to provide for electrical continuity of the raceway system and for grounding of noncurrent-carrying metal parts.

b) Type MI cable with termination fittings approved for the location. Type MI cable shall be installed and supported in a manner to avoid tensile stress at the termination fittings. [14-77]

c) In industrial establishments with restricted public access, where the conditions of maintenance and supervision ensure that only qualified persons will service the installation Type MC-HL cable, listed for use in Class I, Division 1 locations, with a gas/vaportight continuous corrugated metallic (14-78) sheath, an overall jacket of suitable polymeric material, separate grounding conductors in accordance with Section 250-122, and provided with termination fittings listed for the application.
FPN: See Sections 334-3 and 334-4 for restrictions on use of Type MC cable.

d) In industrial establishments with restricted public access, where the conditions of maintenance and supervision ensure that only qualified persons will service the installation, Type ITC-HL cable, listed for use in Class I, Division 1 locations, with a gas/vaportight continuous corrugated metallic sheath, an overall jacket of suitable polymeric material and provided with termination fittings listed for the application.

(2) Where necessary to employ flexible connections, as at motor terminals, flexible fittings listed for Class I, Division 1 locations or flexible cord in accordance with the provisions of Section 501-11 shall be permitted.

(3) All boxes, fittings, and joints shall be ~~approved~~ listed for Class I, Division 1.

(b) Class I, Division 2.
(1) In Class I, Division 2 locations, the following wiring methods shall be permitted: [14-83,14-86,14-87]

a) All wiring methods permitted in Article 501-4(a).
b) Threaded rigid metal conduit, threaded steel intermediate metal conduit,
~~b~~c) Enclosed gasketed busways, enclosed gasketed wireways,
~~c~~d) Type PLTC cable in accordance with the provisions of Article 725, or in cable tray systems. PLTC shall be installed in a manner to avoid tensile stress at the termination fittings.
~~d~~e) Type ITC cable in cable trays, in raceways, supported by messenger wire, afforded mechanical protection and run as open wiring, or directly buried where the cable is listed for this use;
~~e~~f) Type MI, MC, MV, or TC cable with -[14-79/14-80] termination fittings, or in cable tray systems and installed in a manner to avoid tensile stress at the termination fittings.

(2) Where provision must be made for limited flexibility, flexible metal fittings, flexible metal conduit with listed fittings, liquidtight flexible metal conduit with listed fittings, liquidtight flexible nonmetallic conduit with listed fittings, or flexible cord listed for extra-hard usage and provided with listed bushed fittings shall be used. An additional conductor for grounding shall be included in the flexible cord. [14-87, 14-80]
FPN: See Section 501-16(b) for grounding requirements where flexible conduit is used.

(3) Nonincendive field wiring shall be permitted using any of the wiring methods permitted for nonhazardous [14-81,14-88,1401] locations, including Chapter 7 and 8 wiring methods. Nonincendive field wiring systems shall be installed in accordance with the control drawing(s). (14-83)

(4) Boxes, fittings, and joints shall not be required to be explosionproof except as required by Sections 501-3(b)(1), 501-6(b)(1), and 501-14(b)(1).

501-5. Sealing and Drainage
Seals in conduit and cable systems shall comply with (a) through (f)~~.~~ ~~Sealing compound shall be of a type approved for the conditions and use~~ (14-89,14-91). Sealing compound shall be used in Type MI cable termination fittings to exclude moisture and other fluids from the cable insulation.

FPN No. 1: Seals are provided in conduit and cable systems to minimize the passage of gases and vapors and prevent the passage of flames from one portion of the electrical installation to another through the conduit. Such communication through Type MI cable is inherently prevented by construction of the cable. Unless specifically designed and tested for the purpose, conduit and cable seals are not intended to prevent the passage of liquids, gases, or vapors at a continuous pressure differential across the seal. Even at differences in pressure across the seal equivalent to a few inches of water, there may be a slow passage of gas or vapor through a seal, and through conductors passing through the seal. See Section 501-5(e)(2). Temperature extremes and highly corrosive liquids and vapors can affect the ability of seals to perform their intended function. See Section 501-5(c)(2).
FPN No. 2: Gas or vapor leakage and propagation of flames may occur through the interstices between the strands of standard stranded conductors larger than No. 2. Special conductor constructions, e.g., compacted strands or sealing of the individual strands, are means of reducing leakage and preventing the propagation of flames.

(a) Conduit Seals, Class I, Division 1. In Class I, Division 1 locations, conduit seals shall be located as follows.
1. In each conduit entry into an explosionproof enclosure where either (a) the enclosure contains apparatus, such as switches, circuit breakers, fuses, relays, or resistors, that may produce arcs, sparks, or high temperatures that are considered to be an ignition source in normal operation, or (b) the entry is 2-in. size or larger and the enclosure contains terminals, splices, or taps. For the purposes of this section high temperatures shall be considered to be any temperatures exceeding 80 percent of the autoignition temperature in degrees Celsius of the gas or vapor involved.

Exception to (a)(1)(a): Conduit entering an enclosure where such switches, circuit breakers, fuses, relays, or resistors are
a. Enclosed within a chamber hermetically sealed against the entrance of gases or vapors, or
b. Immersed in oil in accordance with Section 501-6(b)(1)(b), or
c. Enclosed within a factory-sealed explosionproof chamber located within the enclosure, identified ~~approved~~ [14-92, 14-93] for the location, and marked "factory sealed" or equivalent, unless the enclosure entry is 2 in. size or larger. Factory-sealed enclosures shall not be considered to serve as a seal for another adjacent explosionproof enclosure that is required to have a conduit seal.
Conduit seals shall be installed within 18 in. (457 mm) from the enclosure. Only explosionproof unions, couplings, reducers, elbows, capped elbows, and conduit bodies similar to L, T, and Cross types that are not larger than the trade size of the conduit shall be permitted between the sealing fitting and the explosionproof enclosure.
d. In nonincendive circuits. [14-94]

2. In each conduit entry into a pressurized enclosure where the conduit is not pressurized as part of the protection system. Conduit seals shall be installed within 18 in. (457 mm) from the pressurized enclosure.

FPN No. 1: Installing the seal as close as possible to the enclosure will reduce problems with purging the dead airspace in the pressurized conduit.
FPN No. 2: For further information, see Standard for Purged and Pressurized Enclosures for Electrical Equipment, NFPA 496-1998.

3. Where two or more explosionproof enclosures for which conduit seals are required under (a)(1) are connected by nipples or by runs of conduit not more than 36 in. (914 mm) long, a single conduit seal in each such nipple connection or run of conduit shall be considered sufficient if located not more than 18 in. (457 mm) from either enclosure.

4. In each conduit run leaving a Class I, Division 1 location. The sealing fitting shall be permitted on either side of the boundary of such location within 10 ft (3.05 m) of the boundary, and shall be designed and installed so to minimize the amount of gas or vapor within the Division 1 portion of the conduit from being communicated to the conduit beyond the seal. Except for listed ~~approved~~ [14-95,14-96] explosionproof reducers at the conduit seal, there shall be no union, coupling, box, or fitting between the conduit seal and the point at which the conduit leaves the Division 1 location.
Exception: Metal conduit containing no unions, couplings, boxes, or fittings that passes completely through a Class I, Division 1 location with no fittings less than 12 in. (305 mm) beyond each boundary shall not require a conduit seal if the termination points of the unbroken conduit are in unclassified locations.

(b) Conduit Seals, Class I, Division 2. In Class I, Division 2 locations, conduit seals shall be located as follows.
1. For connections to enclosures that are required to be explosionproof, a conduit seal shall be provided in accordance with (a)(1)(a) and (a)(3). All portions of the conduit run or nipple between the seal and such enclosure shall comply with Section 501-4(a).
2. In each conduit run passing from a Class I, Division 2 location into an unclassified location. The sealing fitting shall be permitted on either side of the boundary of such location within 10 ft (3.05 m) of the boundary, and shall be designed and installed so to minimize the amount of gas or vapor within the Division 2 portion of the conduit from being communicated to the conduit beyond the seal. Rigid metal conduit or threaded steel intermediate metal conduit shall be used between the sealing fitting and the point at which the conduit leaves the Division 2 location, and a threaded connection shall be used at the sealing fitting. Except for listed ~~approved~~[14-100,14-101] explosionproof reducers at the conduit seal, there shall be no union, coupling, box, or fitting between the conduit seal and the point at which the conduit leaves the Division 2 location.

Exception No. 1: Metal conduit containing no unions, couplings, boxes or fittings that passes completely through a Class I, Division 2 location with no fittings less than 12 in. (305 mm) beyond each boundary shall not be required to be sealed if the termination points of the unbroken conduit are in unclassified locations.

Exception No. 2: Conduit systems terminating at an unclassified location where a wiring method transition is made to cable tray, cablebus, ventilated busway, Type MI cable, or open wiring shall not be required to be sealed where passing from the Class I, Division 2 location into the unclassified location. The unclassified location shall be outdoors or, if the conduit system is all in one room, it shall be permitted to be indoors. The conduits shall not terminate at an enclosure containing an ignition source in normal operation.
Exception No. 3: Conduit systems passing from an enclosure or room that is unclassified as a result of pressurization into a Class I, Division 2 location shall not require a seal at the boundary.

FPN: For further information, refer to Standard for Purged and Pressurized Enclosures for Electrical Equipment, NFPA 496-1998.

Exception No. 4: Segments of aboveground conduit systems shall not be required to be sealed where passing from a Class I, Division 2 location into an unclassified location if the following conditions are met:
a. No part of the conduit system segment passes through a Class I, Division I location where the conduit contains unions, couplings, boxes, or fittings within 12 in. (305 mm) of the Class I, Division 1 location; and
b. The conduit system segment is located entirely in outdoor locations; and
c. The conduit system segment is not directly connected to canned pumps, process or service connections for flow, pressure, or analysis measurement, etc., that depend on a single compression seal, diaphragm, or tube to prevent flammable or combustible fluids from entering the conduit system; and
d. The conduit system segment contains only threaded metal conduit, unions, couplings, conduit bodies, and fittings in the unclassified location; and
e. The conduit system segment is sealed at its entry to each enclosure or fitting housing terminals, splices, or taps in Class I, Division 2 locations.

(c) Class I, Divisions 1 and 2. Where required, seals in Class I, Division 1 and 2 locations shall comply with the following.
(1) Fittings. Enclosures for connections or equipment shall be provided with an approved integral means for sealing, or sealing fittings approved for Class I locations shall be used. ~~Sealing fittings shall be accessible.~~Sealing fittings shall be listed for use with one or more specific compounds and shall be accessible. (14-102,14-103,14-104, 14-105)
(2) Compound. The compound shall provide a ~~Sealing compound shall be approved and shall provide a~~ seal against passage of gas or vapors through the seal fitting, shall not be affected by the surrounding atmosphere or liquids, and shall not have a melting point of less than 93ºC (200ºF). (14-104, 14-105)
(3) Thickness of Compounds. In a completed seal, the minimum thickness of the sealing compound shall not be less than the trade size of the sealing fitting and, in no case, less than 5/8 in. (16 mm).
Exception: Listed cable sealing fittings shall not be required to have a minimum thickness equal to the trade size of the fitting.
(4) Splices and Taps. Splices and taps shall not be made in fittings intended only for sealing with compound, nor shall other fittings in which splices or taps are made be filled with compound.
(5) Assemblies. In an assembly where equipment that may produce arcs, sparks, or high temperatures is located in a compartment separate from the compartment containing splices or taps, and an integral seal is provided where conductors pass from one compartment to the other, the entire assembly shall be identified ~~approved~~ for Class I locations. Seals in conduit connections to the compartment containing splices or taps shall be provided in Class I, Division 1 locations where required by (a)(1)(b).[14-106, 14-107]
(6) Conductor Fill. The cross-sectional area of the conductors permitted in a seal shall not exceed 25 percent of the cross-sectional area of a rigid metal conduit of the same trade size unless it is specifically identified ~~approved~~ [14-108,14-109]-for a higher percentage of fill.

(d) Cable Seals, Class I, Division 1. In Class I, Division 1 locations, cable seals shall be located as follows.
1. Cable shall be sealed at all terminations. The sealing fitting shall comply with (c). Multiconductor Type MC-HL cables with a

gas/vaportight continuous corrugated aluminum sheath and an overall jacket of suitable polymeric material shall be sealed with an listed ~~approved~~ [14-110,14-111]-fitting after removing the jacket and any other covering so that the sealing compound will surround each individual insulated conductor in such a manner as to minimize the passage of gases and vapors.
Exception: Shielded cables and twisted pair cables shall not require the removal of the shielding material or separation of the twisted pairs provided the termination is by an approved means to minimize the entrance of gases or vapors and prevent propagation of flame into the cable core.

2. Cables in conduit with a gas/vaportight continuous sheath capable of transmitting gases or vapors through the cable core shall be sealed in the Division 1 location after removing the jacket and any other coverings so that the sealing compound will surround each individual insulated conductor and the outer jacket.
Exception: Multiconductor cables with a gas/vaportight continuous sheath capable of transmitting gases or vapors through the cable core shall be permitted to be considered as a single conductor by sealing the cable in the conduit within 18 in. (457 mm) of the enclosure and the cable end within the enclosure by an approved means to minimize the entrance of gases or vapors and prevent the propagation of flame into the cable core, or by other approved methods. For shielded cables and twisted pair cables, it shall not be required to remove the shielding material or separate the twisted pair.

3. Each multiconductor cable in conduit shall be considered as a single conductor if the cable is incapable of transmitting gases or vapors through the cable core. These cables shall be sealed in accordance with (a).

(e) Cable Seals, Class I, Division 2. In Class I, Division 2 locations, cable seals shall be located as follows.
1. Cables entering enclosures that are required to be explosionproof ~~approved for Class I locations~~ [14-116,14-118]shall be sealed at the point of entrance. The sealing fitting shall comply with (b)(1). Multiconductor cables with a gas/vaportight continuous sheath capable of transmitting gases or vapors through the cable core shall be sealed in an listed ~~approved~~ [14-117,14-119]-fitting in the Division 2 location after removing the jacket and any other coverings so that the sealing compound will surround each individual insulated conductor in such a manner as to minimize the passage of gases and vapors. Multiconductor cables in conduit shall be sealed as described in (d).
Exception No. 1: Cables passing from an enclosure or room that is unclassified as a result of Type Z pressurization into a Class I, Division 2 location shall not require a seal at the boundary.
Exception No. 2: Shielded cables and twisted pair cables shall not require the removal of the shielding material or separation of the twisted pairs provided the termination is by an approved means to minimize the entrance of gases or vapors and prevent propagation of flame into the cable core.

2. Cables with a gas/vaportight continuous sheath and that will not transmit gases or vapors through the cable core in excess of the quantity permitted for seal fittings shall not be required to be sealed except as required in (e)(1). The minimum length of such cable run shall not be less than that length that limits gas or vapor flow through the cable core to the rate permitted for seal fittings [0.007 ft3/hour (198 cm3/hour) of air at a pressure of 6 in. of water (1493 pascals)].
FPN No. 1: See Outlet Boxes and Fittings for Use in Hazardous (Classified) Locations, ANSI/UL 886-1994.
FPN No. 2: The cable core does not include the interstices of the conductor strands.

3. Cables with a gas/vaportight continuous sheath capable of transmitting gases or vapors through the cable core shall not be required to be sealed except as required in (e)(1), unless the cable is attached to process equipment or devices that may cause a pressure in excess of 6 in. of water (1493 pascals) to be exerted at a cable end, in which case a seal, barrier, or other means shall be provided to prevent migration of flammables into an unclassified area.
Exception: Cables with an unbroken gas/vaportight continuous sheath shall be permitted to pass through a Class I, Division 2 location without seals.

4. Cables that do not have gas/vaportight continuous sheath shall be sealed at the boundary of the Division 2 and unclassified location in such a manner as to minimize the passage of gases or vapors into an unclassified location.
FPN: The sheath mentioned in (d) and (e) may be either metal or a nonmetallic material.

(f) Drainage.
(1) Control Equipment. Where there is a probability that liquid or other condensed vapor may be trapped within enclosures for control equipment or at any point in the raceway system, approved means shall be provided to prevent accumulation or to permit periodic draining of such liquid or condensed vapor.

(2) Motors and Generators. Where the authority having jurisdiction judges that there is a probability that liquid or condensed vapor may accumulate within motors or generators, joints and conduit systems shall be arranged to minimize entrance of liquid. If means to prevent accumulation or to permit periodic draining are judged necessary, such means shall be provided at the time of manufacture and shall be considered an integral part of the machine.

(3) Canned Pumps, Process or Service Connections, etc. For canned pumps, process or service connections for flow, pressure, or analysis measurement, etc., that depend on a single compression seal, diaphragm, or tube to prevent flammable or combustible fluids from entering the electrical raceway or cable system capable of transmitting fluids, an additional approved seal, barrier, or other means shall be provided to prevent the flammable or combustible fluid from entering the raceway or cable system capable of transmitting fluids beyond the additional devices or means, if the primary seal fails. The additional approved seal or barrier and the interconnecting enclosure shall meet the temperature and pressure conditions to which they will be subjected upon failure of the primary seal, unless other approved means are provided to accomplish the purpose above. Drains, vents, or other devices shall be provided so that primary seal leakage will be obvious.
FPN: See also the fine print notes to Section 501-5.

501-6. Switches, Circuit Breakers, Motor Controllers, and Fuses
(a) Class I, Division 1. In Class I, Division 1 locations, switches, circuit breakers, motor controllers, and fuses, including pushbuttons, relays, and similar devices, shall be provided with enclosures, and the enclosure in each case, together with the enclosed apparatus, shall be identified ~~approved~~ [14-130, 14-131] -as a complete assembly for use in Class I locations.

(b) Class I, Division 2. Switches, circuit breakers, motor controllers, and fuses in Class I, Division 2 locations shall comply with the following:

(1) Type Required. Circuit breakers, motor controllers, and switches intended to interrupt current in the normal performance of the function for which they are installed shall be provided with enclosures identified ~~approved~~[14-132,14-133]- for Class I, Division 1 locations in accordance with Section 501-3(a), unless general-purpose enclosures are provided and
a. The interruption of current occurs within a chamber hermetically sealed against the entrance of gases and vapors, or
b. The current make-and-break contacts are oil-immersed and of the general-purpose type having a 2 -in. (50.8-mm) minimum immersion for power contacts and a 1 -in. (25.4-mm) minimum immersion for control contacts, or
c. The interruption of current occurs within a factory-sealed explosionproof chamber ~~approved for the location~~[14-134, 14-135], or
d. The device is a solid state, switching control without contacts, where the surface temperature does not exceed 80 percent of the ignition temperature in degrees Celsius of the gas or vapor involved.

(2) Isolating Switches. Fused or unfused disconnect and isolating switches for transformers or capacitor banks that are not intended to interrupt current in the normal performance of the function for which they are installed shall be permitted to be installed in general-purpose enclosures.

(3) Fuses. For the protection of motors, appliances, and lamps, other than as provided in (b)(4), standard plug or cartridge fuses shall be permitted, provided they are placed within enclosures identified ~~approved~~ (14-136,14-137) for the location; or fuses shall be permitted if they are within general-purpose enclosures, and if they are of a type in which the operating element is immersed in oil or other approved liquid, or the operating element is enclosed within a chamber hermetically sealed against the entrance of gases and vapors, or the fuse is a nonindicating, filled, current-limiting type.

(4) Fuses Internal to Lighting Fixtures. Approved cartridge fuses shall be permitted as supplementary protection within lighting fixtures.

501-7. Control Transformers and Resistors
Transformers, impedance coils, and resistors used as, or in conjunction with, control equipment for motors, generators, and appliances shall comply with (a) and (b).
(a) Class I, Division 1. In Class I, Division 1 locations, transformers, impedance coils, and resistors, together with any switching mechanism associated with them, shall be provided with enclosures identified ~~approved~~ [14-140,14-141]- for Class I, Division 1 locations in accordance with Section 501-3(a).

(b) Class I, Division 2. In Class I, Division 2 locations, control transformers and resistors shall comply with the following.
(1) Switching Mechanisms. Switching mechanisms used in conjunction with transformers, impedance coils, and resistors shall comply with Section 501-6(b).
(2) Coils and Windings. Enclosures for windings of transformers, solenoids, or impedance coils shall be permitted to be of the general-purpose type.
(3) Resistors. Resistors shall be provided with enclosures; and the assembly shall be identified ~~approved~~ [14-142, 14-143]- for Class I locations, unless resistance is nonvariable and maximum operating temperature, in degrees Celsius, will not exceed 80 percent of the ignition temperature of the gas or vapor involved, or has been tested and found incapable of igniting the gas or vapor.

501-8. Motors and Generators
(a) Class I, Division 1. In Class I, Division 1 locations, motors, generators, and other rotating electric machinery shall be as follows:
1. Identified ~~Approved~~[14-146,14-147]- for Class I, Division 1 locations; or
2. Of the totally enclosed type supplied with positive-pressure ventilation from a source of clean air with discharge to a safe area, so arranged to prevent energizing of the machine until ventilation has been established and the enclosure has been purged with at least 10 volumes of air, and also arranged to automatically de-energize the equipment when the air supply fails; or
3. Of the totally enclosed inert gas-filled type supplied with a suitable reliable source of inert gas for pressuring the enclosure, with devices provided to ensure a positive pressure in the enclosure and arranged to automatically de-energize the equipment when the gas supply fails; or
4. Of a type designed to be submerged in a liquid that is flammable only when vaporized and mixed with air, or in a gas or vapor at a pressure greater than atmospheric and that is flammable only when mixed with air; and the machine is arranged so to prevent energizing it until it has been purged with the liquid or gas to exclude air, and also arranged to automatically de-energize the equipment when the supply of liquid or gas or vapor fails or the pressure is reduced to atmospheric.
Totally enclosed motors of Types (2) or (3) shall have no external surface with an operating temperature in degrees Celsius in excess of 80 percent of the ignition temperature of the gas or vapor involved. Appropriate devices shall be provided to detect and automatically de-energize the motor or provide an adequate alarm if there is any increase in temperature of the motor beyond designed limits.
Auxiliary equipment shall be of a type identified ~~approved~~ [14-144,14-145]- for the location in which it is installed.
FPN: See ASTM Test Procedure, D 2155-69.

(b) Class I, Division 2. In Class I, Division 2 locations, motors, generators, and other rotating electric machinery in which are employed sliding contacts, centrifugal or other types of switching mechanism (including motor overcurrent, overloading, and overtemperature devices), or integral resistance devices, either while starting or while running, shall be identified ~~approved~~ [14-149, 14-151]- for Class I, Division 1 locations, unless such sliding contacts, switching mechanisms, and resistance devices are provided with enclosures approved for Class I, Division 2 locations in accordance with Section 501-3(b). The exposed surface of space heaters used to prevent condensation of moisture during shutdown periods shall not exceed 80 percent of the ignition temperature in degrees Celsius of the gas or vapor involved when operated at rated voltage, and the maximum surface temperature [based on a 40ºC (104ºF) ambient] shall be permanently marked on a visible nameplate mounted on the motor. Otherwise, space heaters shall be identified ~~approved~~ [14-152] for Class I, Division 2 locations.
In Class I, Division 2 locations, the installation of open or nonexplosionproof enclosed motors, such as squirrel-cage induction motors without brushes, switching mechanisms, or similar arc-producing devices that are not identified for use in a Class I, Division 2 location, shall be permitted.
FPN No. 1: It is important to consider the temperature of internal and external surfaces that may be exposed to the flammable atmosphere.
FPN No. 2: It is important to consider the risk of ignition due to currents arcing across discontinuities and overheating of parts in multisection enclosures of large motors and generators. Such motors and generators may need equipotential bonding jumpers across joints in the enclosure and from enclosure to ground. Where the presence of ignitible gases or vapors is suspected, clean-air purging may be needed immediately prior to and during start-up periods.

501-9. Lighting Fixtures
Lighting fixtures shall comply with (a) or (b).
(a) Class I, Division 1. In Class I, Division 1 locations, lighting fixtures shall comply with the following.
(1) Approved Fixtures. Each fixture shall be identified ~~approved~~ as a complete assembly for the Class I, Division 1 location and shall be clearly marked to indicate the maximum wattage of lamps for which it is identified ~~approved~~. Fixtures intended for portable use shall be specifically identified ~~approved~~ as a complete assembly for that use. [14-153,14-154]
(2) Physical Damage. Each fixture shall be protected against physical damage by a suitable guard or by location.
(3) Pendant Fixtures. Pendant fixtures shall be suspended by and supplied through threaded rigid metal conduit stems or threaded steel intermediate conduit stems, and threaded joints shall be provided with set-screws or other effective means to prevent loosening. For stems longer than 12 in. (305 mm), permanent and effective bracing against lateral displacement shall be provided at a level not more than 12 in. (305 mm) above the lower end of the stem, or flexibility in the form of a fitting or flexible connector identified ~~approved~~[14-155,14-156]- for the Class I, Division 1 location shall be provided not more than 12 in. (305 mm) from the point of attachment to the supporting box or fitting.
(4) Supports. Boxes, box assemblies, or fittings used for the support of lighting fixtures shall be identified ~~approved~~ [14-157, 14-158]- for Class I locations.

(b) Class I, Division 2. In Class I, Division 2 locations, lighting fixtures shall comply with the following~~:~~.
(1) Portable Lighting Equipment. Portable lighting equipment shall comply with (a)(1).
Exception: Where portable lighting equipment are mounted on movable stands and are connected by flexible cords, as covered in Section 501-11, they shall be permitted, where mounted in any position, if they conform to Section 501-9(b)(2).
(2) Fixed Lighting. Lighting fixtures for fixed lighting shall be protected from physical damage by suitable guards or by location. Where there is danger that falling sparks or hot metal from lamps or fixtures might ignite localized concentrations of flammable vapors or gases, suitable enclosures or other effective protective means shall be provided. Where lamps are of a size or type that may, under normal operating conditions, reach surface temperatures exceeding 80 percent of the ignition temperature in degrees Celsius of the gas or vapor involved, fixtures shall comply with (a)(1) or shall be of a type that has been tested in order to determine the marked operating temperature or temperature class~~range~~ (T Code).
(3) Pendant Fixtures. Pendant fixtures shall be suspended by threaded rigid metal conduit stems, threaded steel intermediate metal conduit stems, or by other approved means. For rigid stems longer than 12 in. (305 mm), permanent and effective bracing against lateral displacement shall be provided at a level not more than 12 in. (305 mm) above the lower end of the stem, or flexibility in the form of an identified ~~approved~~ [14-162, 14-164]- fitting or flexible connector shall be provided not more than 12 in. (305 mm) from the point of attachment to the supporting box or fitting.
(4) Switches. Switches that are a part of an assembled fixture or of an individual lampholder shall comply with Section 501-6(b)(1).
(5) Starting Equipment. Starting and control equipment for electric-discharge lamps shall comply with Section 501-7(b).
Exception: A thermal protector potted into a thermally protected fluorescent lamp ballast if the lighting fixture is identified ~~approved~~ [14-165, 14-166]- for locations of this class and division.

501-10. Utilization Equipment
(a) Class I, Division 1. In Class I, Division 1 locations, all utilization equipment shall be approved for Class I, Division 1 locations.

(b) Class I, Division 2. In Class I, Division 2 locations, all utilization equipment shall comply with the following.
(1) Heaters. Electrically heated utilization equipment shall conform with either item (a) or (b).
a. The heater shall not exceed 80 percent of the ignition temperature in degrees Celsius of the gas or vapor involved on any surface that is exposed to the gas or vapor when continuously energized at the maximum rated ambient

temperature. If a temperature controller is not provided, these conditions shall apply when the heater is operated at 120 percent of rated voltage.

Exception No. 1: For motor-mounted anticondensation space heaters, see Section 501-8(b).

Exception No. 2: A current-limiting device is applied to the circuit serving the heater that will limit the current in the heater to a value less than that required to raise the heater surface temperature to 80 percent of the ignition temperature.

b. The heater shall be identified ~~approved~~ [14-169, 14-170] for Class I, Division 1 locations.
Exception: Electrical resistance heat tracing identified ~~approved~~ [14-171, 14-172] for Class I, Division 2 locations.

(2) Motors. Motors of motor-driven utilization equipment shall comply with Section 501-8(b).

(3) Switches, Circuit Breakers, and Fuses. Switches, circuit breakers, and fuses shall comply with Section 501-6(b).

501-11. Flexible Cords, Class I, Divisions 1 and 2
A flexible cord shall be permitted for connection between portable lighting equipment or other portable utilization equipment and the fixed portion of their supply circuit. Flexible cord shall also be permitted for that portion of the circuit where the fixed wiring methods of Section 501-4(a) cannot provide the necessary degree of movement for fixed and mobile electrical utilization equipment, in an industrial establishment where conditions of maintenance and engineering supervision ensure that only qualified persons will install and service the installation, and the flexible cord is protected by location or by a suitable guard from damage. The length of the flexible cord shall be continuous. Where flexible cords are used, the cords shall be as follows:
1. Of a type listed ~~approved~~ [14-174,14-175] for extra-hard usage;
2. Contain, in addition to the conductors of the circuit, a grounding conductor complying with Section 400-23;
3. Connected to terminals or to supply conductors in an approved manner;
4. Be supported by clamps or by other suitable means in such a manner that there will be no tension on the terminal connections; and
5. Be provided with suitable seals where the flexible cord enters boxes, fittings, or enclosures of the explosionproof type.
Exception: As provided in Sections 501-3(b)(6) and 501-4(b).
Electric submersible pumps with means for removal without entering the wet-pit shall be considered portable utilization equipment. The extension of the flexible cord within a suitable raceway between the wet-pit and the power source shall be permitted.
Electric mixers intended for travel into and out of open-type mixing tanks or vats shall be considered portable utilization equipment.
FPN: See Section 501-13 for flexible cords exposed to liquids having a deleterious effect on the conductor insulation.

501-12. Receptacles and Attachment Plugs, Class I, Divisions 1 and 2
Receptacles and attachment plugs shall be of the type providing for connection to the grounding conductor of a flexible cord and shall be identified ~~approved~~ [14-178,14-179] for the location.
Exception: As provided in Section 501-3(b)(6).

501-13. Conductor Insulation, Class I, Divisions 1 and 2
Where condensed vapors or liquids may collect on, or come in contact with, the insulation on conductors, such insulation shall be of a type approved for use under such conditions; or the insulation shall be protected by a sheath of lead or by other approved means.

501-14. Signaling, Alarm, Remote-Control, and Communications Systems
(a) Class I, Division 1. In Class I, Division 1 locations, all apparatus and equipment of signaling, alarm, remote-control, and communications systems, regardless of voltage, shall be identified ~~approved~~ [14-184,14-185] for Class I, Division 1 locations, and all wiring shall comply with Sections 501-4(a) and 501-5(a) and (c).

(b) Class I, Division 2. In Class I, Division 2 locations, signaling, alarm, remote-control, and communications systems shall comply with the following.
(1) Contacts. Switches, circuit breakers, and make-and-break contacts of pushbuttons, relays, alarm bells, and horns shall have enclosures identified ~~approved~~ [14-186,14-187] for Class I, Division 1 locations in accordance with Section 501-3(a).
Exception: General-purpose enclosures shall be permitted if current-interrupting contacts are one of the following:
a. Immersed in oil, or
b. Enclosed within a chamber hermetically sealed against the entrance of gases or vapors, or
c. In nonincendive circuits, or
d. Part of a listed nonincendive component
(2) Resistors and Similar Equipment. Resistors, resistance devices, thermionic tubes, rectifiers, and similar equipment shall comply with Section 501-3(b)(2).
(3) Protectors. Enclosures shall be provided for lightning protective devices and for fuses. Such enclosures shall be permitted to be of the general-purpose type.
(4) Wiring and Sealing. All wiring shall comply with Sections 501-4(b) and 501-5(b) and (c).

501-15. Live Parts, Class I, Divisions 1 and 2
There shall be no exposed live parts.

501-16. Grounding, Class I, Divisions 1 and 2
Wiring and equipment in Class I, Division 1 and 2 locations shall be grounded as specified in Article 250 and with the following additional requirements.
(a) Bonding. The locknut-bushing and double-locknut types of contacts shall not be depended on for bonding purposes, but bonding jumpers with proper fittings or other approved means of bonding shall be used. Such means of bonding shall apply to all intervening raceways, fittings, boxes, enclosures, etc., between Class I locations and the point of grounding for service equipment or point of grounding of a separately derived system.
Exception: The specific bonding means shall only be required to the nearest point where the grounded circuit conductor and the grounding electrode are connected together on the line side of the building or structure disconnecting means as specified in Sections 250-32(a), (b), and (c), provided the branch-circuit overcurrent protection is located on the load side of the disconnecting means.
FPN: See Section 250-100 for additional bonding requirements in hazardous (classified) locations.

(b) Types of Equipment Grounding Conductors. Where flexible metal conduit or liquidtight flexible metal conduit is used as permitted in Section 501-4(b) and is to be relied on to complete a sole equipment grounding path, it shall be installed with internal or external bonding jumpers in parallel with each conduit and complying with Section 250-102.
Exception: In Class I, Division 2 locations, the bonding jumper shall be permitted to be deleted where all the following conditions are met.
a. Listed liquidtight flexible metal conduit 6 ft (1.83 m) or less in length, with fittings listed for grounding, is used.
b. Overcurrent protection in the circuit is limited to 10 amperes or less.
c. The load is not a power utilization load.

501-17. Surge Protection
(a) Class I, Division 1. Surge arresters, including their installation and connection, shall comply with Article 280. The surge arresters and capacitors shall be installed in enclosures identified ~~approved~~ [14-194, 14-195] for Class I, Division 1 locations. Surge-protective capacitors shall be of a type designed for specific duty.

(b) Class I, Division 2. Surge arresters shall be nonarcing, such as metal-oxide varistor (MOV), sealed type, and surge-protective capacitors shall be of a type designed for specific duty. Installation and connection shall comply with Article 280.
Enclosures shall be permitted to be of the general-purpose type.
Surge protection of types other than described above shall be installed in enclosures identified ~~approved~~ [14-196,14-197] for Class I, Division 1 locations.

501-18. Multiwire Branch Circuits
In a Class I, Division 1 location, a multiwire branch circuit shall not be permitted.
Exception: Where the disconnect device(s) for the circuit opens all ungrounded conductors of the multiwire circuit simultaneously.
SUBSTANTIATION: During the January 2000 ROP meeting, Code Making Panel 14 was challenged with a very difficult task due to the large number of proposals that required action, the technical content of the requested revisions, and the Technical Correlating Committee formatting changes. As a result, it was very difficult for the NEC staff assigned to Code Making Panel 14 to keep up with the actions taking place. This comment's intent is to clarify what took place and make necessary revisions.

PANEL ACTION: Accept in Principle.
Revise Article 501 to read as follows:

ARTICLE 501 -- Class I Locations
[Comment 14-48]

501-1 General. The general rules of this Code shall apply to the electric wiring and equipment in locations classified as Class I in Section 500-~~7~~5. Equipment listed and marked in accordance with Section 505-9(c)(2) for use in Class I, Zone 0, 1, or 2 locations shall be permitted in Class I, Division 2 locations for the same gas and with a suitable temperature ~~rating~~class~~ification~~.

Exception: As modified by this article.

501-2 Transformers and Capacitors

(a) Class I, Division 1. In Class I, Division 1 locations, transformers and capacitors shall comply with the following.

(1) Containing Liquid that Will Burn. Transformers and capacitors containing a liquid that will burn shall be installed only in ~~approved~~vaults that comply with Sections 450-41 through 450-48, and, in addition,

(a) There shall be no door or other communicating opening between the vault and the Division 1 location, and
(b) Ample ventilation shall be provided for the continuous removal of flammable gases or vapors, and
(c) Vent openings or ducts shall lead to a safe location outside of buildings, and
(d) Vent ducts and openings shall be of sufficient area to relieve explosion pressures within the vault, and all portions of vent ducts within the buildings shall be of reinforced concrete construction.

(2) Not Containing Liquid that Will Burn. Transformers and capacitors that do not contain a liquid that will burn shall be installed in vaults complying with (a)(1) or be approved for Class I locations.

(b) Class I, Division 2. In Class I, Division 2 locations, transformers and capacitors shall comply with Sections 450-21 through 450-27.

501-3 Meters, Instruments, and Relays

(a) Class I, Division 1. In Class I, Division 1 locations, meters, instruments, and relays, including kilowatt-hour meters, instrument transformers, resistors, rectifiers, and thermionic tubes, shall be provided with enclosures identified ~~approved~~ for Class I, Division 1 locations. Enclosures ~~approved~~for Class I, Division 1 locations include explosionproof enclosures and purged and pressurized enclosures.

FPN: See Standard for Purged and Pressurized Enclosures for Electrical Equipment, NFPA 496-1998.

(b) Class I, Division 2. In Class I, Division 2 locations, meters, instruments, and relays shall comply with the following.

(1) Contacts. Switches, circuit breakers, and make-and-break contacts of pushbuttons, relays, alarm bells, and horns shall have enclosures identified ~~approved~~for Class I, Division 1 locations in accordance with Section 501-3(a).

Exception: General-purpose enclosures shall be permitted, if current-interrupting contacts are
a. Immersed in oil, or
b. Enclosed within a chamber that is hermetically sealed against the entrance of gases or vapors, or
c. In nonincendive circuits, or
d. Part of a listed nonincendive component.

(2) Resistors and Similar Equipment. Resistors, resistance devices, thermionic tubes, rectifiers, and similar equipment that are used in or in connection with meters, instruments, and relays shall comply with Section 501-3(a).

Exception: General-purpose–type enclosures shall be permitted if such equipment is without make-and-break or sliding contacts [other than as provided in (b)(1)] and if the maximum operating temperature of any exposed surface will not exceed 80 percent of the ignition temperature in degrees Celsius of the gas or vapor involved or has been tested and found incapable of igniting the gas or vapor. This exception shall not apply to thermionic tubes.

(3) Without Make-or-Break Contacts. Transformer windings, impedance coils, solenoids, and other windings that do not incorporate sliding or make-or-break contacts shall be provided with enclosures. General-purpose–type enclosures shall be permitted.

(4) General-Purpose Assemblies. Where an assembly is made up of components for which general-purpose enclosures are acceptable as provided in (b)(1), (b)(2), and (b)(3), a single general-purpose enclosure shall be acceptable for the assembly. Where such an assembly includes any of the equipment described in (b)(2), the maximum obtainable surface temperature of any component of the assembly shall be clearly and permanently indicated on the outside of the enclosure. Alternatively, ~~approved~~equipment shall be permitted to be marked to indicate the temperature ~~range~~class~~-~~ for which it is suitable, using the temperature class (T Code)~~identification numbers~~ of Table 500-8 (b)~~5(d)~~.

(5) Fuses. Where general-purpose enclosures are permitted in (b)(1), (b)(2), (b)(3), and (b)(4), fuses for overcurrent protection of instrument circuits not subject to overloading in normal use shall be permitted to be mounted in general-purpose enclosures if each such fuse is preceded by a switch complying with (b)(1).

(6) Connections. To facilitate replacements, process control instruments shall be permitted to be connected through flexible cord, attachment plug, and receptacle, provided the following:

1. A switch complying with (b)(1) is provided so that the attachment plug is not depended on to interrupt current; and
2. The current does not exceed 3 amperes at 120 volts, nominal; and
3. The power-supply cord does not exceed 900 mm (3 ft)~~(914 mm)~~, is of a type listed ~~approved~~ for extra-hard usage or for hard usage if protected by location, and is supplied through an attachment plug and receptacle of the locking and grounding type; and
4. Only necessary receptacles are provided; and
5. The receptacle carries a label warning against unplugging under load.

501-4. Wiring Methods. Wiring methods shall comply with (a) or (b).

~~(a)~~(b) Class I, Division 1.

(1) In Class I, Division 1 locations, the following wiring methods shall be permitted:

(a) Threaded rigid metal conduit or threaded steel intermediate metal conduit. Threaded joints shall be made up with at least five threads fully engaged.

Exception No. 1: Rigid nonmetallic conduit complying with Article 347 shall be permitted where encased in a concrete envelope a minimum of 50 mm (2 in.) ~~(50.8 mm)~~thick and provided with not less than 600 mm (24 in.) ~~(610 mm)~~ of cover measured from the top of the conduit to grade. The concrete encasement shall be permitted to be omitted where subject to the provisions of Section 511-4, Exception; 514-8, Exception No. 2; and Section 515-5(a). Threaded rigid metal conduit or threaded steel intermediate metal conduit shall be used for the last 600 mm (24 in.) ~~(610 mm)~~of the underground run to emergence or to the point of connection to the aboveground raceway. An equipment grounding conductor shall be included to provide for electrical continuity of the raceway system and for grounding of noncurrent-carrying metal parts.

(b) Type MI cable with termination fittings listed ~~approved~~ for the location. Type MI cable shall be installed and supported in a manner to avoid tensile stress at the termination fittings.
(c) In industrial establishments with restricted public access, where the conditions of maintenance and supervision ensure that only qualified persons will service the installation, Type MC-HL cable, listed for use in Class I, Division 1 locations, with a gas/vaportight continuous corrugated metallic sheath, an overall jacket of suitable polymeric material, separate grounding conductors in accordance with Section 250-122, and provided with termination fittings listed for the application.

FPN: See Sections 334-3 and 334-4 for restrictions on use of Type MC cable.

(d) In industrial establishments with restricted public access, where the conditions of maintenance and supervision ensure that only qualified persons will service the installation, Type ITC-HL cable, listed for use in Class I, Division 1 locations, with a gas/vaportight continuous corrugated metallic sheath, an overall jacket of suitable polymeric material and provided with termination fittings listed for the application.

(2) Where necessary to employ flexible connections, as at motor terminals, flexible fittings listed for Class I, Division 1 locations or flexible cord in accordance with the provisions of Section 501-11 shall be permitted.

(3) All boxes, fittings, and joints shall be approved ~~approved listed~~ for Class I, Division 1.

(b) Class I, Division 2.

(1) In Class I, Division 2 locations, the following wiring methods shall be permitted:

(a) All wiring methods permitted in ~~Article~~ 501-4(a).
(b) Threaded rigid metal conduit, threaded steel intermediate metal conduit,
(~~b~~c) Enclosed gasketed busways, enclosed gasketed wireways,
(~~c~~d) Type PLTC cable in accordance with the provisions of Article 725, or in cable tray systems. PLTC shall be installed in a manner to avoid tensile stress at the termination fittings.
(~~d~~e) Type ITC cable in cable trays, in raceways, supported by messenger wire, afforded mechanical protection and run as open wiring, or directly buried where the cable is listed for this use;
(~~e~~f) Type MI, MC, MV, or TC cable with ~~-~~termination fittings, or in cable tray systems and installed in a manner to avoid tensile stress at the termination fittings.

(2) Where provision must be made for limited flexibility, flexible metal fittings, flexible metal conduit with listed fittings, liquidtight flexible metal conduit with listed fittings, liquidtight flexible nonmetallic conduit with listed fittings, or flexible cord listed for extra-hard usage and provided with listed bushed fittings shall be used. An additional conductor for grounding shall be included in the flexible cord.

FPN: See Section 501-16(b) for grounding requirements where flexible conduit is used.

(3) Nonincendive field wiring shall be permitted using any of the wiring methods permitted for unclassified ~~nonhazardous~~locations.~~, including Chapter 7 and 8 wiring methods.~~ Nonincendive field wiring systems shall be installed in accordance with the control drawing(s). Simple apparatus, not shown on the control drawing, shall be permitted in a nonincendive field wiring circuit provided the simple apparatus does not interconnect the nonincendive field wiring circuit to any other circuit.

FPN: Simple apparatus is defined in Section 504-2.

Separate nonincendive field wiring circuits shall be:

(a) in separate cables, or
(b) in multiconductor cables where the conductors of each circuit are within a grounded metal shield, or
(c) in multiconductor cables where the conductors of each circuit have insulation with a minimum thickness of 0.25 mm (0.01 in).

(4) Boxes, fittings, and joints shall not be required to be explosionproof except as required by Sections 501-3(b)(1), 501-6(b)(1), and 501-14(b)(1).

501-5. Sealing and Drainage. Seals in conduit and cable systems shall comply with (a) through (f)~~. Sealing compound shall be of a type approved for the conditions and use~~ . Sealing compound shall be used in Type MI cable termination fittings to exclude moisture and other fluids from the cable insulation.

FPN No. 1: Seals are provided in conduit and cable systems to minimize the passage of gases and vapors and prevent the passage of flames from one portion of the electrical installation to another through the conduit. Such communication through Type MI cable is inherently prevented by construction of the cable. Unless specifically designed and tested for the purpose, conduit and cable seals are not intended to prevent the passage of liquids, gases, or vapors at a continuous pressure differential across the seal. Even at differences in pressure across the seal equivalent to a few inches of water, there may be a slow passage of gas or vapor through a seal, and through conductors passing through the seal. See Section 501-5(e)(2). Temperature extremes and highly corrosive liquids and vapors can affect the ability of seals to perform their intended function. See Section 501-5(c)(2).

FPN No. 2: Gas or vapor leakage and propagation of flames may occur through the interstices between the strands of standard stranded conductors larger than No. 2. Special conductor constructions, e.g., compacted strands or sealing of the individual strands, are means of reducing leakage and preventing the propagation of flames.

(a) Conduit Seals, Class I, Division 1. In Class I, Division 1 locations, conduit seals shall be located as follows.

(1) In each conduit entry into an explosionproof enclosure where either (a) the enclosure contains apparatus, such as switches, circuit breakers, fuses, relays, or resistors, that may produce arcs, sparks, or high temperatures that are considered to be an ignition source in normal operation, or ~~(b)~~(b) the entry is metric designator 53 (trade size 2) or larger ~~the entry is 2 in. size or larger~~ and the enclosure contains terminals, splices, or taps. For the purposes of this section high temperatures shall be considered to be any temperatures exceeding 80 percent of the autoignition temperature in degrees Celsius of the gas or vapor involved.

Exception to (a)(1)(a): Conduit entering an enclosure where such switches, circuit breakers, fuses, relays, or resistors are
a. Enclosed within a chamber hermetically sealed against the entrance of gases or vapors, or
b. Immersed in oil in accordance with Section 501-6(b)(1)(b), or
c. Enclosed within a factory-sealed explosionproof chamber located within the enclosure, identified ~~approved~~ for the location, and marked "factory sealed" or equivalent, unless the enclosure entry is metric designator 53 (trade size 2) ~~, unless the enclosure entry is 2 in. size~~ or larger.

Factory-sealed enclosures shall not be considered to serve as a seal for another adjacent explosionproof enclosure that is required to have a conduit seal. Conduit seals shall be installed within 450 mm (18 in.) ~~(457 mm)~~from the enclosure. Only explosionproof unions, couplings, reducers, elbows, capped elbows, and conduit bodies similar to L, T, and Cross types that are not larger than the trade size of the conduit shall be permitted between the sealing fitting and the explosionproof enclosure.

d. In nonincendive circuits.

(2) In each conduit entry into a pressurized enclosure where the conduit is not pressurized as part of the protection system. Conduit seals shall be installed within 450 mm (18 in.) ~~(457 mm)~~ from the pressurized enclosure.

FPN No. 1: Installing the seal as close as possible to the enclosure will reduce problems with purging the dead airspace in the pressurized conduit.

FPN No. 2: For further information, see Standard for Purged and Pressurized Enclosures for Electrical Equipment, NFPA 496-1998.

(3) Where two or more explosionproof enclosures for which conduit seals are required under (a)(1) are connected by nipples or by runs of conduit not more than 900 mm (36 in.) ~~(914 mm)~~ long, a single conduit seal in each such nipple connection or run of conduit shall be considered sufficient if located not more than 450 mm (18 in.) ~~(457 mm)~~from either enclosure.

(4) In each conduit run leaving a Class I, Division 1 location. The sealing fitting shall be permitted on either side of the boundary of such location within 3.05m (10 ft.) ~~10 ft (3.05 m)~~of the boundary, and

shall be designed and installed so to minimize the amount of gas or vapor within the Division 1 portion of the conduit from being communicated to the conduit beyond the seal. Except for listed ~~approved~~explosionproof reducers at the conduit seal, there shall be no union, coupling, box, or fitting between the conduit seal and the point at which the conduit leaves the Division 1 location.

Exception No. 1: Metal conduit containing no unions, couplings, boxes, or fittings that passes completely through a Class I, Division 1 location with no fittings less than 300 mm (12 in.) ~~(305 mm)~~ beyond each boundary shall not require a conduit seal if the termination points of the unbroken conduit are in unclassified locations.

Exception No. 2: For underground conduit installed in accordance with Section 300-5 where the boundary is beneath the ground, the sealing fitting shall be permitted to be installed after the conduit leaves the ground, but there shall be no union, coupling, box, or fitting, other than listed explosionproof reducers at the sealing fitting, in the conduit between the sealing fitting and the point at which the conduit leaves the ground.

(b) Conduit Seals, Class I, Division 2. In Class I, Division 2 locations, conduit seals shall be located as follows.

(1) For connections to enclosures that are required to be explosionproof, a conduit seal shall be provided in accordance with (a)(1)(a) and (a)(3). All portions of the conduit run or nipple between the seal and such enclosure shall comply with Section 501-4(a).

(2) In each conduit run passing from a Class I, Division 2 location into an unclassified location. The sealing fitting shall be permitted on either side of the boundary of such location within 3.05m (10 ft.)~~10 ft (3.05 m)~~ of the boundary, and shall be designed and installed so to minimize the amount of gas or vapor within the Division 2 portion of the conduit from being communicated to the conduit beyond the seal. Rigid metal conduit or threaded steel intermediate metal conduit shall be used between the sealing fitting and the point at which the conduit leaves the Division 2 location, and a threaded connection shall be used at the sealing fitting. Except for listed ~~approved~~explosionproof reducers at the conduit seal, there shall be no union, coupling, box, or fitting between the conduit seal and the point at which the conduit leaves the Division 2 location.

Exception No. 1: Metal conduit containing no unions, couplings, boxes or fittings that passes completely through a Class I, Division 2 location with no fittings less than 300 mm (12 in.) ~~(305 mm)~~ beyond each boundary shall not be required to be sealed if the termination points of the unbroken conduit are in unclassified locations.

Exception No. 2: Conduit systems terminating at an unclassified location where a wiring method transition is made to cable tray, cablebus, ventilated busway, Type MI cable, or open wiring shall not be required to be sealed where passing from the Class I, Division 2 location into the unclassified location. The unclassified location shall be outdoors or, if the conduit system is all in one room, it shall be permitted to be indoors. The conduits shall not terminate at an enclosure containing an ignition source in normal operation.

Exception No. 3: Conduit systems passing from an enclosure or room that is unclassified as a result of pressurization into a Class I, Division 2 location shall not require a seal at the boundary.

FPN: For further information, refer to Standard for Purged and Pressurized Enclosures for Electrical Equipment, NFPA 496-1998.

Exception No. 4: Segments of aboveground conduit systems shall not be required to be sealed where passing from a Class I, Division 2 location into an unclassified location if the following conditions are met:
a. No part of the conduit system segment passes through a Class I, Division I location where the conduit contains unions, couplings, boxes, or fittings within 300 mm (12 in.) ~~(305 mm)~~ of the Class I, Division 1 location; and
b. The conduit system segment is located entirely in outdoor locations; and
c. The conduit system segment is not directly connected to canned pumps, process or service connections for flow, pressure, or analysis measurement, etc., that depend on a single compression seal, diaphragm, or tube to prevent flammable or combustible fluids from entering the conduit system; and
d. The conduit system segment contains only threaded metal conduit, unions, couplings, conduit bodies, and fittings in the unclassified location; and
e. The conduit system segment is sealed at its entry to each enclosure or fitting housing terminals, splices, or taps in Class I, Division 2 locations.

(c) Class I, Divisions 1 and 2. Where required, seals in Class I, Division 1 and 2 locations shall comply with the following.

(1) Fittings. Enclosures for connections or equipment shall be provided with an ~~approved~~integral means for sealing, or sealing fittings listed ~~approved~~for the ~~Class I~~location~~s~~ shall be used. ~~Sealing fittings shall be accessible.~~Sealing fittings shall be listed for use with one or more specific compounds and shall be accessible.

(2) Compound. The compound shall provide a ~~Sealing compound shall be approved and shall provide a~~ seal against passage of gas or vapors through the seal fitting, shall not be affected by the surrounding atmosphere or liquids, and shall not have a melting point of less than 93ºC (200ºF).

(3) Thickness of Compounds. In a completed seal, the minimum thickness of the sealing compound shall not be less than the trade size of the sealing fitting and, in no case, less than 16 mm (5/8 in.)~~(16 mm)~~.

Exception: Listed cable sealing fittings shall not be required to have a minimum thickness equal to the trade size of the fitting.

(4) Splices and Taps. Splices and taps shall not be made in fittings intended only for sealing with compound, nor shall other fittings in which splices or taps are made be filled with compound.

(5) Assemblies. In an assembly where equipment that may produce arcs, sparks, or high temperatures is located in a compartment separate from the compartment containing splices or taps, and an integral seal is provided where conductors pass from one compartment to the other, the entire assembly shall be identified ~~approved~~ for the ~~Class I~~location~~s~~. Seals in conduit connections to the compartment containing splices or taps shall be provided in Class I, Division 1 locations where required by (a)(1)(b).

(6) Conductor Fill. The cross-sectional area of the conductors permitted in a seal shall not exceed 25 percent of the cross-sectional area of a rigid metal conduit of the same trade size unless it is specifically identified ~~approved~~ for a higher percentage of fill.

(d) Cable Seals, Class I, Division 1. In Class I, Division 1 locations, cable seals shall be located as follows.

(1) Cable shall be sealed at all terminations. The sealing fitting shall comply with (c). Multiconductor Type MC-HL cables with a gas/vaportight continuous corrugated aluminum sheath and an overall jacket of suitable polymeric material shall be sealed with a~~n~~ listed ~~approved~~ fitting after removing the jacket and any other covering so that the sealing compound will surround each individual insulated conductor in such a manner as to minimize the passage of gases and vapors.

Exception: Shielded cables and twisted pair cables shall not require the removal of the shielding material or separation of the twisted pairs provided the termination is by an approved means to minimize the entrance of gases or vapors and prevent propagation of flame into the cable core.

(2) Cables in conduit with a gas/vaportight continuous sheath capable of transmitting gases or vapors through the cable core shall be sealed in the Division 1 location after removing the jacket and any other coverings so that the sealing compound will surround each individual insulated conductor and the outer jacket.

Exception: Multiconductor cables with a gas/vaportight continuous sheath capable of transmitting gases or vapors through the cable core shall be permitted to be considered as a single conductor by sealing the cable in the conduit within 450 mm (18 in.) ~~(457 mm)~~ of the enclosure and the cable end within the enclosure by an approved means to minimize the entrance of gases or vapors and prevent the propagation of flame into the cable core, or by other approved methods. For shielded cables and twisted pair cables, it shall not be required to remove the shielding material or

separate the twisted pair.

(3) Each multiconductor cable in conduit shall be considered as a single conductor if the cable is incapable of transmitting gases or vapors through the cable core. These cables shall be sealed in accordance with (a).

(e) Cable Seals, Class I, Division 2. In Class I, Division 2 locations, cable seals shall be located as follows.

(1) Cables entering enclosures that are required to be explosionproof ~~approved for Class I locations~~ shall be sealed at the point of entrance. The sealing fitting shall comply with (b)(1). Multiconductor cables with a gas/vaportight continuous sheath capable of transmitting gases or vapors through the cable core shall be sealed in a~~n~~ listed ~~approved~~ fitting in the Division 2 location after removing the jacket and any other coverings so that the sealing compound will surround each individual insulated conductor in such a manner as to minimize the passage of gases and vapors. Multiconductor cables in conduit shall be sealed as described in (d).

Exception No. 1: Cables passing from an enclosure or room that is unclassified as a result of Type Z pressurization into a Class I, Division 2 location shall not require a seal at the boundary.

Exception No. 2: Shielded cables and twisted pair cables shall not require the removal of the shielding material or separation of the twisted pairs provided the termination is by an approved means to minimize the entrance of gases or vapors and prevent propagation of flame into the cable core.

(2) Cables with a gas/vaportight continuous sheath and that will not transmit gases or vapors through the cable core in excess of the quantity permitted for seal fittings shall not be required to be sealed except as required in (e)(1). The minimum length of such cable run shall not be less than that length that limits gas or vapor flow through the cable core to the rate permitted for seal fittings [200 cm3/hour (~~1~~0.007 ft3/hour) ~~(198 cm3/hour)~~of air at a pressure of 1500 pascals (6 in. of water)~~(1493 pascals)~~].

FPN No. 1: See Outlet Boxes and Fittings for Use in Hazardous (Classified) Locations, ANSI/UL 886-1994.

FPN No. 2: The cable core does not include the interstices of the conductor strands.

(3) Cables with a gas/vaportight continuous sheath capable of transmitting gases or vapors through the cable core shall not be required to be sealed except as required in (e)(1), unless the cable is attached to process equipment or devices that may cause a pressure in excess of 1500 pascals (6 in. of water) ~~(1493 pascals)~~to be exerted at a cable end, in which case a seal, barrier, or other means shall be provided to prevent migration of flammables into an unclassified location ~~area~~.

Exception: Cables with an unbroken gas/vaportight continuous sheath shall be permitted to pass through a Class I, Division 2 location without seals.

(4) Cables that do not have gas/vaportight continuous sheath shall be sealed at the boundary of the Division 2 and unclassified location in such a manner as to minimize the passage of gases or vapors into an unclassified location.

FPN: The sheath mentioned in (d) and (e) may be either metal or a nonmetallic material.

(f) Drainage.

(1) Control Equipment. Where there is a probability that liquid or other condensed vapor may be trapped within enclosures for control equipment or at any point in the raceway system, approved means shall be provided to prevent accumulation or to permit periodic draining of such liquid or condensed vapor.

(2) Motors and Generators. Where the authority having jurisdiction judges that there is a probability that liquid or condensed vapor may accumulate within motors or generators, joints and conduit systems shall be arranged to minimize entrance of liquid. If means to prevent accumulation or to permit periodic draining are judged necessary, such means shall be provided at the time of manufacture and shall be considered an integral part of the machine.

(3) Canned Pumps, Process or Service Connections, etc. For canned pumps, process or service connections for flow, pressure, or analysis measurement, etc., that depend on a single compression seal, diaphragm, or tube to prevent flammable or combustible fluids from entering the electrical raceway or cable system capable of transmitting fluids, an additional approved seal, barrier, or other means shall be provided to prevent the flammable or combustible fluid from entering the raceway or cable system capable of transmitting fluids beyond the additional devices or means, if the primary seal fails. The additional approved seal or barrier and the interconnecting enclosure shall meet the temperature and pressure conditions to which they will be subjected upon failure of the primary seal, unless other approved means are provided to accomplish the purpose above. Drains, vents, or other devices shall be provided so that primary seal leakage will be obvious.

FPN: See also the fine print notes to Section 501-5.

501-6. Switches, Circuit Breakers, Motor Controllers, and Fuses

(a) Class I, Division 1. In Class I, Division 1 locations, switches, circuit breakers, motor controllers, and fuses, including pushbuttons, relays, and similar devices, shall be provided with enclosures, and the enclosure in each case, together with the enclosed apparatus, shall be identified ~~-~~as a complete assembly for use in Class I locations.

(b) Class I, Division 2. Switches, circuit breakers, motor controllers, and fuses in Class I, Division 2 locations shall comply with the following:

(1) Type Required. Circuit breakers, motor controllers, and switches intended to interrupt current in the normal performance of the function for which they are installed shall be provided with enclosures identified ~~approved~~for Class I, Division 1 locations in accordance with Section 501-3(a), unless general-purpose enclosures are provided and

(a) The interruption of current occurs within a chamber hermetically sealed against the entrance of gases and vapors, or
(b) The current make-and-break contacts are oil-immersed and of the general-purpose type having a 50 mm (2 ~~-~~in.) ~~(50.8 mm)~~ minimum immersion for power contacts and a 25 mm (1 ~~-~~in.) ~~(25.4 mm)~~ minimum immersion for control contacts, or
(c) The interruption of current occurs within a factory-sealed explosionproof chamber ~~approved for the location~~, or
(d) The device is a solid state, switching control without contacts, where the surface temperature does not exceed 80 percent of the ignition temperature in degrees Celsius of the gas or vapor involved.

(2) Isolating Switches. Fused or unfused disconnect and isolating switches for transformers or capacitor banks that are not intended to interrupt current in the normal performance of the function for which they are installed shall be permitted to be installed in general-purpose enclosures.

(3) Fuses. For the protection of motors, appliances, and lamps, other than as provided in (b)(4), standard plug or cartridge fuses shall be permitted, provided they are placed within enclosures identified ~~approved~~ for the location; or fuses shall be permitted if they are within general-purpose enclosures, and if they are of a type in which the operating element is immersed in oil or other approved liquid, or the operating element is enclosed within a chamber hermetically sealed against the entrance of gases and vapors, or the fuse is a nonindicating, filled, current-limiting type.

(4) Fuses Internal to Luminaires (Lighting Fixtures). ~~Approved~~ Listed ~~c~~cartridge fuses shall be permitted as supplementary protection within luminaires (lighting fixtures).

501-7. Control Transformers and Resistors. Transformers, impedance coils, and resistors used as, or in conjunction with, control equipment for motors, generators, and appliances shall comply with (a) and (b).

(a) Class I, Division 1. In Class I, Division 1 locations, transformers, impedance coils, and resistors, together with any switching mechanism associated with them, shall be provided with enclosures identified ~~approved~~for Class I, Division 1 locations in accordance with Section 501-3(a).

(b) Class I, Division 2. In Class I, Division 2 locations, control transformers and resistors shall comply with the following.

(1) Switching Mechanisms. Switching mechanisms used in conjunction with transformers, impedance coils, and resistors shall comply with Section 501-6(b).

(2) Coils and Windings. Enclosures for windings of transformers, solenoids, or impedance coils shall be permitted to be of the general-purpose type.

(3) Resistors. Resistors shall be provided with enclosures; and the assembly shall be identified ~~approved~~for Class I locations, unless resistance is nonvariable and maximum operating temperature, in degrees Celsius, will not exceed 80 percent of the ignition temperature of the gas or vapor involved, or has been tested and found incapable of igniting the gas or vapor.

501-8. Motors and Generators

(a) Class I, Division 1. In Class I, Division 1 locations, motors, generators, and other rotating electric machinery shall be as follows:

(1) Identified ~~Approved~~for Class I, Division 1 locations; or
(2) Of the totally enclosed type supplied with positive-pressure ventilation from a source of clean air with discharge to a safe area, so arranged to prevent energizing of the machine until ventilation has been established and the enclosure has been purged with at least 10 volumes of air, and also arranged to automatically de-energize the equipment when the air supply fails; or
(3) Of the totally enclosed inert gas-filled type supplied with a suitable reliable source of inert gas for pressuring the enclosure, with devices provided to ensure a positive pressure in the enclosure and arranged to automatically de-energize the equipment when the gas supply fails; or
(4) Of a type designed to be submerged in a liquid that is flammable only when vaporized and mixed with air, or in a gas or vapor at a pressure greater than atmospheric and that is flammable only when mixed with air; and the machine is arranged so to prevent energizing it until it has been purged with the liquid or gas to exclude air, and also arranged to automatically de-energize the equipment when the supply of liquid or gas or vapor fails or the pressure is reduced to atmospheric.

Totally enclosed motors of Types (2) or (3) shall have no external surface with an operating temperature in degrees Celsius in excess of 80 percent of the ignition temperature of the gas or vapor involved. Appropriate devices shall be provided to detect and automatically de-energize the motor or provide an adequate alarm if there is any increase in temperature of the motor beyond designed limits. Auxiliary equipment shall be of a type identified ~~approved~~ for the location in which it is installed.

FPN: See ASTM Test Procedure, D 2155-69.

(b) Class I, Division 2. In Class I, Division 2 locations, motors, generators, and other rotating electric machinery in which are employed sliding contacts, centrifugal or other types of switching mechanism (including motor overcurrent, overloading, and overtemperature devices), or integral resistance devices, either while starting or while running, shall be identified ~~approved~~ for Class I, Division 1 locations, unless such sliding contacts, switching mechanisms, and resistance devices are provided with enclosures identified~~approved~~ for Class I, Division 2 locations in accordance with Section 501-3(b). The exposed surface of space heaters used to prevent condensation of moisture during shutdown periods shall not exceed 80 percent of the ignition temperature in degrees Celsius of the gas or vapor involved when operated at rated voltage, and the maximum surface temperature [based on a 40ºC (104ºF) ambient] shall be permanently marked on a visible nameplate mounted on the motor. Otherwise, space heaters shall be identified ~~approved~~ for Class I, Division 2 locations. In Class I, Division 2 locations, the installation of open or nonexplosionproof enclosed motors, such as squirrel-cage induction motors without brushes, switching mechanisms, or similar arc-producing devices that are not identified for use in a Class I, Division 2 location, shall be permitted.

FPN No. 1: It is important to consider the temperature of internal and external surfaces that may be exposed to the flammable atmosphere.

FPN No. 2: It is important to consider the risk of ignition due to currents arcing across discontinuities and overheating of parts in multisection enclosures of large motors and generators. Such motors and generators may need equipotential bonding jumpers across joints in the enclosure and from enclosure to ground. Where the presence of ignitible gases or vapors is suspected, clean-air purging may be needed immediately prior to and during start-up periods.

501-9. Luminaires (Lighting Fixtures). Luminaires ~~L~~(lighting fixtures) shall comply with (a) or (b).

(a) Class I, Division 1. In Class I, Division 1 locations, luminaires (lighting fixtures) shall comply with the following.

(1) ~~Approved~~ Luminaires (Lighting Fixtures). Each luminaire (lighting fixture) shall be identified ~~approved~~ as a complete assembly for the Class I, Division 1 location and shall be clearly marked to indicate the maximum wattage of lamps for which it is identified~~approved~~. Luminaires (lighting fixtures) intended for portable use shall be specifically listed ~~identified approved~~ as a complete assembly for that use.

(2) Physical Damage. Each luminaire (lighting fixture) shall be protected against physical damage by a suitable guard or by location.

(3) Pendant Luminaires (Lighting Fixtures). Pendant luminaires (lighting fixtures) shall be suspended by and supplied through threaded rigid metal conduit stems or threaded steel intermediate conduit stems, and threaded joints shall be provided with set-screws or other effective means to prevent loosening. For stems longer than 300 mm (12 in.) ~~(305 mm)~~, permanent and effective bracing against lateral displacement shall be provided at a level not more than 300 mm (12 in.) ~~(305 mm)~~above the lower end of the stem, or flexibility in the form of a fitting or flexible connector identified ~~approved~~for the Class I, Division 1 location shall be provided not more than 300 mm (12 in.) ~~(305 mm)~~from the point of attachment to the supporting box or fitting.

(4) Supports. Boxes, box assemblies, or fittings used for the support of luminaires (lighting fixtures) shall be identified~~-~~ for Class I locations.

(b) Class I, Division 2. In Class I, Division 2 locations, luminaires (lighting fixtures) shall comply with the following:

(1) Portable Lighting Equipment. Portable lighting equipment shall comply with (a)(1).

Exception: Where portable lighting equipment are mounted on movable stands and are connected by flexible cords, as covered in Section 501-11, they shall be permitted, where mounted in any position, if they conform to Section 501-9(b)(2).

(2) Fixed Luminaires (Lighting Fixtures). Luminaires (lighting fixtures) for fixed lighting shall be protected from physical damage by suitable guards or by location. Where there is danger that falling sparks or hot metal from lamps or fixtures might ignite localized concentrations of flammable vapors or gases, suitable enclosures or other effective protective means shall be provided. Where lamps are of a size or type that may, under normal operating conditions, reach surface temperatures exceeding 80 percent of the ignition temperature in degrees Celsius of the gas or vapor involved, fixtures shall comply with (a)(1) or shall be of a type that has been tested in order to determine the marked operating temperature or temperature class~~range~~ (T Code).

(3) Pendant Luminaires (Lighting Fixtures). Pendant luminaires (lighting fixtures) shall be suspended by threaded rigid metal conduit stems, threaded steel intermediate metal conduit stems, or by other approved means. For rigid stems longer than 300 mm (12 in.)~~(305 mm)~~, permanent and effective bracing against lateral displacement shall be provided at a level not more than 300 mm (12 in.) ~~(305 mm)~~above the lower end of the stem, or flexibility in the form of an identified ~~-~~fitting or flexible connector shall be provided not more than 300 mm (12 in.) ~~(305 mm)~~ from the point of attachment to the supporting box or fitting.

(4) Switches. Switches that are a part of an assembled fixture or of an individual lampholder shall comply with Section 501-6(b)(1).

(5) Starting Equipment. Starting and control equipment for electric-discharge lamps shall comply with Section 501-7(b).

Exception: A thermal protector potted into a thermally protected fluorescent lamp ballast if the luminaire (lighting fixture) is identified ~~approved~~ for the location~~s of this class and division~~.

501-10. Utilization Equipment

(a) Class I, Division 1. In Class I, Division 1 locations, all utilization equipment shall be identified ~~approved~~ for Class I, Division 1 locations.

(b) Class I, Division 2. In Class I, Division 2 locations, all utilization equipment shall comply with the following.

(1) Heaters. Electrically heated utilization equipment shall conform with either item (a) or (b).

(a) The heater shall not exceed 80 percent of the ignition temperature in degrees Celsius of the gas or vapor involved on any surface that is exposed to the gas or vapor when continuously energized at the maximum rated ambient temperature. If a temperature controller is not provided, these conditions shall apply when the heater is operated at 120 percent of rated voltage.

Exception No. 1: For motor-mounted anticondensation space heaters, see Section 501-8(b).

Exception No. 2: A current-limiting device is applied to the circuit serving the heater that will limit the current in the heater to a value less than that required to raise the heater surface temperature to 80 percent of the ignition temperature.

(b) The heater shall be identified ~~approved~~ for Class I, Division 1 locations.

Exception: Electrical resistance heat tracing identified ~~approved~~ for Class I, Division 2 locations.

(2) Motors. Motors of motor-driven utilization equipment shall comply with Section 501-8(b).

(3) Switches, Circuit Breakers, and Fuses. Switches, circuit breakers, and fuses shall comply with Section 501-6(b).

501-11. Flexible Cords, Class I, Divisions 1 and 2. A flexible cord shall be permitted for connection between portable lighting equipment or other portable utilization equipment and the fixed portion of their supply circuit. Flexible cord shall also be permitted for that portion of the circuit where the fixed wiring methods of Section 501-4(a) cannot provide the necessary degree of movement for fixed and mobile electrical utilization equipment, in an industrial establishment where conditions of maintenance and engineering supervision ensure that only qualified persons will install and service the installation, and the flexible cord is protected by location or by a suitable guard from damage. The length of the flexible cord shall be continuous. Where flexible cords are used, the cords shall be as follows:

(1) Of a type listed ~~approved~~for extra-hard usage;

(2) Contain, in addition to the conductors of the circuit, a grounding conductor complying with Section 400-23;

(3) Connected to terminals or to supply conductors in an approved manner;

(4) Be supported by clamps or by other suitable means in such a manner that there will be no tension on the terminal connections; and

(5) Be provided with suitable seals where the flexible cord enters boxes, fittings, or enclosures of the explosionproof type.

Exception: As provided in Sections 501-3(b)(6) and 501-4(b).

Electric submersible pumps with means for removal without entering the wet-pit shall be considered portable utilization equipment. The extension of the flexible cord within a suitable raceway between the wet-pit and the power source shall be permitted. Electric mixers intended for travel into and out of open-type mixing tanks or vats shall be considered portable utilization equipment.

FPN: See Section 501-13 for flexible cords exposed to liquids having a deleterious effect on the conductor insulation.

501-12. Receptacles and Attachment Plugs, Class I, Divisions 1 and 2. Receptacles and attachment plugs shall be of the type providing for connection to the grounding conductor of a flexible cord and shall be identified ~~approved~~ for the location.

Exception: As provided in Section 501-3(b)(6).

501-13. Conductor Insulation, Class I, Divisions 1 and 2. Where condensed vapors or liquids may collect on, or come in contact with, the insulation on conductors, such insulation shall be of a type identified ~~approved~~ for use under such conditions; or the insulation shall be protected by a sheath of lead or by other approved means.

501-14. Signaling, Alarm, Remote-Control, and Communications Systems

(a) Class I, Division 1. In Class I, Division 1 locations, all apparatus and equipment of signaling, alarm, remote-control, and communications systems, regardless of voltage, shall be identified ~~-~~ for Class I, Division 1 locations, and all wiring shall comply with Sections 501-4(a) and 501-5(a) and (c).

(b) Class I, Division 2. In Class I, Division 2 locations, signaling, alarm, remote-control, and communications systems shall comply with the following.

(1) Contacts. Switches, circuit breakers, and make-and-break contacts of pushbuttons,
relays, alarm bells, and horns shall have enclosures identified ~~approved~~ for Class I, Division 1 locations in accordance with Section 501-3(a).

Exception: General-purpose enclosures shall be permitted if current-interrupting contacts are one of the following:
a. Immersed in oil, or
b. Enclosed within a chamber hermetically sealed against the entrance of gases or vapors, or
c. In nonincendive circuits, or
d. Part of a listed nonincendive component

(2) Resistors and Similar Equipment. Resistors, resistance devices, thermionic tubes, rectifiers, and similar equipment shall comply with Section 501-3(b)(2).

(3) Protectors. Enclosures shall be provided for lightning protective devices and for fuses. Such enclosures shall be permitted to be of the general-purpose type.

(4) Wiring and Sealing. All wiring shall comply with Sections 501-4(b) and 501-5(b) and (c).

501-15. Live Parts, Class I, Divisions 1 and 2. There shall be no exposed live parts.

501-16. Grounding, Class I, Divisions 1 and 2. Wiring and equipment in Class I, Division 1 and 2 locations shall be grounded as specified in Article 250 and with the following additional requirements.

(a) Bonding. The locknut-bushing and double-locknut types of contacts shall not be depended on for bonding purposes, but bonding jumpers with proper fittings or other approved means of bonding shall be used. Such means of bonding shall apply to all intervening raceways, fittings, boxes, enclosures, etc., between Class I locations and the point of grounding for service equipment or point of grounding of a separately derived system.

Exception: The specific bonding means shall only be required to the nearest point where the grounded circuit conductor and the grounding electrode are connected together on the line side of the building or structure disconnecting means as specified in Sections 250-32(a), (b), and (c), provided the branch-circuit overcurrent protection is located on the load side of the disconnecting means.

FPN: See Section 250-100 for additional bonding requirements in hazardous (classified) locations.

(b) Types of Equipment Grounding Conductors. Where flexible metal conduit or liquidtight flexible metal conduit is used as permitted in Section 501-4(b) and is to be relied on to complete a sole equipment grounding path, it shall be installed with internal or

external bonding jumpers in parallel with each conduit and complying with Section 250-102.

Exception: In Class I, Division 2 locations, the bonding jumper shall be permitted to be deleted where all the following conditions are met.
a. Listed liquidtight flexible metal conduit 1.8 m (6 ft) ~~(1.83 m)~~ or less in length, with fittings listed for grounding, is used.
b. Overcurrent protection in the circuit is limited to 10 amperes or less.
c. The load is not a power utilization load.

501-17. Surge Protection

(a) Class I, Division 1. Surge arresters, including their installation and connection, shall comply with Article 280. The surge arresters and capacitors shall be installed in enclosures identified ~~approved~~ for Class I, Division 1 locations. Surge-protective capacitors shall be of a type designed for specific duty.

(b) Class I, Division 2. Surge arresters shall be nonarcing, such as metal-oxide varistor (MOV), sealed type, and surge-protective capacitors shall be of a type designed for specific duty. Installation and connection shall comply with Article 280. Enclosures shall be permitted to be of the general-purpose type. Surge protection of types other than described above shall be installed in enclosures identified ~~approved~~ for Class I, Division 1 locations.

501-18. Multiwire Branch Circuits. In a Class I, Division 1 location, a multiwire branch circuit shall not be permitted.

Exception: Where the disconnect device(s) for the circuit opens all ungrounded conductors of the multiwire circuit simultaneously.

PANEL STATEMENT: The action on this Comment, which is a rewrite of Article 501, incorporates all applicable actions on Comments 14-43 through 14-84.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
COMMENT ON AFFIRMATIVE:
BRIESCH: Since Article 505 was rewritten by Comment 14-126, the reference in the second sentence of Section 501-1 is no longer correct. It should be revised from 505-10 to 505-9. Section 505-10 does not exist in the new Article 505.
In Section 501-5(d)(1) in the third sentence, change "aluminum" to "metallic." Section 501-4(a)(1)(c) was revised to change "aluminum" to "Metallic" by the Panel's acceptance of Proposals 14-59a and 14-78. It appears that this correlation was overlooked in Section 501-5(d)(1). As currently worded, one could conclude that only aluminum sheathed cables need to be sealed in this manner and not cables with other types of sheaths. This is not the intent of the requirement and would result in cables with other than aluminum sheaths being improperly sealed.
COOK: I agree with the reorganization of Article 501 and most of the actions taken by the panel. I do not support action on comment 14-81 and expressed the negative on that comment. I also believe the following editorial changes should be made:
• Section 501-4(a)(1)(a), the Exception No. 1: should be changed to Exception:
• Section 501-4(a)(1)(a) Exception, the reference to Section 515-5(a) has been relocated to Section 515-8(a) in the reorganization of Article 515.
I also believe that when proposal 14-78 was accepted during the ROP to change proposed Section 501-4(a)(1)(c) from "...corrugated aluminum sheath, ..." to "...corrugated metallic sheath,...", that a correlation change should have been made to proposed Section 501-5(d)(1). This action was not discussed by the panel, however, I do not believe that the intent is to only require cable seals on aluminum MC-HL cable and not require them on metal sheathed cables. I also do not believe that this was the intent of the submitter of proposal 14-78.
• In Section 501-1, revise "505-10" to "505-9". (correlation)
• In Section 501-5(a)(1) Exception, change "Exception to 501-5(a)(1)(a)" to "Exception to 501-5(a)(1)". (editorial)
GOODMAN: Panel members Mr. Briesch, Mr. Cook, Mr. Jagunich, and O'Meara have identified typographical, syntax, cross-reference, and other minor errors in the section. I support the correction of these items as "editorial" by the Panel Chair and NFPA staff, provided no changes are made to the content of the effected sections.
JAGUNICH: 1) The exception to 501-5(a)(1) is stated as an Exception to (a)(1)(a) which is a section that does not exist.
2) The Exception itself is so worded that it is not clear what the exception allows. Add words at the very beginning of the exception, as follows:
"Exception to (a)(1): Seals are not required for conduit entering ...".
OMEARA: Recommend making editorial changes (corrections to this rewrite of Article 501 as follows:
501-1: In the second sentence change, "...in accordance with Section 505-10..." to "... in accordance with Section 505-9...".

(Log #1492)

14- 49 - (501-1): Reject
SUBMITTER: David N. Bishop, David N. Bishop, Consultant
COMMENT ON PROPOSAL NO: 14-60
RECOMMENDATION: Reconsider 14-60, but change as follows:
Revise third bullet: Combustible gas detector equipment is installed in accordance with ~~industrial practices~~ API RP500.
Delete last bullet: ~~appropriate alarms with ventilation or interlocks are provided~~
SUBSTANTIATION: This practice has been followed by the offshore oil and gas industry for approximately 30 years with no known incidents as a result. It is allowed by Dept. of Interior, Minerals management Service federal regulations. The last "bullet" is unnecessary as it is addressed by API RP 500. Similar wording should be included in Article 505, but referencing API RP505 vs. API RP500.
PANEL ACTION: Reject.
PANEL STATEMENT: The NEC Style Manual does not allow reference of other standards in mandatory text. The submitter is referred to the action on Comment 14-51.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #1951)

14- 50 - (501-1): Accept in Principle
SUBMITTER: David Wechsler, Union Carbide Corp.
COMMENT ON PROPOSAL NO: 14-60
RECOMMENDATION: It is understood that the NEC is primarily an electrical installation document; however, the NEC does include installation techniques such as purged and pressurized areas and ventilating pipes. The use of gas detection equipment as a method of protection in hazardous (classified) locations is related to such techniques. Gas detection equipment is capable of providing indication of the presence of combustible gases prior to reaching lower explosive limits and is capable of providing alarms with ventilation or interlocks. The original proposed text has been modified to incorporate a more defined set of electrical installation criteria to allow for proper process evaluation, but introduces no new concepts or requirements that have not had prior public exposure.
Following the Exception under 501-1 add the following text:
Permanently mounted combustible gas detection equipment may be used as a means for reducing the need for special electrical equipment provided that the location is continuously monitored by combustible gas detection equipment that is:
• listed and marked both as performance tested and as suitable for use in hazardous (classified) locations,
• installed in accordance with industrial practices,
• used in industrial establishments where the conditions of maintenance and supervision ensure that only qualified persons will service the installation,
• actuating ventilation equipment or other means designed to prevent the concentration of gas from reaching the lower explosive limit when the gas concentration reaches 20% of the lower explosive limit,
• automatically de-energizing the equipment being protected when the gas concentration reaches 40% of the lower explosive limit,
• automatically de-energizing the equipment being protected upon failure of the gas detection equipment; and
• providing an adequate number of installed sensors to ensure the sensing of combustible gas in the protected area covers all areas where such gas might accumulate.
FPN No. 1: For suggested minimum performance specifications and guidance in the selection of gas detection equipment, see ISA S12.13.01, Performance Requirements, Combustible Gas Detectors.
FPN No. 2: For suggested installation, operation and maintenance guidance, see ISA RP12.13.02, Installation, Operation, and Maintenance of Combustible Gas Detection Instruments.
FPN No. 3: For guidance in the installation of gas detection equipment, see ANSI/API RP 500, Recommended Practice for Classification of Electrical Installations at Petroleum Facilities Classified as Class I, Division 1 and Division 2.

SUBSTANTIATION: Equipment necessary to be placed in hazardous (classified) locations which cannot meet specific hazardous location protection techniques currently requires purged/pressurized protection techniques. This is not always possible or desirable under all installation considerations. For many years gas detection equipment has been used as a method of protection in petroleum facilities in accordance with ANSI/API RP 500, Recommended Practice Classification of Electrical Installations at Petroleum Facilities Classified as Class I, Division 1 and Division 2 and within hazardous location facilities in Canada in accordance with the Canadian Electrical Code (CEC) with no reported incidents. Gas detection equipment is capable of providing indication of the presence of combustible gases prior to reaching lower explosive limits and is capable of providing alarms with ventilation or interlocks. To ensure proper gas detection equipment functionality under such critical conditions, an existing ISA standard S12.13.01, Performance Requirements, Combustible Gas Detectors, will provide guidance on gas detection equipment performance requirements and an existing ISA recommended practice RP 12.13.02, Installation, Operation, and Maintenance of Combustible Gas Detection Instruments, will provide user guidance on the proper use of gas detection equipment. In conclusion, this additional method of protection should be considered for equipment which cannot meet the proper hazardous (classified) location requirements, but is necessary to be installed in such locations.

PANEL ACTION: Accept in Principle.
See action on Comment 14-51.

PANEL STATEMENT: The action on Comment 14-51 satisfies the intent of the submitter.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NEGATIVE: 1

EXPLANATION OF NEGATIVE:
COOK: See my Explanation of Negative on Comment 14-51.

(Log #2326)

14- 51 - (501-1): Accept in Principle

Note: The Technical Correlating Committee directs that the definition in 500-2 read: "Combustible Gas Detection System. A protection technique utilizing stationary gas detectors in industrial establishments." to remove the mandatory requirements from the definition. The Technical Correlating Committee further directs that the Panel Action on 500-7(K) be revised to read as follows to correct the style manual violation in the text:

"(K) Combustible Gas Detection System. A combustible gas detection system shall be permitted as a means of protection in industrial establishments with restricted public access and where the conditions of maintenance and supervision ensure that only qualified persons will service the installation. Gas detection equipment shall be listed for detection of the specific gas or vapor to be encountered. Where such a system is installed, equipment specified in (1), (2), or (3) shall be permitted.

(1) Inadequate Ventilation. In a Class I, Division 1 location that is so classified due to inadequate ventilation, electrical equipment suitable for Class I, Division 2 locations shall be permitted.

(2) Interior of a Building. In a building located in, or with an opening into, a Class I, Division 2 location where the interior does not contain a source of flammable gas or vapor, electrical equipment for unclassified locations shall be permitted.

(3) Interior of a Control Panel. In the interior of a control panel containing instrumentation utilizing or measuring flammable liquids, gases or vapors, electrical equipment suitable for Class I, Division 2 locations shall be permitted.

FPN No. 1: For further information, see ANSI/ISA-12.13.01, Performance Requirements, Combustible Gas Detectors.

FPN No. 2: For further information, see ANSI/API RP 500, Recommended Practice for Classification of Locations for Electrical Installations at Petroleum Facilities Classified as Class I, Division 1 or Division 2.

FPN No. 3: For further information, see ISA-RP12.13.02, Installation, Operation, and Maintenance of Combustible Gas Detection Instruments."

SUBMITTER: Jon Miller, Detector Electronics Corp.

COMMENT ON PROPOSAL NO: 14-60

RECOMMENDATION: The action of the panel to reject this proposal would eliminate a beneficial electrical installation practice that could be used in place of a purged and pressurized protection technique. The proposed wording has been developed based upon the purged and pressurized enclosure Fine Print Note (FPN) in Article 501 of the NEC with additional text for electrical installation guidance. The use of gas detection equipment as a method of protection in hazardous (classified) locations has equivalent process evaluation and installation requirement complexity to that of purged and pressurized enclosures. It is recommended that further consideration be given to gas detection equipment as a method of protection in hazardous (classified) locations.

The initial proposed wording is as follows:

501-1. General

The general rules of this Code shall apply to the electric wiring and equipment in locations classified as Class I in Section 500-7.

Equipment listed and marked in accordance with Section 505-10 for use in Class I, Zone 0, 1, or 2 locations shall be permitted in Class I, Division 2 locations for the same gas and with a suitable temperature rating.

Exception: As modified by this article.

Permanently mounted combustible gas detection equipment may be used as a means for reducing the need for special electrical equipment when:

- combustible gas detection equipment is listed and marked both as performance tested and as suitable for use in hazardous (classified) locations,
- combustible gas detection equipment is installed in accordance with industrial practices,
- used in industrial establishments where the conditions of maintenance and supervision ensure that only qualified persons will service the installation, and
- appropriate alarms with ventilation or interlocks are provided.

FPN 1: For suggested minimum performance specifications and guidance in the selection of gas detection equipment, see ISA S12.13.01, Performance Requirements, Combustible Gas Detectors.

FPN 2: For suggested installation, operation and maintenance guidance, see ISA RP12.13.02, Installation, Operation, and Maintenance of Combustible Gas Detection Instruments.

FPN 3: For guidance in the installation of gas detection equipment, see ANSI/API RP 500, Recommended Practice for Classification of Electrical Installations at Petroleum Facilities Classified as Class I, Division 1 and Division 2.

SUBSTANTIATION: Equipment necessary to be placed in hazardous (classified) locations that cannot meet specific hazardous location protection techniques currently requires a purged and pressurized enclosure protection method. This is not always possible or desirable under all installation considerations. For many years gas detection equipment has been used as a method of protection in petroleum facilities in accordance with ANSI/API RP 500, Recommended Practice for Classification of Electrical Installations at Petroleum Facilities Classified as Class I, Division 1 and Division 2 and within hazardous location facilities in Canada in accordance with the Canadian Electrical Code (CEC) with no reported incidents. Gas detection equipment is capable of providing indication of the presence of combustible gases prior to reaching lower explosive limits and is capable of providing alarms with ventilation or interlocks. To ensure proper gas detection equipment functionality under such critical conditions, an existing ISA standard S12.13.01, Performance Requirements, Combustible Gas Detectors, will provide guidance on gas detection equipment performance requirements and an existing ISA Recommended Practice RP12.12.02, Installation, Operation, and Maintenance of Combustible Gas Detection Instruments, will provide user guidance on the proper use of gas detection equipment. These documents offer an equivalent level of complexity to that of the ANSI/NFPA 496 purged and pressurized enclosure practices. In conclusion, this additional method of protection should be considered for equipment that cannot meet the proper hazardous (classified) location requirements, but is necessary to be installed in such locations.

PANEL ACTION: Accept in Principle.
Add the following new definition to 500-2:

"Combustible Gas Detection System. A protection technique utilizing stationary gas detectors in industrial establishments which under specific conditions permits the use of equipment suitable for Class I, Division 2 locations to be used in a Class I, Division 1 location or the use of equipment suitable for unclassified locations to be used in a Class I, Division 2 locations."

Add the following new Paragraph (k) to 500-7: "(k) Combustible Gas Detection System. A Combustible gas detection system incorporating combustible gas detectors used in industrial establishments with restricted public access, where the conditions of maintenance and supervision ensure that only qualified persons will service the installation, is a protection technique permitted under the following conditions:

1) In a Class I, Division 1 location that is so classified due to inadequate ventilation, electrical equipment suitable for Class I, Division 2 locations shall be permitted.

2) In a building located in, or with an opening into, a Class I, Division 2 location where the interior does not contain a source of flammable gas or vapor, electrical equipment for unclassified locations shall be permitted.

3) In the interior of a control panel containing instrumentation utilizing or measuring flammable liquids, gases or vapors, electrical equipment suitable for Class I, Division 2 locations shall be permitted.

Gas detection equipment shall be listed for detection of the specific gas or vapor to be encountered.

FPN: For further information, see ANSI/ISA-12.13.01, Performance Requirements, Combustible Gas Detectors.

Use of this technique for each of the applications above includes adherence to established industrial practices and requirements.

FPN No. 1: For further information, see ANSI/API RP 500, Recommended Practice for Classification of Locations for Electrical Installations at Petroleum Facilities Classified as Class I, Division 1 or Division 2."

FPN No. 2: For further information, see ISA-RP12.13.02, Installation, Operation, and Maintenance of Combustible Gas Detection Instruments."

Renumber existing (k) to (l).

PANEL STATEMENT: The Panel agrees to applying gas detection systems in industrial establishments and selected uses. This is in keeping with long-standing practices of existing industry standards.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:

AFFIRMATIVE: 13

NEGATIVE: 1

EXPLANATION OF NEGATIVE:

COOK: The International Association of Electrical Inspectors supports any technology that results in safe electrical systems. We believe that a combustible gas detection system could be effectively used as a protection technique in Class I locations where knowledgeable designers, installers, and users have access to and apply all applicable industry standards. We do not however, support the text as proposed. We do not believe that the text provides specific requirements that our members would be able to enforce. It is recognized that providing all the information required to ensure safe application would be difficult and possibly outside the scope of the NEC. Inspectors, many of whom work for government agencies, would have difficulty converting the referenced or any other recommended practices into mandatory requirements. Without the ability to enforce all the provisions of the referenced documents, installations that would otherwise be safe, could be very dangerous. It is believed that authorities having jurisdiction (AHJ's) currently have the flexibility to accept this technology and do so using Section 500-4(i) Other Protection Techniques, of the 1999 NEC, where adequate supporting
information is made available and it can be demonstrated that the technology will be properly applied.

COMMENT ON AFFIRMATIVE:

ALEXANDER: This affirmative comment is being attached to the initial ballot in order to permit my Code-Making Panel 14 colleagues to respond to it, as they feel appropriate. I am documenting some items here for design and enforcement reference. Hopefully, they will also appear in the 2002 NEC Handbook.

During the discussion on Comments 14-51 and 14-155, it was the consensus of Code-Making Panel 14 that a "Combustible Gas Detection System" does not actually alter the area classification - it simply permits using reduced installation/protection methods under certain very specific conditions.

Code-Making Panel 14 also agreed that, while gas detection systems have been used successfully in those specific conditions, they were not currently a specifically recognized protection method in either Section 500-7 or 505-8 and Code-Making Panel 14 wanted to validate those installations that are consistent with the new text of section 500-7(k) or 505-8(i).

The new definitions in Sections 500-2 and 505-2 are not in conflict with the above, but I do not believe that it is immediately apparent that the electrical area classification is not actually altered.

Since the protection technique will be limited to the specific conditions noted in Sections 500-7(k) or 505-8(i), I do not believe that this is a problem at the moment; however, Comments 14-51 and 14-155 actually desired a more generalized permitted use of gas detection systems. While Code-Making Panel 14 was open to the concept, we felt that the guidance proposed was insufficient.

I suggested that the submitter might wish to contact the NFPA and propose a committee project to develop a standard for gas detection systems similar to NFPA 496.

GOODMAN: Panel member Mr. Alexander provided an Affirmative Comment with the initial ballot as both a means to solicit response from other panel members and to provide additional information "documenting some items for design and enforcement references." While the opportunity to respond is appreciated, I do not believe that this comment section is the appropriate forum to set design and enforcement references nor is it correct to identify panel consensus which were never reached during the panel meeting.

During the discussions and panel actions on Comments 14-51 and 14-155, several points of view were discussed at some length regarding the area classification of the locations in which gas detection systems were employed. While cases for both changing and not changing the classification of the location were presented, there was no Panel 14 voting or consensus achieved as to whether or not the use of gas detection equipment permitted/required the change of the area classification of the location. It is noted that the new section on gas detection closely follows API RP 500 which has included the use of gas detection equipment in the petroleum industry for many years. API RP 500 uses the words "designated" and "considered" when reducing the area classification based on the use of combustible gas detection equipment. The area classification drawings, therefore, typically show the classification as designated after employing the combustible gas detection equipment.

Without a consensus of Panel 14 regarding this issue, inclusion into the 2002 NEC Handbook or the use of the comment as a design or enforcement reference would be misleading and should not be made.

(Log #2277)

14- 52 - (501-3(a)): Accept in Principle

SUBMITTER: Larry E. Fuhrman, City of Titusville

COMMENT ON PROPOSAL NO: 14-63 and 14-65

RECOMMENDATION: Revise text as follows:

(a) In Class I, Division I, locations, meters, instrument transformers, resistors, rectifiers, and thermonic tubes, shall be provided with enclosures ~~approved~~ "listed" for Class I, Division I locations.

SUBSTANTIATION: Panel Action on other similar proposals was to accept the change from approved to "listed". Enclosures for Class I, Division I, are readily available and a non listed enclosure should not be approved by the Authority Having Jurisdiction. This action would make it clear to the installer and the Authority Having Jurisdiction that it is the Panel's intent to require listed equipment in Class I, Division I areas. See 501-3(b)(1).

PANEL ACTION: Accept in Principle.

In the first sentence of 501-3(a), change the word "approved" to "identified".

PANEL STATEMENT: The word "identified" is more appropriate.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:

AFFIRMATIVE: 14

(Log #145)

14- 53 - (501-4): Accept

SUBMITTER: Technical Correlating Committee National Electrical Code

COMMENT ON PROPOSAL NO: 14-73

RECOMMENDATION: The Technical Correlating Committee directs that the Panel clarify the Panel Action on this Proposal. The Panel's stated action is to revise 501-4 as shown in Proposal 14-318a which is a complete rewrite of Article 505, not Article 501. This action will be considered by the Panel as a Public Comment. It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 16 for information, with respect to Code-Making Panel 16's Panel Action on Proposal 16-319. Code-Making Panel 14 shall retain jurisdiction regarding types of wiring methods permitted in hazardous locations.

SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.

PANEL ACTION: Accept.

PANEL STATEMENT: The panel accepts the recommendation of the Technical Correlating Committee to clarify that the reference is to Proposal 14-59a instead of Proposal 14-318a.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:

AFFIRMATIVE: 14

(Log #485)

14- 54 - (501-4): Accept

SUBMITTER: William T. Fiske, Intertek Testing Services

COMMENT ON PROPOSAL NO: 14-73

RECOMMENDATION: Panel action should be upheld.

SUBSTANTIATION: Mr. Lawrence's comment in the ROP is not germane. CMP 16 is not concerned with classified locations.

PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #2278)

14- 55 - (501-4(3)): Reject
Note: See Technical Correlating Committee action on Comment 14-51.
SUBMITTER: Larry E. Fuhrman, City of Titusville
COMMENT ON PROPOSAL NO: 14-59a
RECOMMENDATION: Revise text as follows:
(3) All boxes fittings and joints shall be ~~approved~~ "listed" for Class I, Division I.
SUBSTANTIATION: Panel Action on all equipment utilized in Class 1, Division 1, locations consistently Accepted in Part proposals changed the word approved to "listed". This comment, if accepted, would keep the consistency of the requirements for Class 1, Division 1.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel believes that "approved" is the appropriate term for this application.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #478)

14- 56 - (501-4(a)(1)): Reject
SUBMITTER: William T. Fiske, Intertek Testing Services
COMMENT ON PROPOSAL NO: 14-76
RECOMMENDATION: The proposal should be accepted, thus reversing panel action.
SUBSTANTIATION: We believe that the panel statement in the ROP is erroneous. The submitter has, in fact, substantiated that going to 3.5 threads engaged does not significantly increase the risk of fire or explosion.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel reaffirms its position of requiring five threads fully engaged.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #893)

14- 57 - (501-4(a)(1)): Reject
SUBMITTER: William G. Lawrence, Jr., S. Yarmouth, MA
COMMENT ON PROPOSAL NO: 14-76
RECOMMENDATION: Proposal 14-76 should be accepted as proposed.
Consideration should also be given to the location of the requirement. As the minimum thread engagement is applicable to more than just conduit, a better location would be the "general" requirements section [500-8(d)] of Article 500 in a similar manner to the requirement presented in Article 505 [505.9(D) of the preprint]. The requirement, be it 3.5 or 5, should be located in similar sections of the articles.
SUBSTANTIATION: Research work conducted by the Electrical Equipment Certification Service (EECS/BASEEFA/MECS) in the United Kingdom has concluded that 2.3 hand-tight tapered threads will not transmit an explosion. The 2.3 threads represents at least 150 percent safety factor on the proposed 3.5 minimum thread wrench-tight engagement. The conclusions of the research work are provided and demonstrate that the integrity of the installation is not compromised.
Note: Supporting material is available for review at NFPA Headquarters.
PANEL ACTION: Reject.
PANEL STATEMENT: While the information provided indicates that the reduced number of thread engagements proposed may not contribute to additional flame transmission, the panel believes that there are advantages to requiring an engagement of five threads.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
LAWRENCE: Comment 14-57 should have been accepted. The panel's rejection of Proposal 14-76 was based on "a lack of technical substantiation". I believe that the submitter provided the requested technical substantiation with Comment 14-57. In the panel's rejection of Comment 14-57, they agreed that the provided test report confirmed that the proposed reduced thread engagement would not contribute to an increased risk of flame transmission, but there are other "advantages" to the current five thread minimum engagement. The panel was remiss in their failure to detail how any of those undefined "advantages" affected the rationale for their rejection, and, therefore, did not comply with 4-4.6.3 of the Regulations Governing Committee Projects.

(Log #2312)

14- 58 - (501-4(a)(1)): Reject
SUBMITTER: Joseph H. Kuczka, Killark
COMMENT ON PROPOSAL NO: 14-76
RECOMMENDATION: This proposal should be reconsidered. This new requirement should be permitted in the interest of international harmonization.
SUBSTANTIATION: If this change is considered to compromise safety, then the use of straight threaded couplings to HPT conduit should not be permitted.
PANEL ACTION: Reject.
PANEL STATEMENT: See Comments 14-56 and 14-57.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #486)

14- 59 - (501-4(b)): Accept
SUBMITTER: William T. Fiske, Intertek Testing Services
COMMENT ON PROPOSAL NO: 14-86
RECOMMENDATION: Accept in Part, rather than in Principle.
SUBSTANTIATION: The panel statement is correct, but the statement supports an action to Accept in Part.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #1018)

14- 60 - (501-4(b)): Accept in Principle
SUBMITTER: Nicholas Ludlam, Factory Mutual Research
COMMENT ON PROPOSAL NO: 14-83
RECOMMENDATION: Although I agree with the panel statement it does not go far enough. The addition of simple apparatus to a nonincendive field wiring circuit was not covered in the panel statement.
(b) Class I, Division 2. In Class I, Division 2 locations, threaded rigid metal conduit, threaded steel intermediate metal conduit, enclosed gasketed busways, enclosed gasketed wireways, or Type PLTC cable in accordance with the provisions of Article 725, or Type ITC cable in cable trays, in raceways, supported by messenger wire, or directly buried where the cable is listed for this use; Type MI, MC , MV or TC cable with approved termination fittings shall be the wiring method employed. Type ITC, PLTC, MI, MC, MV or TC cable shall be permitted to be installed in cable tray systems and shall be installed in a manner to avoid tensile stress at the termination fittings. Boxes, fittings, and joints shall not be required to be exposionproof except as required by Sections 501-3(b)(1), 501-6(b)(1), and 501-14(b)(1). Where provisions must be made for limited flexibility, as at motor terminals, flexible metal fittings, flexible metal conduit with approved fittings, liquidtight flexible metal conduit with approved.
FPN: See Section 501-16(b) for grounding requirements where flexible conduit is used.
Exception: Nonincendive field wiring shall be permitted using any of the methods suitable for wiring in unclassified locations.
Nonincendive field wiring systems shall be installed in accordance with the control drawing(s).
Exception: A simple apparatus that does not interconnect nonincendive field wiring circuits.
FPN: The control drawing identification is marked on the apparatus.
SUBSTANTIATION: The use of the control drawing for interconnecting nonincendive field wiring systems was accepted as part of the original panel action.

The addition of simple apparatus as defined in 504-2 was included in the original proposal but the substantiation omitted. This is similar to the situation for intrinsically safe circuits where 'simple apparatus' can be added to the circuit without the need to resubmit it for listing and without it being specifically covered by the control drawing. This part of the proposal brings the use of simple apparatus in nonincendive field wiring into line with intrinsically safe circuits. The proposed FPN does not include a requirement as stated by the panel, and is actually identical to the wording used in 504-10 of the existing code. The order of the Exception and FPN have been switched so that the exception does not appear to be part of the FPN.

PANEL ACTION: Accept in Principle.

In 501-4(b)(3) add a second sentence to read as follows:

"Simple apparatus, not shown on the control drawing, shall be permitted in a nonincendive field wiring circuit provided the simple apparatus does not interconnect the nonincendive field wiring circuit to any other circuit."

Also add a Fine Print Note to read as follows:

"FPN: Simple apparatus is defined in Section 504-2."

In addition, delete the words " the intrinsic safety of" from the definition of "simple apparatus" in 504-2.

PANEL STATEMENT: The panel action accomplishes the intent of the commenter by inserting the language into the new draft text.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:

AFFIRMATIVE: 14

(Log #2327)

14- 61 - (501-4(b)): Accept in Principle in Part

Note: The Technical Correlating Committee understands that the panel action should have been to add a new paragraph to 501-4(B)(3) as shown in the text of the rewrite for Article 501 in Comment 14-48.

SUBMITTER: Nicholas Ludlam, Factory Mutual Research

COMMENT ON PROPOSAL NO: 14-84

RECOMMENDATION: I think that the Panel misunderstood the problems associated with Nonincendive Field Wiring.

Separation of Nonincendive Field Wring Conductors

(a) From Nonincendive Field Wiring Conductors.

(1) Open Wiring. Conductors and cables of nonincendive field wiring circuits not in raceways or cable trays shall be separated at least 1.97 in. (50 mm) and secured from conductors and cables of any other circuits.

(2) In Raceways, Cable Trays and Cables. Conductors of nonincendive field wiring circuits shall not be placed in any raceway, cable tray, or cable with conductors of any other circuit.

Exception No. 1: Where conductors of nonincendive field wiring circuits are separated from conductors of incendive field wiring circuits by a distance of at least 1.97 in. (50 mm) and secured, or by a grounded metal partition or an approved insulating partition.

FPN: No. 20 gauge sheet metal partitions 0.0359 in. (912 mm) or thicker are generally considered acceptable.

Exception No. 2: Where either (1) all of the nonincendive field wiring circuit conductors or (2) all of the incendive field wiring circuit conductors are in grounded metal-sheathed or metal-clad cables where the sheathing or cladding is capable of carrying fault current to ground.

FPN: Cables meeting the requirements of Articles 330 and 334 are typical of those considered acceptable.

(3) Within Enclosures.

a. Conductors of nonincendive field wiring circuits shall be separated at least 1.97 in. (50 mm) from conductors of any incendive field wiring circuits, or as specified in Section 501-4(b)(a)(2).

b. All conductors shall be secured so that any conductor that might come loose from a terminal cannot come in contact with another terminal.

FPN No, 1: The use of separate wiring compartments for the nonincendive field wiring and incendive field wiring terminals is the preferred method of complying with this requirement.

FPN No. 2: Physical barriers such as grounded metal partitions or approved insulating partitions or approved restricted access wiring ducts separated from other such ducts by at least 3/4 in. (19 mm) can be used to help ensure the required separation of the wiring.

(b) From Different Nonincendive Field Wiring Circuit Conductors. Different nonincendive field wiring circuits shall be in separate cables or shall be separated from each other by one of the following means.

1. The conductors of each circuit are within a grounded metal shield.

2. The conductors of each circuit have insulation with a minimum thickness of 0.01 in. (254 mm).

Exception: Unless otherwise approved.

SUBSTANTIATION: It seems to me that there is a hole in the current NEC for nonincendive field wiring circuits. Class 2 Circuits [725-41 and Chapter 9 Tables 11(a) and 11(b)] are circuits in which the power is limited and which as a result can be considered not to be a source risk of fire or shock. By comparison with the tables in ISA 12.12:1994, any Associated Nonincendive Field Wiring output can also be categorized as a Class 2 power supply. Class 2 and 3 circuits can be wired in any cable suitable for ordinary locations [726-61 Exception 1]. In addition, faults are not considered to occur in the wiring for a Class 2 or Class 3 circuit, and Class 2 or Class 3 power sources shall not have the output connections paralleled or otherwise interconnected unless listed for such interconnection. But Nonincendive Field wiring circuits do consider the wiring opening, shorting and grounding. So if you have a Class 2 circuit which is also a Nonincendive field wiring circuit, then it can be run in ordinary location wiring with no regard to the mechanical protection afforded by the PLTC cable that are to be used for other Class 2 circuits in Hazardous Locations. (It can also be wired in any other type of cable provided it is adequately supported and protected from mechanical damage, and not just PLTC - 725-61(d)). Considering also that Class 2 circuits cannot be mixed with any other circuit [except Class 3 circuits 725-54(b)(2)] unless by the exception listed in 504b. But since there is no restriction on the number and type of circuits run in the same ordinary location cable, and because we have to consider the faults, we can have the situation where a shorting of the outputs of the circuit gives rise to a situation where the voltage and current in the cable no longer are nonignition capable, and are no longer Class 2 circuits.

Some examples of this are: A 4-20mA circuit will normally operate at 24V, and a maximum current under normal operation of 22mA. For nonincendive field wiring we have to consider the case where the outputs are shorted together. The maximum current is then dependent on the current limiting within the power source. This typically is 100mA but could be as much as 245mA. 24V 100mA is nonignition capable for Class I Groups A and B by comparison with the ignition curves in ISA 12.12:1994. But if you have a circuit such as a PLC then you will have more than one output. If there are more than 3 outputs for this PLC, and the outputs are all 24V 100mA then by comparison with the ignition curves in ISA 12.12:1994 this IS ignition capable for Class I Groups A and B. In order to make this Nonincendive Field Wiring a usable concept, we need to define a method of segregating circuits. The proposal was an attempt to correct this omission from the NEC. The added text is based on the current 504-30.

Note: Although this example is for Class I the same problems apply for Class II although the ignition energies permitted are higher.

PANEL ACTION: Accept in Principle in Part.

Add a new section to 501-4(b)(3) to read "Separate nonincendive field wiring circuits shall be:

a) in separate cables, or

b) in multiconductor cables where the conductors of each circuit are within a grounded metal shield, or

c) in multiconductor cables where the conductors of each circuit have insulation with a minimum thickness of 0.25 mm (0.01 in)."

PANEL STATEMENT: The panel action satisfies the intent of the submitter, with regard to separation of conductors in cables.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:

AFFIRMATIVE: 14

(Log #2194)

14- 62 - (501-4(b), Exception): Accept

SUBMITTER: Mark Goodman, BP (ARCO)

COMMENT ON PROPOSAL NO: 14-88

RECOMMENDATION: Replace "Ordinary" with "Unclassified".

SUBSTANTIATION: This comment is in support of the original proposal and substantiation.

This proposal should have been "Accept" and not "Accept in Principle". The Panel Action is contrary to the submitter's intent and justification. The correct term is "unclassified" and should be used consistently throughout the code sections to avoid confusion and misapplication.

PANEL ACTION: Accept.

PANEL STATEMENT: "Ordinary" was changed to "nonhazardous" at the ROP stage and is now changed to "unclassified".

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:

AFFIRMATIVE: 14

(Log #1400)

14- 63 - (501-4(b)(6) or Article 501-5 (b)): Reject
SUBMITTER: Kari Barrett, American Chemistry Council
COMMENT ON PROPOSAL NO: 14-73
RECOMMENDATION: New text.
Provide the following: (6) Types CATVP, CATVR, or CATV in cable trays, in raceways, supported by messenger wire, or otherwise adequately supported and mechanically protected by angles, struts, channels, or other mechanical means.
SUBSTANTIATION: To agree with the action taken by Panel 16 on proposal 16-319.
PANEL ACTION: Reject.
PANEL STATEMENT: The use of this cable is already permitted, provided that it is evaluated as nonincendive field wiring or part of an intrinsically safe system. Substantiation has not been provided for the general inclusion of this wiring method in Division 2 locations.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #2279)

14- 64 - (501-5(a)(4) Exception No. 2): Accept
SUBMITTER: Larry E. Fuhrman, City of Titusville
COMMENT ON PROPOSAL NO: 14-98
RECOMMENDATION: Revise text as follows:
Exception No. 2: For underground conduit installed in accordance with Section 300-5 where the boundary is beneath the ground, the sealing fitting shall be permitted to be installed after the conduit leaves the ground, but there shall be no union, coupling, box, or fitting, other than ~~approved~~"listed" explosion-proof reducers at the sealing fitting, in the conduit between the sealing fitting and the point at which the conduit leaves the ground.
SUBSTANTIATION: Panel's action was to accept this proposal, but previously accepting in principle 14-95 and 14-96 will make accepting wording for equipment requirement different. To be consistent with the other Panel's action to change the word approved to "listed", this proposal should have been "Accept in Principle" and/or "Accept in Part" with the change from approved to "listed", the submitter had no way of knowing other actions would modify text.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #487)

14- 65 - (501-5(b)): Accept
SUBMITTER: William T. Fiske, Intertek Testing Services
COMMENT ON PROPOSAL NO: 14-99
RECOMMENDATION: Panel should maintain its rejection of the proposal.
SUBSTANTIATION: The panel statement is correct.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #575)

14- 66 - (501-5(b) Exception No. 1): Reject
SUBMITTER: Joe Cox, Bluff City, TN
COMMENT ON PROPOSAL NO: 14-99
RECOMMENDATION: The panel should have accepted the proposal.
SUBSTANTIATION: Threaded metal conduit couplings should be allowed in a conduit run through a division 2 location between two unclassified locations without conduit seals where exiting the classified location.
Exception No. 2 under the same article allows conduit systems containing (unreadable word) fittings, couplings, unions, etc. to pass from division 2 to unclassified locations without a boundary seal, provided the conduit system is in one room and opens to another wiring system. This proposal is similar, in that it proposes that insufficient quantities of flammable materials will be introduced into the conduit and travel to an adjacent location creating a hazardous condition.
Threaded couplings are allowed in Division 1 conduit systems. If the panel believes these offer tight fitting threads sufficient to exhaust and cool exploding vapors, then the same tight fit should be adequate to prevent nonexploding vapor migration.
A Division 2 location is not expected to be hazardous but a very small percentage of the time. Does the panel expect that during this short time enough vapor will migrate through the coupling threads and create a hazardous condition in the unclassified location? Common sense should indicate otherwise.
PANEL ACTION: Reject.
PANEL STATEMENT: No new technical substantiation has been provided.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #484)

14- 67 - (501-6(b)(4)):
Note: The Technical Correlating Committee directs that the Panel Action on Comment 14-67 be reported as "Accept in Principle" to correlate with the Panel Action on Comment 14-68.
SUBMITTER: William T. Fiske, Intertek Testing Services
COMMENT ON PROPOSAL NO: 14-138
RECOMMENDATION: Revise as follows:
"(4) Fuses internal to Lighting Fixtures. ~~Approved~~ cartridge fuses...".
SUBSTANTIATION: Acceptance of this comment changes panel action from Reject to Accept in Part. substantiation for this comment is contained in the last sentence of Mr. Jagunich's comment on vote in the ROP.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #2280)

14- 68 - (501-6(b)(4)): Accept in Part
SUBMITTER: Larry E. Fuhrman, City of Titusville
COMMENT ON PROPOSAL NO: 14-138
RECOMMENDATION: Revise text as follows:
(4) Fuses internal to lighting fixtures. Approved "listed" cartridge fuses shall be permitted as supplementary protection within lighting fixtures.
SUBSTANTIATION: I agree with Member Mr. Cook. Over-current protection is fundamentally the most significant feature of the NEC to imply fuses could be utilized without a listing is completely contrary to the requirements found elsewhere in the NEC. See Section 90-7. How would a field test be performed and still have a working product in the case of a fuse?
PANEL ACTION: Accept in Part.
Revise to read "Listed cartridge fuses shall be permitted as supplementary protection within luminaires (lighting fixtures)."
PANEL STATEMENT: Listed fuses are readily available.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #146)

14- 69 - (501-9(a)(1)): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 14-153
RECOMMENDATION: It was the action of the Technical Correlating Committee that the Panel give consideration to also revising the title of 501-9(a)(1) to correlate with the Panel's actions on Proposals 14-237 and 14-238. This action will be considered by the Panel as a Public Comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #147)

14- 70 - (501-9(a)(1)): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 14-154
RECOMMENDATION: It was the action of the Technical Correlating Committee that the Panel give consideration to also revising the title of 501-9(a)(1) to correlate with the Panel's actions on Proposals 14-237 and 14-238. This action will be considered by the Panel as a Public Comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #488)

14- 71 - (501-9(a)(1)):
Note: The Technical Correlating Committee directs that this Comment be reported as "Accept in Principle in Part". The Technical Correlating Committee understands that the Panel Action on this Comment is modified by the Panel Action on Comment 14-48.
SUBMITTER: William T. Fiske, Intertek Testing Services
COMMENT ON PROPOSAL NO: 14-153
RECOMMENDATION: Revise as follows:
"Each fixture shall be ~~approved~~ listed as a complete assembly for the Class I, Division 1 location and shall be clearly marked to indicate the maximum wattage of lamps for which it is ~~approved~~ listed. Fixtures intended for portable use shall be specifically ~~approved~~ listed as a complete assembly for that use.
SUBSTANTIATION: Accepting this comment would change panel action from accept to accept in principle. It seems incongruous for the code to require some lighting equipment in ordinary locations to be listed, but require fixtures in classified locations only to be identified.
Listed lighting fixtures are readily available.
PANEL ACTION: Accept in Part.
Revise the second sentence to read: "Fixtures intended for portable use shall be specifically listed as a complete assembly for that use."
PANEL STATEMENT: The panel believes that the actions taken at the ROP stage were correct, except for portable fixtures, which should be listed for this application.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
COMMENT ON AFFIRMATIVE:
SABAN: Good job - portable fixtures "shall be listed" This I hope will now save lives.

(Log #489)

14- 72 - (501-9(b)(5)): Reject
SUBMITTER: William T. Fiske, Intertek Testing Services
COMMENT ON PROPOSAL NO: 14-165 and 14-166
RECOMMENDATION: Revise as follows:
"A thermal protector potted into a thermally protected fluorescent lamp ballast if the lighting fixture is ~~approved~~ listed for locations of this class and division.
SUBSTANTIATION: Listed thermally protected fixtures are readily available.
Mr. Jagunich's comment on Proposal No. 14-138 is relevant here, also. Accepting this proposal would change panel action from accept to accept in principle.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel maintains its position from the ROP.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #490)

14- 73 - (501-10(b)(1)b): Reject
SUBMITTER: William T. Fiske, Intertek Testing Services
COMMENT ON PROPOSAL NO: 14-169 and 14-170
RECOMMENDATION: Revise as follows:
"The heater shall be ~~approved~~ listed for Class I, Division 1 locations."
SUBSTANTIATION: Listed Class I, Division I heaters are readily available, and Section 501-10(b)(1)(a) contains criteria for approving heaters that are not listed.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel maintains its position from the ROP.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #148)

14- 74 - (501-11): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 14-173
RECOMMENDATION: It was the action of the Technical Correlating Committee that this Proposal be reconsidered and correlated with the action on Proposal 14-318a. The Technical Correlating Committee understands that there is no change to 501-11. This action will be considered by the Panel as a Public Comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
PANEL STATEMENT: The panel has reconsidered this issue and confirms that the text was intended for Article 505, not Article 501.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #149)

14- 75 - (501-13): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 14-181
RECOMMENDATION: It was the action of the Technical Correlating Committee that this Proposal be reconsidered and correlated with the action on Proposal 14-318a. The Technical Correlating Committee understands that there is no change to 501-13. This action will be considered by the Panel as a Public Comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
PANEL STATEMENT: The panel has reconsidered this issue and confirms that the text was intended for Article 505, not Article 501.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #491)

14- 76 - (501-13 and 501-18 (new)): Accept in Principle
SUBMITTER: William T. Fiske, Intertek Testing Services
COMMENT ON PROPOSAL NO: 14-180,14-181,14-182
RECOMMENDATION: Revise as follows:
"... such insulation shall be of a type ~~approved~~ identified for use under such conditions; or the insulation shall be protected by a sheath of lead or other approved means."
SUBSTANTIATION: Materials must either be "identified" or "listed." Means and methods must be "approved". Acceptance of this comment would change panel action on 14-180, 14-181 and 14-182 to accept in principle in part.
PANEL ACTION: Accept in Principle.
Change the word "approved" to "identified" in 501-13 and 505-18.
PANEL STATEMENT: The correct reference is 505-18, not 501-18.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

COMMENT ON AFFIRMATIVE:
OMEARA: The panel action was to accept the proposed wording as submitted. The reason for the "accept in principle" vote was due to the incorrect paragraph reference. The referenced paragraphs were "501-13 and 501-18 (New)" ... the correct paragraph references should have been "501-13 and 505-18".

(Log #610)

14- 77 - (501-13): Accept in Part
SUBMITTER: Glenn W. Zieseniss, Crown Point, IN
COMMENT ON PROPOSAL NO: 14-180
RECOMMENDATION: This proposal should be changed to "accept."
SUBSTANTIATION: Mr. Cook's Explanation of Negative is correct.
The Authorities Having Jurisdiction should not be put in the position of approving an insulation that could be identified for such use. Listed for the application by a NRTL organization would also be an alternate.
PANEL ACTION: Accept in Part.
Change the first occurence of "approved" to "identified", but not the second.
PANEL STATEMENT: Means and methods must be approved.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #2281)

14- 78 - (501-13): Accept in Part
SUBMITTER: Larry E. Fuhrman, City of Titusville
COMMENT ON PROPOSAL NO: 14-180
RECOMMENDATION: Revise text as follows:
Where condensed vapors or liquids may collect on or come in contact with, the insulation on conductors, such insulation shall be of a type "identified" for use under such conditions, or the insulation shall be protected by a sheath of lead or by other approved means.
SUBSTANTIATION: The insulation on a conductor certainly could not be field evaluated or tested. Flexible cords and other conductors used in this environment must be listed or identified. All conductors must be identified for their ability to perform in every environment. Field approval here is impossible. If an alternative method of protection is utilized, the approval of the alternate method could be field evaluated.
PANEL ACTION: Accept in Part.
Insert the word identified without the quotation marks.
PANEL STATEMENT: Editorial.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #492)

14- 79 - (501-14(b)(1)): Reject
SUBMITTER: William T. Fiske, Intertek Testing Services
COMMENT ON PROPOSAL NO: 14-186, 14-187
RECOMMENDATION: Revise as follows:
"... shall have enclosures ~~approved~~ listed for Class I, Division 1 locations...".
SUBSTANTIATION: Listed Class I, Division 1 enclosures are readily available.
Acceptance of this proposal would change panel action from accept to accept in principle.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel has concluded that the appropriate term is "identified".
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #150)

14- 80 - (501-15): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 14-188
RECOMMENDATION: It was the action of the Technical Correlating Committee that this Proposal be reconsidered and correlated with the action on Proposal 14-318a. The Technical Correlating Committee understands that there is no change to 501-15. This action will be considered by the Panel as a Public Comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
PANEL STATEMENT: The panel has reconsidered this issue and confirms that the text was intended for Article 505, not Article 501.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #686)

14- 81 - (501-16(a)): Reject
SUBMITTER: William E. Bickner, Stillwater, MN
COMMENT ON PROPOSAL NO: 14-191
RECOMMENDATION: This proposal should be accepted, either as is, or in principle.
SUBSTANTIATION: It is unclear whether the panel statement means the existing text is intended to be more stringent than Article 250 or the proposed changes would make it more stringent (the proposed change would bring this section into agreement with Article 250, which is not the case now). This part of this section could also simply state "Bonding shall comply with Section 250-100," and still have the same effect.
PANEL ACTION: Reject.
PANEL STATEMENT: The requirement in Article 501 is more rigorous than Article 250 requirements, and is so intended. The substantiation accompanying proposal 14-191 does not support a change to Article 501.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
COOK: I agree with submitter of comment and proposal. Current text in 501-16(a) addresses bonding where locknut-bushing and double-locknut contacts are encountered. Proposed text would also address wiring methods with single locknuts and shoulders of connectors, which I believe is the intent of the panel. I do not agree with the Panel Statement.

(Log #493)

14- 82 - (501-17(a)): Reject
SUBMITTER: William T. Fiske, Intertek Testing Services
COMMENT ON PROPOSAL NO: 14-194, 14-195
RECOMMENDATION: Revise as follows:
"... surge arrestors and capacitors shall be installed in enclosures ~~approved~~ listed for Class I, Division 1 locations...".
SUBSTANTIATION: Listed enclosures are readily available.
Acceptance of this comment would change panel action from accept to accept in principle.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel has concluded that the appropriate term is "identified".
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #494)

14- 83 - (501-17(b)): Reject
SUBMITTER: William T. Fiske, Intertek Testing Services
COMMENT ON PROPOSAL NO: 14-196, 14-197
RECOMMENDATION: Revise as follows:
"Surge protection of types other than those described above shall be installed in enclosures ~~approved~~ listed for Class I, Division 1 locations".
SUBSTANTIATION: Listed enclosures are readily available.
Acceptance of this comment would change panel action from accept to accept in principle.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel has concluded that the appropriate term is "identified".
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #151)

14- 84 - (501-18): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 14-198
RECOMMENDATION: It was the action of the Technical Correlating Committee that this Proposal be reconsidered and correlated with the action on Proposal 14-318a. The Technical Correlating Committee understands that there is no change to 501-18. This action will be considered by the Panel as a Public Comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
PANEL STATEMENT: The panel has reconsidered this issue and confirms that the text was intended for Article 505, not Article 501.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

ARTICLE 502 — CLASS II LOCATIONS

(Log #152)

14- 85 - (502): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 14-200
RECOMMENDATION: It was the action of the Technical Correlating Committee that this Proposal be reconsidered by the Panel. The issues of raceway trade size, extracts, and use of soft versus hard metrication were all studied in detail and resolutions were communicated to the Panel prior to the Panel Meeting. It should be noted that all of the other Code-Making Panels accepted the metrication directive. This action will be considered by the Panel as a Public Comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
The panel accepts the Technical Correlating Committee direction to reconsider Proposal 14-200. The original Proposal 14-200 is accepted in principle with the following changes(section numbers are 1999 NEC):
-Section 502-5(2), change "10 ft. (3.05m)" to "3.05m (10 ft.)".
-Also, in 502-9, change "0.021 in. (533 um)" to "0.53 mm (0.021 in)".
PANEL STATEMENT: Revised text provides more consistent use of metric units from Article 500 through 516 and consistency with CMP-8 action on conduit. CMP-14 recognizes that some changes involve extracted material, however changes were made based on Standards Council direction provided at their October 6, 2000 meeting.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #153)

14- 86 - (502): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 14-200a
RECOMMENDATION: The Technical Correlating Committee advises that Article Scope statements are the responsibility of the Technical Correlating Committee and the Technical Correlating Committee accepts the Panel Action. Further, it was the action of the Technical Correlating Committee that this Proposal be reconsidered by the Panel, with further consideration given to the comments expressed in the voting, specifically with respect to comments that the accepted Proposal does not accurately reflect what was agreed upon by the Panel. It is the understanding of the Technical Correlating Committee that this proposal is modified by Proposals 14-201, 14-202, 14-204, 14-205, 14-206, 14-207, 14-207a, 14-208, 14-209, 14-210, 14-210a, 14-211, 14-212, 14-213, 14-216, 14-219, 14-223,14-224, 14-227, 14-228, 14-231, 14-232, 14-233, 14-234, 14-235, 14-236, 14-239, 14-240, 14-243, 14-244, 14-245, 14-246, 14-249, 14-250, 14-251, 14-252, 14-255, 14-256, 14-257, 14-258, 14-259, 14-262, 14-263, 14-264, 14-265, 14-266, 14-267, 14-268, 14-269, 14-270, and 14-271. This action will be considered by the Panel as a Public Comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
PANEL STATEMENT: See action on Comment 14-90.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #1340)

14- 87 - (502): Accept in Principle
SUBMITTER: Mike O'Meara, A.P.S.
COMMENT ON PROPOSAL NO: 14-200a
RECOMMENDATION: Revise text as follows:
I agree with the panel action to accept this proposal but feel the proposal should not incorporate the panel action on Proposal 14-200.
SUBSTANTIATION: By rejecting proposal 14-200, the proposed wording in the Article 502 rewrite is not in compliance with the NFPA Manual of Style, Chapter 4.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See action on Comment 14-85.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #1397)

14- 88 - (502): Accept in Principle
SUBMITTER: Kari Barrett, American Chemistry Council
COMMENT ON PROPOSAL NO: 14-200a
RECOMMENDATION: Use the rewrite from Mr. Wechsler's ballot as stated in the balloting comments for this proposal, as the starting textural basis for all actions on public comments to Article 502 proposals.
SUBSTANTIATION: As stated under the balloting comments of the Panel 14 committee, due to the errors that the Committee felt existed with the presented rewrite texts, that are corrected by the rewrite addressed by the Wechsler submitted ballot, this "Wechsler" rewrite should be the starting textual basis for Panel actions.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See action on Comment 14-90.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #1948)

14- 89 - (502): Reject
SUBMITTER: David Wechsler, Union Carbide Corp.
COMMENT ON PROPOSAL NO: 14-200a
RECOMMENDATION: Replace "identified" with the prior NEC wording.
SUBSTANTIATION: The proposed definition for "identified" contains an important FPN that is fundamental to the entire reason for having this definition. This definition also differs from the Article 100 definition. It was the action of the Technical Correlating Committee that the Article 100 definition be used and that the FPN be eliminated since it contains permissive language that is not permitted by the NEC Style Manual. With the elimination of this definition, the text must be reverted to that of the current code.
PANEL ACTION: Reject.
PANEL STATEMENT: See action on Comment 14-90.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #2231)

14- 90 - (502): Accept in Principle
Note: The Technical Correlating Committee directs that "lighting fixtues" be changed to "luminaires (lighting fixtures)" in 502-11(a)(40.
SUBMITTER: James D. Cospolich, Waldemar S. Nelson & Co., Inc.
COMMENT ON PROPOSAL NO: 14-200a
RECOMMENDATION: Please see the following revised text which represents what I believe to be the correct wording that Code Making Panel 14 voted on and accepted during the January 2000 ROP meeting. The shaded wording represents what I consider to be revisions and corrections. Some of this shaded wording is very important for the technical accuracy and intent of the article.

ARTICLE 502 -- Class II Locations

502-1. General

The general rules of this Code shall apply to the electric wiring and equipment in locations classified as Class II locations in Section 500-5(c)~~500-8~~.

Exception: As modified by this article.

Dust-ignitionproof, as used in this article, shall mean enclosed in a manner that will exclude dusts and, where installed and protected in accordance with this Code, will not permit arcs, sparks, or heat otherwise generated or liberated inside of the enclosure to cause ignition of exterior accumulations or atmospheric suspensions of a specified dust on or in the vicinity of the enclosure.

FPN: For further information on dust-ignitionproof enclosures, see Type 9 enclosure in Enclosures for Electrical Equipment, ANSI/NEMA 250-1991, and Explosionproof and Dust-Ignitionproof Electrical Equipment for Hazardous (Classified) Locations, ANSI/UL 1203-1994.

Equipment installed in Class II locations shall be able to function at full rating without developing surface temperatures high enough to cause excessive dehydration or gradual carbonization of any organic dust deposits that may occur.

FPN: Dust that is carbonized or excessively dry is highly susceptible to spontaneous ignition.

Equipment and wiring of the type defined in Article 100 as explosionproof shall not be required and shall not be acceptable in Class II locations unless identified ~~approved~~ [14-201, 14-202]-for such locations.

Where Class II, Group E dusts are present in hazardous quantities, there are only Division 1 locations.

502-2. Transformers and Capacitors

(a) Class II, Division 1. In Class II, Division 1 locations, transformers and capacitors shall comply with the following.

(1) Containing Liquid that Will Burn. Transformers and capacitors containing a liquid that will burn shall be installed only in ~~approved~~[14-204,14-205]-vaults complying with Sections 450-41 through 450-48, and, in addition, the following shall apply.

a. Doors or other openings communicating with the Division 1 location shall have self-closing fire doors on both sides of the wall, and the doors shall be carefully fitted and provided with suitable seals (such as weather stripping) to minimize the entrance of dust into the vault.

b. Vent openings and ducts shall communicate only with the outside air.

c. Suitable pressure-relief openings communicating with the outside air shall be provided.

(2) Not Containing Liquid that Will Burn. Transformers and capacitors that do not contain a liquid that will burn shall be installed in vaults complying with Sections 450-41 through 450-48 or be identified ~~approved~~ [14-206,14-207]-as a complete assembly, including terminal connections for Class II locations.

(3) Metal Dusts. No transformer or capacitor shall be installed in a location where dust from magnesium, aluminum, aluminum bronze powders, or other metals of similarly hazardous characteristics may be present.

(b) Class II, Division 2. In Class II, Division 2 locations, transformers and capacitors shall comply with the following.

(1) Containing Liquid that Will Burn. Transformers and capacitors containing a liquid that will burn shall be installed in vaults that comply with Sections 450-41 through 450-48.

(2) Containing Askarel. Transformers containing askarel and rated in excess of 25 kVA shall be as follows:

a. Provided with pressure-relief vents

b. Provided with a means for absorbing any gases generated by arcing inside the case, or the pressure-relief vents shall be connected to a chimney or flue that will carry such gases outside the building

c. Have an airspace of not less than 6 in. (152 mm) between the transformer cases and any adjacent combustible material

(3) Dry-Type Transformers. Dry-type transformers shall be installed in vaults or shall have their windings and terminal connections enclosed in tight metal housings without ventilating or other openings and shall operate at not over 600 volts, nominal.

502-4. Wiring Methods

Wiring methods shall comply with (a) or ~~and~~ (b). (CP-1409 to correlate with 501-4)

(a) Class II, Division 1. In Class II, Division 1 locations, threaded rigid metal conduit, threaded steel intermediate metal conduit, or Type MI cable with termination fittings listed ~~approved~~ [14-208,14-209]-for the location shall be the wiring method employed. Type MI cable shall be installed and supported in a manner to avoid tensile stress at the termination fittings.

Exception: In industrial establishments with limited public access, where the conditions of maintenance and supervision ensure that only qualified persons will service the installation, Type MC cable, listed for use in Class II, Division 1 locations, with a gas/vaportight continuous corrugated metallic ~~aluminum~~ [14-210]-sheath, an overall jacket of suitable polymeric material, separate grounding conductors in accordance with Section 250-122, and provided with termination fittings listed for the application shall be permitted.

(1) Fittings and Boxes. Fittings and boxes shall be provided with threaded bosses for connection to conduit or cable terminations and shall be dust-tight. Fittings and boxes in which taps, joints, or terminal connections are made, or that are used in Group E, shall be identified for Class II locations.~~, shall have close fitting covers, and shall have no openings (such as holes for attachment screws) through which dust might enter or through which sparks or burning material might escape. Fittings and boxes in which taps, joints, or terminal connections are made, or that are used in locations where dusts are of a combustible, electrically conductive nature, shall be approved for Class II locations.~~ (14-211,14-212,CP-1408)

(2) Flexible Connections. Where necessary to employ flexible connections, dusttight flexible connectors, liquidtight flexible metal conduit with approved fittings, liquidtight flexible nonmetallic conduit with listed ~~approved~~ fittings, or flexible cord listed ~~approved~~ for extra-hard usage and provided with bushed fittings shall be used. Where flexible cords are used, they shall comply with Section 502-12. Where flexible connections are subject to oil or other corrosive conditions, the insulation of the conductors shall be of a type listed ~~approved~~ for the condition or shall be protected by means of a suitable sheath. [14-213]

FPN: See Section 502-16(b) for grounding requirements where flexible conduit is used.

(b) Class II, Division 2. In Class II, Division 2 locations, rigid metal conduit, intermediate metal conduit, electrical metallic tubing, dusttight wireways, Type MC or MI cable with listed ~~approved~~ [14-216,14-219]-termination fittings, Type PLTC in cable trays, Type ITC in cable trays, or Type MC, MI, or TC cable installed in ladder, ventilated trough, or ventilated channel cable trays in a single layer, with a space not less than the larger cable diameter between the two adjacent cables, shall be the wiring method employed.

Exception No. 1: Nonincendive field wiring shall be permitted using any of the methods suitable for wiring in nonhazardous ~~ordinary~~ locations including Chapter 7 and 8 wiring methods.(14-220)

Exception No. 2: Type MC cable listed for use in Class II, Division 1 locations shall be permitted to be installed without the above required spacings.

(1) Boxes and Fittings. All boxes and fittings shall be dusttight. (14-221,14-222)

~~(1) Wireways, Fittings, and Boxes. Wireways, fittings, and boxes in which taps, joints, or terminal connections are made shall be designed to minimize the entrance of dust and (1) shall be provided with telescoping or close fitting covers or other effective means to prevent the escape of sparks or burning material and (2) shall have no openings (such as holes for attachment screws) through which, after installation, sparks or burning material might escape or through which adjacent combustible material might be ignited.~~

(2) Flexible Connections. Where flexible connections are necessary, (a)(2) shall apply.

Rewrite of above section 502-4 to correlate with 501-4 and as modified by Proposals

502-4. Wiring Methods

Wiring methods shall comply with (a) or (b). (CP-1409 to correlate with 501-4)

(a) Class II, Division 1.

(1) In Class II, Division 1 locations, the following wiring methods shall be permitted:

(a) Threaded rigid metal conduit, or threaded steel intermediate metal conduit may be used.

(b) Type MI cable with termination fittings listed [14-208,14-209] for the location. Type MI cable shall be installed and supported in a manner to

avoid tensile stress at the termination fittings.

(c) In industrial establishments with limited public access, where the conditions of maintenance and supervision ensure that only qualified persons will service the installation, Type MC cable, listed for use in Class II, Division 1 locations, with a gas/vaportight continuous corrugated metallic [14-210] sheath, an overall jacket of suitable polymeric material, separate grounding conductors in accordance with Section 250-122, and provided with termination fittings listed for the application shall be permitted.

(d) Fittings and boxes shall be provided with threaded bosses for connection to conduit or cable terminations and shall be dust-tight. Fittings and boxes in which taps, joints, or terminal connections are made, or that are used in Group E, shall be identified for Class II locations. (14-211,14-212,CP-1408)

(e) Where necessary to employ flexible connections, dusttight flexible connectors, liquidtight flexible metal conduit with listed fittings, liquidtight flexible nonmetallic conduit with listed fittings, or flexible cord listed for extra-hard usage and provided with bushed fittings shall be used. Where flexible cords are used, they shall comply with Section 502-12. Where flexible connections are subject to oil or other corrosive conditions, the insulation of the conductors shall be of a type listed for the condition or shall be protected by means of a suitable sheath. [14-213]

FPN: See Section 502-16(b) for grounding requirements where flexible conduit is used.

(b) Class II, Division 2.

(1) In Class II, Division 2 locations, the following wiring methods shall be permitted:

a. Rigid metal conduit, intermediate metal conduit, electrical metallic tubing,
b. Dusttight wireways,
c. Type MC or MI cable with listed [14-216,14-219]termination fittings,
d. Type PLTC in cable trays,
e. Type ITC in cable trays,
f. Type MC, MI, or TC cable installed in ladder, ventilated trough, or ventilated channel cable trays in a single layer, with a space not less than the larger cable diameter between the two adjacent cables, shall be the wiring method employed.

Exception: Type MC cable listed for use in Class II, Division 1 locations shall be permitted to be installed without the above required spacings.

(2) Where provision must be made for flexibility apply 502-4 (a)(1)(e.)

(3) Nonincendive field wiring shall be permitted using any of the wiring methods permitted for nonhazardous [14-81,14-88,1401, 14-220] locations, including Chapter 7 and 8 wiring methods. Nonincendive field wiring systems shall be installed in accordance with the control drawing(s). (14-83)

(4) All boxes and fittings shall be dusttight. (14-221,14-222)

502-5. Sealing, Class II, Divisions 1 and 2

Where a raceway provides communication between an enclosure that is required to be dust-ignitionproof and one that is not, suitable means shall be provided to prevent the entrance of dust into the dust-ignitionproof enclosure through the raceway. One of the following means shall be permitted:
1. A permanent and effective seal,
2. A horizontal raceway not less than 10 ft (3.05 m) long, or
3. A vertical raceway not less than 5 ft (1.52 m) long and extending downward from the dust-ignitionproof enclosure

Where a raceway provides communication between an enclosure that is required to be dust-ignitionproof and an enclosure in an unclassified location, seals shall not be required.
Sealing fittings shall be accessible.
Seals shall not be required to be explosionproof.
FPN: Electrical sealing putty is a method of sealing.

502-6. Switches, Circuit Breakers, Motor Controllers, and Fuses

(a) Class II, Division 1. In Class II, Division 1 locations, switches, circuit breakers, motor controllers, and fuses shall comply with the following:
(1) Type Required. Switches, circuit breakers, motor controllers, and fuses, including pushbuttons, relays, and similar devices that are intended to interrupt current during normal operation or that are installed where combustible dusts of an electrically conductive nature may be present, shall be provided with identified ~~approved~~ [14-223,14-224] dust-ignitionproof enclosures.
(2) Isolating Switches. Disconnecting and isolating switches containing no fuses and not intended to interrupt current and not installed where dusts may be of an electrically conductive nature shall be provided with tight metal enclosures that shall be designed to minimize the entrance of dust and that shall (1) be equipped with telescoping or close-fitting covers or with other effective means to prevent the escape of sparks or burning material and (2) have no openings (such as holes for attachment screws) through which, after installation, sparks or burning material might escape or through which exterior accumulations of dust or adjacent combustible material might be ignited.

(3) Metal Dusts. In locations where dust from magnesium, aluminum, aluminum bronze powders, or other metals of similarly hazardous characteristics may be present, fuses, switches, motor controllers, and circuit breakers shall have enclosures identified ~~specifically approved~~(14-225,14-226)-for such locations.

(b) Class II, Division 2. In Class II, Division 2 locations, enclosures for fuses, switches, circuit breakers, and motor controllers, including pushbuttons, relays, and similar devices, shall be dusttight.

502-7. Control Transformers and Resistors

(a) Class II, Division 1. In Class II, Division 1 locations, control transformers, solenoids, impedance coils, resistors, and any overcurrent devices or switching mechanisms associated with them shall have dust-ignitionproof enclosures approved for Class II locations. No control transformer, impedance coil, or resistor shall be installed in a location where dust from magnesium, aluminum, aluminum bronze powders, or other metals of similarly hazardous characteristics may be present unless provided with an enclosure identified ~~approved~~[14-227, 14-228]-for the specific location.

(b) Class II, Division 2. In Class II, Division 2 locations, transformers and resistors shall comply with the following.
(1) Switching Mechanisms. Switching mechanisms (including overcurrent devices) associated with control transformers, solenoids, impedance coils, and resistors shall be provided with dusttight enclosures.
(2) Coils and Windings. Where not located in the same enclosure with switching mechanisms, control transformers, solenoids, and impedance coils shall be provided with tight metal housings without ventilating openings.
(3) Resistors. Resistors and resistance devices shall have dust-ignitionproof enclosures identified ~~approved~~ for Class II locations.(14-229,14-230)
Exception: Where the maximum normal operating temperature of the resistor will not exceed 120ºC (248ºF), nonadjustable resistors or resistors that are part of an automatically timed starting sequence shall be permitted to have enclosures complying with (b)(2).

502-8. Motors and Generators

(a) Class II, Division 1. In Class II, Division 1 locations, motors, generators, and other rotating electrical machinery shall be
1. Identified ~~Approved~~[14-231, 14-232]-for Class II, Division 1 locations, or
2. Totally enclosed pipe-ventilated, meeting temperature limitations in Section 502-1.

(b) Class II, Division 2. In Class II, Division 2 locations, motors, generators, and other rotating electrical equipment shall be totally enclosed nonventilated, totally enclosed pipe-ventilated, totally enclosed water–air cooled, totally enclosed fan-cooled or dust-ignitionproof for which maximum full-load external temperature shall be in accordance with Section 500-8(c)(2) ~~500-5(f)~~ for normal operation when operating in free air (not dust blanketed) and shall have no external openings.
Exception: If the authority having jurisdiction believes accumulations of nonconductive, nonabrasive dust will be moderate and if machines can be easily reached for routine cleaning and maintenance, the following shall be permitted to be installed:
a. Standard open-type machines without sliding contacts, centrifugal or other types of switching mechanism (including motor overcurrent,

overloading, and overtemperature devices), or integral resistance devices
b. Standard open-type machines with such contacts, switching mechanisms, or resistance devices enclosed within dusttight housings without ventilating or other openings
c. Self-cleaning textile motors of the squirrel-cage type

502-9. Ventilating Piping
Ventilating pipes for motors, generators, or other rotating electric machinery, or for enclosures for electric equipment, shall be of metal not less than 0.021 in. (533 µm) in thickness, or of equally substantial noncombustible material, and shall comply with the following:
1. Lead directly to a source of clean air outside of buildings,
2. Be screened at the outer ends to prevent the entrance of small animals or birds, and
3. Be protected against physical damage and against rusting or other corrosive influences
Ventilating pipes shall also comply with (a) and (b).

(a) Class II, Division 1. In Class II, Division 1 locations, ventilating pipes, including their connections to motors or to the dust-ignitionproof enclosures for other equipment, shall be dusttight throughout their length. For metal pipes, seams and joints shall comply with one of the following:
1. Be riveted and soldered,
2. Be bolted and soldered,
3. Be welded, or
4. Be rendered dusttight by some other equally effective means

(b) Class II, Division 2. In Class II, Division 2 locations, ventilating pipes and their connections shall be sufficiently tight to prevent the entrance of appreciable quantities of dust into the ventilated equipment or enclosure and to prevent the escape of sparks, flame, or burning material that might ignite dust accumulations or combustible material in the vicinity. For metal pipes, lock seams and riveted or welded joints shall be permitted; and tight-fitting slip joints shall be permitted where some flexibility is necessary, as at connections to motors.

502-10. Utilization Equipment
(a) Class II, Division 1. In Class II, Division 1 locations, all utilization equipment shall be identified ~~approved~~ [14-233,14-234] for Class II locations. Where dust from magnesium, aluminum, aluminum bronze powders, or other metals of similarly hazardous characteristics may be present, such equipment shall be approved for the specific location.

(b) Class II, Division 2. In Class II, Division 2 locations, all utilization equipment shall comply with the following.
(1) Heaters. Electrically heated utilization equipment shall be identified ~~approved~~ [14-235,14-236]-for Class II locations.
Exception: Metal-enclosed radiant heating panel equipment shall be dusttight and marked in accordance with Section 500-8 (b)~~500-5(d)~~.
(2) Motors. Motors of motor-driven utilization equipment shall comply with Section 502-8(b).
(3) Switches, Circuit Breakers, and Fuses. Enclosures for switches, circuit breakers, and fuses shall be dusttight.
(4) Transformers, Solenoids, Impedance Coils, and Resistors. Transformers, solenoids, impedance coils, and resistors shall comply with Section 502-7(b).

502-11. Lighting Fixtures
Lighting fixtures shall comply with (a) and (b).
(a) Class II, Division 1. In Class II, Division 1 locations, lighting fixtures for fixed and portable lighting shall comply with the following.
(1) ~~Approved~~ Fixtures. Each fixture shall be identified ~~approved~~ for Class II locations and shall be clearly marked to indicate the maximum wattage of the lamp for which it is designed ~~approved~~. In locations where dust from magnesium, aluminum, aluminum bronze powders, or other metals of similarly hazardous characteristics may be present, fixtures for fixed or portable lighting and all auxiliary equipment shall be identified ~~approved~~ for the specific location. (14-237,14-238)
(2) Physical Damage. Each fixture shall be protected against physical damage by a suitable guard or by location.
(3) Pendant Fixtures. Pendant fixtures shall be suspended by threaded rigid metal conduit stems, threaded steel intermediate metal conduit stems, by chains with approved fittings, or by other approved means. For rigid stems longer than 12 in. (305 mm), permanent and effective bracing against lateral displacement shall be provided at a level not more than 12 in. (305 mm) above the lower end of the stem, or flexibility in the form of a fitting or a flexible connector listed ~~approved~~[14-240,14-243]-for the location shall be provided not more than 12 in. (305 mm) from the point of attachment to the supporting box or fitting. Threaded joints shall be provided with set-screws or other effective means to prevent loosening. Where wiring between an outlet box or fitting and a pendant fixture is not enclosed in conduit, flexible cord listed ~~approved~~ [14-239,14-244]-for hard usage shall be used, and suitable seals shall be provided where the cord enters the fixture and the outlet box or fitting. Flexible cord shall not serve as the supporting means for a fixture.

(4) Supports. Boxes, box assemblies, or fittings used for the support of lighting fixtures shall be identified ~~approved~~ [14-245,14-246]-for Class II locations.

(b) Class II, Division 2. In Class II, Division 2 locations, lighting fixtures shall comply with the following.
(1) Portable Lighting Equipment. Portable lighting equipment shall be identified ~~approved~~ for Class II locations. They shall be clearly marked to indicate the maximum wattage of lamps for which they are designed~~approved~~ [14-247,14-248].
(2) Fixed Lighting. Lighting fixtures for fixed lighting, where not of a type identified ~~approved~~ [14-249,14-250]-for Class II locations, shall provide enclosures for lamps and lampholders that shall be designed to minimize the deposit of dust on lamps and to prevent the escape of sparks, burning material, or hot metal. Each fixture shall be clearly marked to indicate the maximum wattage of the lamp that shall be permitted without exceeding an exposed surface temperature in accordance with Section 500-8 (c)(2)~~500-5(f~~) under normal conditions of use.
(3) Physical Damage. Lighting fixtures for fixed lighting shall be protected from physical damage by suitable guards or by location.
(4) Pendant Fixtures. Pendant fixtures shall be suspended by threaded rigid metal conduit stems, threaded steel intermediate metal conduit stems, by chains with approved fittings, or by other approved means. For rigid stems longer than 12 in. (305 mm), permanent and effective bracing against lateral displacement shall be provided at a level not more than 12 in. (305 mm) above the lower end of the stem, or flexibility in the form of an approved fitting or a flexible connector shall be provided not more than 12 in. (305 mm) from the point of attachment to the supporting box or fitting. Where wiring between an outlet box or fitting and a pendant fixture is not enclosed in conduit, flexible cord listed ~~approved~~ [14-251,14-256]-for hard usage shall be used. Flexible cord shall not serve as the supporting means for a fixture.
(5) Electric-Discharge Lamps. Starting and control equipment for electric-discharge lamps shall comply with the requirements of Section 502-7(b).

502-12. Flexible Cords — Class II, Divisions 1 and 2
Flexible cords used in Class II locations shall comply with the following:
1. Be of a type listed ~~approved~~[14-258,14-259]-for extra-hard usage,
FPN: Flexible cord listed for hard usage as permitted by Sections 502-11 (a) (3) and (b) (4). (14-257)
2. Contain, in addition to the conductors of the circuit, a grounding conductor complying with Section 400-23,
3. Be connected to terminals or to supply conductors in an approved manner,
4. Be supported by clamps or by other suitable means in such a manner that there will be no tension on the terminal connections, and
5. Be provided with suitable seals to prevent the entrance of dust where the flexible cord enters boxes or fittings that are required to be dust-ignitionproof

502-13. Receptacles and Attachment Plugs
(a) Class II, Division 1. In Class II, Division 1 locations, receptacles and attachment plugs shall be of the type providing for connection to the grounding conductor of the flexible cord and shall be identified ~~approved~~[14-262,14-263]-for Class II locations.

(b) Class II, Division 2. In Class II, Division 2 locations, receptacles and attachment plugs shall be of the type that provide for connection to the grounding conductor of the flexible cord and shall be designed so that connection to the supply circuit cannot be made or broken while live parts are exposed.

502-14. Signaling, Alarm, Remote-Control, and Communications Systems; and Meters, Instruments, and Relays
FPN: See Article 800 for rules governing the installation of communications circuits.

(a) Class II, Division 1. In Class II, Division 1 locations, signaling, alarm, remote-control, and communications systems; and meters, instruments, and relays shall comply with the following:

(1) Wiring Methods. The wiring method shall comply with Section 502-4(a).
(2) Contacts. Switches, circuit breakers, relays, contactors, fuses and current-breaking contacts for bells, horns, howlers, sirens, and other devices in which sparks or arcs may be produced shall be provided with enclosures identified ~~approved~~ [14-264,14-265] for a Class II location.
Exception: Where current-breaking contacts are immersed in oil or where the interruption of current occurs within a chamber sealed against the entrance of dust, enclosures shall be permitted to be of the general-purpose type.
(3) Resistors and Similar Equipment. Resistors, transformers, choke coils, rectifiers, thermionic tubes, and other heat-generating equipment shall be provided with enclosures identified ~~approved~~ [14-266,14-267] for Class II locations.
Exception: Where resistors or similar equipment are immersed in oil or enclosed in a chamber sealed against the entrance of dust, enclosures shall be permitted to be of the general-purpose type.
(4) Rotating Machinery. Motors, generators, and other rotating electric machinery shall comply with Section 502-8(a).
(5) Combustible, Electrically Conductive Dusts. Where dusts are of a combustible, electrically conductive nature, all wiring and equipment shall be identified ~~approved~~ [14-268,14-269] for Class II locations.
(6) Metal Dusts. Where dust from magnesium, aluminum, aluminum bronze powders, or other metals of similarly hazardous characteristics may be present, all apparatus and equipment shall be identified ~~approved~~ [14-270,14-271] for the specific conditions.

(b) Class II, Division 2. In Class II, Division 2 locations, signaling, alarm, remote-control, and communications systems; and meters, instruments, and relays shall comply with the following.
(1) Contacts. Enclosures shall comply with (a)(2), or contacts shall have tight metal enclosures designed to minimize the entrance of dust and shall have telescoping or tight-fitting covers and no openings through which, after installation, sparks or burning material might escape.
Exception: In nonincendive circuits, enclosures shall be permitted to be of the general-purpose type.
(2) Transformers and Similar Equipment. The windings and terminal connections of transformers, choke coils, and similar equipment shall be provided with tight metal enclosures without ventilating openings.
(3) Resistors and Similar Equipment. Resistors, resistance devices, thermionic tubes, rectifiers, and similar equipment shall comply with (a)(3).
Exception: Enclosures for thermionic tubes, nonadjustable resistors, or rectifiers for which maximum operating temperature will not exceed 120ºC (248ºF) shall be permitted to be of the general-purpose type.
(4) Rotating Machinery. Motors, generators, and other rotating electric machinery shall comply with Section 502-8(b).
(5) Wiring Methods. The wiring method shall comply with Section 502-4(b).

502-15. Live Parts, Class II, Divisions 1 and 2
Live parts shall not be exposed.

502-16. Grounding, Class II, Divisions 1 and 2
Wiring and equipment in Class II, Divisions 1 and 2 locations shall be grounded as specified in Article 250 and with the following additional requirements.
(a) Bonding. The locknut-bushing and double-locknut types of contact shall not be depended on for bonding purposes, but bonding jumpers with proper fittings or other approved means of bonding shall be used. Such means of bonding shall apply to all intervening raceways, fittings, boxes, enclosures, etc., between Class II locations and the point of grounding for service equipment or point of grounding of a separately derived system.
Exception: The specific bonding means shall only be required to the nearest point where the grounded circuit conductor and the grounding electrode conductor are connected together on the line side of the building or structure disconnecting means as specified in Sections 250-32(a), (b), and (c), if the branch-circuit overcurrent protection is located on the load side of the disconnecting means.
FPN: See Section 250-100 for additional bonding requirements in hazardous (classified) locations.
(b) Types of Equipment Grounding Conductors. Where flexible conduit is used as permitted in Section 502-4, it shall be installed with internal or external bonding jumpers in parallel with each conduit and complying with Section 250-102.
Exception: In Class II, Division 2 locations, the bonding jumper shall be permitted to be deleted where all the following conditions are met.
a. Listed liquidtight flexible metal conduit 6 ft (1.83 m) or less in length, with fittings listed for grounding, is used.
b. Overcurrent protection in the circuit is limited to 10 amperes or less.
c. The load is not a power utilization load.

502-17. Surge Protection — Class II, Divisions 1 and 2
Surge arresters, including their installation and connection, shall comply with Article 280. In addition, surge arresters, if installed in a Class II, Division 1 location, shall be in suitable enclosures.
Surge-protective capacitors shall be of a type designed for specific duty.

502-18. Multiwire Branch Circuits
In a Class II, Division 1 location, a multiwire branch circuit shall not be permitted.
Exception: Where the disconnect device(s) for the circuit opens all ungrounded conductors of the multiwire circuit simultaneously.
SUBSTANTIATION: During the January 2000 ROP meeting, Code Making Panel 14 was challenged with a very difficult task due to the large number of proposals that required action, the technical content of the requested revisions, and the Technical Correlating Committee formatting changes. As a result, it was very difficult for the NEC staff assigned to Code Making Panel 14 to keep up with the actions taking place. This comment's intent is to clarify what took place and make necessary revisions.
PANEL ACTION: Accept in Principle.
Revise Article 502 to read as follows:

ARTICLE 502
[Comment 14-90]

Class II Locations

502-1. General

The general rules of this Code shall apply to the electric wiring and equipment in locations classified as Class II locations in Section 500-5(c)~~500-8~~.

Exception: As modified by this article.

~~**Dust ignitionproof**, as used in this article, shall mean enclosed in a manner that will exclude dusts and, where installed and protected in accordance with this Code, will not permit arcs, sparks, or heat otherwise generated or liberated inside of the enclosure to cause ignition of exterior accumulations or atmospheric suspensions of a specified dust on or in the vicinity of the enclosure.~~

~~FPN: For further information on dust ignitionproof enclosures, see Type 9 enclosure in Enclosures for Electrical Equipment, ANSI/NEMA 250-1991, and Explosionproof and Dust Ignitionproof Electrical Equipment for Hazardous (Classified) Locations, ANSI/UL 1203-1994.~~

Equipment installed in Class II locations shall be able to function at full rating without developing surface temperatures high enough to cause excessive dehydration or gradual carbonization of any organic dust deposits that may occur.

FPN: Dust that is carbonized or excessively dry is highly susceptible to spontaneous ignition.

Explosionproof e~~E~~quipment and wiring ~~of the type defined in Article 100 as explosionproof~~ shall not be required and shall not be acceptable in Class II locations unless identified ~~approved~~ for such locations. Where Class II, Group E dusts are present in hazardous quantities, there are only Division 1 locations.

502-2. Transformers and Capacitors

(a) Class II, Division 1. In Class II, Division 1 locations, transformers and capacitors shall comply with the following.

(1) Containing Liquid that Will Burn. Transformers and capacitors containing a liquid that will burn shall be installed only in ~~approved~~ vaults complying with Sections 450-41 through 450-48, and, in addition, the following shall apply.

a. Doors or other openings communicating with the Division 1 location shall have self-closing fire doors on both sides of the wall, and the doors shall be carefully fitted and provided with suitable seals (such as weather stripping) to minimize the entrance of dust into the vault.
b. Vent openings and ducts shall communicate only with the outside air.

c. Suitable pressure-relief openings communicating with the outside air shall be provided.

(2) Not Containing Liquid that Will Burn. Transformers and capacitors that do not contain a liquid that will burn shall be installed in vaults complying with Sections 450-41 through 450-48 or be identified ~~approved~~ as a complete assembly, including terminal connections for Class II locations.

(3) Metal Dusts. No transformer or capacitor shall be installed in a location where dust from magnesium, aluminum, aluminum bronze powders, or other metals of similarly hazardous characteristics may be present.

(b) Class II, Division 2. In Class II, Division 2 locations, transformers and capacitors shall comply with the following.

(1) Containing Liquid that Will Burn. Transformers and capacitors containing a liquid that will burn shall be installed in vaults that comply with Sections 450-41 through 450-48.

(2) Containing Askarel. Transformers containing askarel and rated in excess of 25 kVA shall be as follows:

a. Provided with pressure-relief vents
b. Provided with a means for absorbing any gases generated by arcing inside the case, or the pressure-relief vents shall be connected to a chimney or flue that will carry such gases outside the building
c. Have an airspace of not less than 150 mm (6 in.) ~~(152 mm)~~ between the transformer cases and any adjacent combustible material

(3) Dry-Type Transformers. Dry-type transformers shall be installed in vaults or shall have their windings and terminal connections enclosed in tight metal housings without ventilating or other openings and shall operate at not over 600 volts, nominal.

~~**502-4. Wiring Methods**~~
~~Wiring methods shall comply with (a) or and (b). (CP-1409 to correlate with 501-4)~~

~~**(a) Class II, Division 1.** In Class II, Division 1 locations, threaded rigid metal conduit, threaded steel intermediate metal conduit, or Type MI cable with termination fittings listed approved [14-208,14-209] for the location shall be the wiring method employed. Type MI cable shall be installed and supported in a manner to avoid tensile stress at the termination fittings.~~
~~Exception: In industrial establishments with limited public access, where the conditions of maintenance and supervision ensure that only qualified persons will service the installation, Type MC cable, listed for use in Class II, Division 1 locations, with a gas/vaportight continuous corrugated metallic aluminum [14-210] sheath, an overall jacket of suitable polymeric material, separate grounding conductors in accordance with Section 250-122, and provided with termination fittings listed for the application shall be permitted.~~

~~(1) Fittings and Boxes. Fittings and boxes shall be provided with threaded bosses for connection to conduit or cable terminations and shall be dust-tight. Fittings and boxes in which taps, joints, or terminal connections are made, or that are used in Group E, shall be identified for Class II locations., shall have close-fitting covers, and shall have no openings (such as holes for attachment screws) through which dust might enter or through which sparks or burning material might escape. Fittings and boxes in which taps, joints, or terminal connections are made, or that are used in locations where dusts are of a combustible, electrically conductive nature, shall be approved for Class II locations. (14-211,14-212,CP-1408)~~

~~(2) Flexible Connections. Where necessary to employ flexible connections, dusttight flexible connectors, liquidtight flexible metal conduit with approved fittings, liquidtight flexible nonmetallic conduit with listed approved fittings, or flexible cord listed approved for extra-hard usage and provided with bushed fittings shall be used. Where flexible cords are used, they shall comply with Section 502-12. Where flexible connections are subject to oil or other corrosive conditions, the insulation of the conductors shall be of a type listed approved for the condition or shall be protected by means of a suitable sheath. [14-213]~~
~~FPN: See Section 502-16(b) for grounding requirements where flexible conduit is used.~~

~~**(b) Class II, Division 2.** In Class II, Division 2 locations, rigid metal conduit, intermediate metal conduit, electrical metallic tubing, dusttight wireways, Type MC or MI cable with listed approved [14-216,14-219] termination fittings, Type PLTC in cable trays, Type ITC in cable trays, or Type MC, MI, or TC cable installed in ladder, ventilated trough, or ventilated channel cable trays in a single layer, with a space not less than the larger cable diameter between the two adjacent cables, shall be the wiring method employed.~~
~~Exception No. 1: Nonincendive field wiring shall be permitted using any of the methods suitable for wiring in nonhazardous ordinary locations including Chapter 7 and 8 wiring methods.(14-220)~~
~~Exception No. 2: Type MC cable listed for use in Class II, Division 1 locations shall be permitted to be installed without the above required spacings.~~

~~(1) Boxes and Fittings. All boxes and fittings shall be dusttight. (14-221,14-222)~~

~~(1) Wireways, Fittings, and Boxes. Wireways, fittings, and boxes in which taps, joints, or terminal connections are made shall be designed to minimize the entrance of dust and (1) shall be provided with telescoping or close fitting covers or other effective means to prevent the escape of sparks or burning material and (2) shall have no openings (such as holes for attachment screws) through which, after installation, sparks or burning material might escape or through which adjacent combustible material might be ignited.~~

~~(2) Flexible Connections. Where flexible connections are necessary, (a)(2) shall apply.~~

~~**Rewrite of above section 502-4 to correlate with 501-4 and as modified by Proposals**~~
502-4. Wiring Methods. Wiring methods shall comply with (a) or (b).

(a) Class II, Division 1.

(1) In Class II, Division 1 locations, the following wiring methods shall be permitted:

(a) Threaded rigid metal conduit, or threaded steel intermediate metal conduit.
(b) Type MI cable with termination fittings listed for the location. Type MI cable shall be installed and supported in a manner to avoid tensile stress at the termination fittings.
(c) In industrial establishments with limited public access, where the conditions of maintenance and supervision ensure that only qualified persons will service the installation, Type MC cable, listed for use in Class II, Division 1 locations, with a gas/vaportight continuous corrugated metallic sheath, an overall jacket of suitable polymeric material, separate grounding conductors in accordance with Section 250-122, and provided with termination fittings listed for the application shall be permitted.
(d) Fittings and boxes shall be provided with threaded bosses for connection to conduit or cable terminations and shall be dust-tight. Fittings and boxes in which taps, joints, or terminal connections are made, or that are used in Group E locations, shall be identified for Class II locations.
(e) Where necessary to employ flexible connections, dusttight flexible connectors, liquidtight flexible metal conduit with listed fittings, liquidtight flexible nonmetallic conduit with listed fittings, or flexible cord listed for extra-hard usage and provided with bushed fittings shall be used. Where flexible cords are used, they shall comply with Section 502-12. Where flexible connections are subject to oil or other corrosive conditions, the insulation of the conductors shall be of a type listed for the condition or shall be protected by means of a suitable sheath.

FPN: See Section 502-16(b) for grounding requirements where flexible conduit is used.

(b) Class II, Division 2.

(1) In Class II, Division 2 locations, the following wiring methods shall be permitted:

(a) All wiring methods permitted in 502-4(a)
(b) Rigid metal conduit, intermediate metal conduit, electrical metallic tubing,
Dusttight wireways,
(c) Type MC or MI cable with listed termination fittings,
(d) Type PLTC in cable trays,
(e) Type ITC in cable trays,
(f) Type MC, MI, or TC cable installed in ladder, ventilated

trough, or ventilated channel cable trays in a single layer, with a space not less than the larger cable diameter between the two adjacent cables, shall be the wiring method employed.

Exception: Type MC cable listed for use in Class II, Division 1 locations shall be permitted to be installed without the above required spacings.

(2) Where provision must be made for flexibility 502-4 (a)(1)(e) shall apply.

(3) Nonincendive field wiring shall be permitted using any of the wiring methods permitted for unclassified ~~nonhazardous~~locations~~, including Chapter 7 and 8 wiring methods~~. Nonincendive field wiring systems shall be installed in accordance with the control drawing(s). Simple apparatus, not shown on the control drawing, shall be permitted in a nonincendive field wiring circuit provided the simple apparatus does not interconnect the nonincendive field wiring circuit to any other circuit.

FPN: Simple apparatus is defined in Section 504-2.

Separate nonincendive field wiring circuits shall be:

(a) in separate cables, or
(b) in multiconductor cables where the conductors of each circuit are within a grounded metal shield, or
(c) in multiconductor cables where the conductors of each circuit have insulation with a minimum thickness of 0.25 mm (0.01 in).

(4) All boxes and fittings shall be dusttight.

502-5. Sealing, Class II, Divisions 1 and 2. Where a raceway provides communication between an enclosure that is required to be dust-ignitionproof and one that is not, suitable means shall be provided to prevent the entrance of dust into the dust-ignitionproof enclosure through the raceway. One of the following means shall be permitted:

1. A permanent and effective seal,
2. A horizontal raceway not less than 3.05m (10 ft.)~~10 ft (3.05 m)~~ long, or
3. A vertical raceway not less than 1.5 m (5 ft) ~~(1.52 m)~~long and extending downward from the dust-ignitionproof enclosure

Where a raceway provides communication between an enclosure that is required to be dust-ignitionproof and an enclosure in an unclassified location, seals shall not be required.

Sealing fittings shall be accessible.

Seals shall not be required to be explosionproof.

FPN: Electrical sealing putty is a method of sealing.

502-6. Switches, Circuit Breakers, Motor Controllers, and Fuses.

(a) Class II, Division 1. In Class II, Division 1 locations, switches, circuit breakers, motor controllers, and fuses shall comply with the following:
(1) Type Required. Switches, circuit breakers, motor controllers, and fuses, including pushbuttons, relays, and similar devices that are intended to interrupt current during normal operation or that are installed where combustible dusts of an electrically conductive nature may be present, shall be provided with identified ~~approved~~ dust-ignitionproof enclosures.

(2) Isolating Switches. Disconnecting and isolating switches containing no fuses and not intended to interrupt current and not installed where dusts may be of an electrically conductive nature shall be provided with tight metal enclosures that shall be designed to minimize the entrance of dust and that shall (1) be equipped with telescoping or close-fitting covers or with other effective means to prevent the escape of sparks or burning material and (2) have no openings (such as holes for attachment screws) through which, after installation, sparks or burning material might escape or through which exterior accumulations of dust or adjacent combustible material might be ignited.

(3) Metal Dusts. In locations where dust from magnesium, aluminum, aluminum bronze powders, or other metals of similarly hazardous characteristics may be present, fuses, switches, motor controllers, and circuit breakers shall have enclosures identified ~~specifically approved~~ for such locations.

(b) Class II, Division 2. In Class II, Division 2 locations, enclosures for fuses, switches, circuit breakers, and motor controllers, including pushbuttons, relays, and similar devices, shall be dusttight.

502-7. Control Transformers and Resistors

(a) Class II, Division 1. In Class II, Division 1 locations, control transformers, solenoids, impedance coils, resistors, and any overcurrent devices or switching mechanisms associated with them shall have dust-ignitionproof enclosures identified ~~approved~~ for Class II locations. No control transformer, impedance coil, or resistor shall be installed in a location where dust from magnesium, aluminum, aluminum bronze powders, or other metals of similarly hazardous characteristics may be present unless provided with an enclosure identified ~~ap~~ for the specific location.

(b) Class II, Division 2. In Class II, Division 2 locations, transformers and resistors shall comply with the following.

(1) Switching Mechanisms. Switching mechanisms (including overcurrent devices) associated with control transformers, solenoids, impedance coils, and resistors shall be provided with dusttight enclosures.

(2) Coils and Windings. Where not located in the same enclosure with switching mechanisms, control transformers, solenoids, and impedance coils shall be provided with tight metal housings without ventilating openings.

(3) Resistors. Resistors and resistance devices shall have dust-ignitionproof enclosures ~~-~~identified ~~approved~~ for Class II locations.

Exception: Where the maximum normal operating temperature of the resistor will not exceed 120ºC (248ºF), nonadjustable resistors or resistors that are part of an automatically timed starting sequence shall be permitted to have enclosures complying with (b)(2).

502-8. Motors and Generators

(a) Class II, Division 1. In Class II, Division 1 locations, motors, generators, and other rotating electrical machinery shall be

1. Identified ~~Approved~~ for Class II, Division 1 locations, or
2. Totally enclosed pipe-ventilated, meeting temperature limitations in Section 502-1.

(b) Class II, Division 2. In Class II, Division 2 locations, motors, generators, and other rotating electrical equipment shall be totally enclosed nonventilated, totally enclosed pipe-ventilated, totally enclosed water–air cooled, totally enclosed fan-cooled or dust-ignitionproof for which maximum full-load external temperature shall be in accordance with Section 500-8(c)(2) ~~500-5(f)~~ for normal operation when operating in free air (not dust blanketed) and shall have no external openings.

Exception: If the authority having jurisdiction believes accumulations of nonconductive, nonabrasive dust will be moderate and if machines can be easily reached for routine cleaning and maintenance, the following shall be permitted to be installed:
a. Standard open-type machines without sliding contacts, centrifugal or other types of switching mechanism (including motor overcurrent, overloading, and overtemperature devices), or integral resistance devices
b. Standard open-type machines with such contacts, switching mechanisms, or resistance devices enclosed within dusttight housings without ventilating or other openings
c. Self-cleaning textile motors of the squirrel-cage type

502-9. Ventilating Piping. Ventilating pipes for motors, generators, or other rotating electric machinery, or for enclosures for electric equipment, shall be of metal not less than 0.53 mm (0.021 in.) ~~(533 µm)~~ in thickness, or of equally substantial noncombustible material, and shall comply with the following:

1. Lead directly to a source of clean air outside of buildings,
2. Be screened at the outer ends to prevent the entrance of small animals or birds, and

3. Be protected against physical damage and against rusting or other corrosive influences.

Ventilating pipes shall also comply with (a) and (b).

(a) Class II, Division 1. In Class II, Division 1 locations, ventilating pipes, including their connections to motors or to the dust-ignitionproof enclosures for other equipment, shall be dusttight throughout their length. For metal pipes, seams and joints shall comply with one of the following:

1. Be riveted and soldered,
2. Be bolted and soldered,
3. Be welded, or
4. Be rendered dusttight by some other equally effective means

(b) Class II, Division 2. In Class II, Division 2 locations, ventilating pipes and their connections shall be sufficiently tight to prevent the entrance of appreciable quantities of dust into the ventilated equipment or enclosure and to prevent the escape of sparks, flame, or burning material that might ignite dust accumulations or combustible material in the vicinity. For metal pipes, lock seams and riveted or welded joints shall be permitted; and tight-fitting slip joints shall be permitted where some flexibility is necessary, as at connections to motors.

502-10. Utilization Equipment

(a) Class II, Division 1. In Class II, Division 1 locations, all utilization equipment shall be identified ~~approved~~ for Class II locations. Where dust from magnesium, aluminum, aluminum bronze powders, or other metals of similarly hazardous characteristics may be present, such equipment shall be identified ~~approved~~ for the specific location.

(b) Class II, Division 2. In Class II, Division 2 locations, all utilization equipment shall comply with the following.

(1) Heaters. Electrically heated utilization equipment shall be identified ~~approved~~ for Class II locations.

Exception: Metal-enclosed radiant heating panel equipment shall be dusttight and marked in accordance with Section 500-8 (b)~~500-5(d)~~.

(2) Motors. Motors of motor-driven utilization equipment shall comply with Section 502-8(b).

(3) Switches, Circuit Breakers, and Fuses. Enclosures for switches, circuit breakers, and fuses shall be dusttight.

(4) Transformers, Solenoids, Impedance Coils, and Resistors. Transformers, solenoids, impedance coils, and resistors shall comply with Section 502-7(b).

502-11. Luminaires (Lighting Fixtures). Luminaires (Lighting fixtures) shall comply with (a) and (b).

(a) Class II, Division 1. In Class II, Division 1 locations, luminaires (lighting fixtures) for fixed and portable lighting shall comply with the following.

(1) ~~Approved~~ Fixtures. Each fixture shall be identified ~~approved~~ for Class II locations and shall be clearly marked to indicate the maximum wattage of the lamp for which it is designed~~approved~~. In locations where dust from magnesium, aluminum, aluminum bronze powders, or other metals of similarly hazardous characteristics may be present, fixtures for fixed or portable lighting and all auxiliary equipment shall be identified ~~approved~~ for the specific location.

(2) Physical Damage. Each fixture shall be protected against physical damage by a suitable guard or by location.

(3) Pendant Fixtures. Pendant fixtures shall be suspended by threaded rigid metal conduit stems, threaded steel intermediate metal conduit stems, by chains with approved fittings, or by other approved means. For rigid stems longer than 300 mm (12 in.) ~~(305 mm)~~, permanent and effective bracing against lateral displacement shall be provided at a level not more than 300 mm (12 in.) ~~(305 mm)~~ above the lower end of the stem, or flexibility in the form of a fitting or a flexible connector listed ~~approved~~ for the location shall be provided not more than 300 mm (12 in.) ~~(305 mm)~~ from the point of attachment to the supporting box or fitting. Threaded joints shall be provided with set-screws or other effective means to prevent loosening. Where wiring between an outlet box or fitting and a pendant fixture is not enclosed in conduit, flexible cord listed ~~approved~~ for hard usage shall be used, and suitable seals shall be provided where the cord enters the fixture and the outlet box or fitting. Flexible cord shall not serve as the supporting means for a fixture.

(4) Supports. Boxes, box assemblies, or fittings used for the support of lighting fixtures shall be identified ~~approved~~ for Class II locations.

(b) Class II, Division 2. In Class II, Division 2 locations, luminaires (lighting fixtures) shall comply with the following.

(1) Portable Lighting Equipment. Portable lighting equipment shall be identified ~~approved~~ for Class II locations. They shall be clearly marked to indicate the maximum wattage of lamps for which they are designed~~approved~~.

(2) Fixed Lighting. Luminaires (Lighting fixtures) for fixed lighting, where not of a type identified ~~approved~~ for Class II locations, shall provide enclosures for lamps and lampholders that shall be designed to minimize the deposit of dust on lamps and to prevent the escape of sparks, burning material, or hot metal. Each fixture shall be clearly marked to indicate the maximum wattage of the lamp that shall be permitted without exceeding an exposed surface temperature in accordance with Section 500-8 (c)(2)~~500-5(f)~~ under normal conditions of use.

(3) Physical Damage. Luminaires (l~~l~~ighting fixtures) for fixed lighting shall be protected from physical damage by suitable guards or by location.

(4) Pendant Fixtures. Pendant fixtures shall be suspended by threaded rigid metal conduit stems, threaded steel intermediate metal conduit stems, by chains with approved fittings, or by other approved means. For rigid stems longer than 300 mm (12 in.) ~~(305 mm)~~, permanent and effective bracing against lateral displacement shall be provided at a level not more than 300 mm (12 in.) ~~(305 mm)~~ above the lower end of the stem, or flexibility in the form of an identified ~~approved~~ fitting or a flexible connector shall be provided not more than 300 mm (12 in.) ~~(305 mm)~~ from the point of attachment to the supporting box or fitting. Where wiring between an outlet box or fitting and a pendant fixture is not enclosed in conduit, flexible cord listed ~~approved~~ for hard usage shall be used. Flexible cord shall not serve as the supporting means for a fixture.

(5) Electric-Discharge Lamps. Starting and control equipment for electric-discharge lamps shall comply with the requirements of Section 502-7(b).

502-12. Flexible Cords — Class II, Divisions 1 and 2. Flexible cords used in Class II locations shall comply with the following:

1. Be of a type listed ~~approved~~ for extra-hard usage,

Exception~~FPN~~: Flexible cord listed for hard usage as permitted by Sections 502-11 (a) (3) and (b)(4).

2. Contain, in addition to the conductors of the circuit, a grounding conductor complying with Section 400-23,
3. Be connected to terminals or to supply conductors in an approved manner,
4. Be supported by clamps or by other suitable means in such a manner that there will be no tension on the terminal connections, and
5. Be provided with suitable seals to prevent the entrance of dust where the flexible cord enters boxes or fittings that are required to be dust-ignitionproof

502-13. Receptacles and Attachment Plugs

(a) Class II, Division 1. In Class II, Division 1 locations, receptacles and attachment plugs shall be of the type providing for connection to the grounding conductor of the flexible cord and shall be identified ~~approved~~ for Class II locations.

(b) Class II, Division 2. In Class II, Division 2 locations, receptacles and attachment plugs shall be of the type that provide for connection to the grounding conductor of the flexible cord and shall be designed so that connection to the supply circuit cannot be made or broken while live parts are exposed.

502-14. Signaling, Alarm, Remote-Control, and Communications Systems; and Meters, Instruments, and Relays

FPN: See Article 800 for rules governing the installation of communications circuits.

(a) Class II, Division 1. In Class II, Division 1 locations, signaling, alarm, remote-control, and communications systems; and meters, instruments, and relays shall comply with the following:

(1) Wiring Methods. The wiring method shall comply with Section 502-4(a).

(2) Contacts. Switches, circuit breakers, relays, contactors, fuses and current-breaking contacts for bells, horns, howlers, sirens, and other devices in which sparks or arcs may be produced shall be provided with enclosures identified ~~approved~~ for a Class II location.

Exception: Where current-breaking contacts are immersed in oil or where the interruption of current occurs within a chamber sealed against the entrance of dust, enclosures shall be permitted to be of the general-purpose type.

(3) Resistors and Similar Equipment. Resistors, transformers, choke coils, rectifiers, thermionic tubes, and other heat-generating equipment shall be provided with enclosures identified ~~approved~~ for Class II locations.

Exception: Where resistors or similar equipment are immersed in oil or enclosed in a chamber sealed against the entrance of dust, enclosures shall be permitted to be of the general-purpose type.

(4) Rotating Machinery. Motors, generators, and other rotating electric machinery shall comply with Section 502-8(a).

(5) Combustible, Electrically Conductive Dusts. Where dusts are of a combustible, electrically conductive nature, all wiring and equipment shall be identified ~~approved~~ for Class II locations.

(6) Metal Dusts. Where dust from magnesium, aluminum, aluminum bronze powders, or other metals of similarly hazardous characteristics may be present, all apparatus and equipment shall be identified ~~approved~~ for the specific conditions.

(b) Class II, Division 2. In Class II, Division 2 locations, signaling, alarm, remote-control, and communications systems; and meters, instruments, and relays shall comply with the following.

(1) Contacts. Enclosures shall comply with (a)(2), or contacts shall have tight metal enclosures designed to minimize the entrance of dust and shall have telescoping or tight-fitting covers and no openings through which, after installation, sparks or burning material might escape.

Exception: In nonincendive circuits, enclosures shall be permitted to be of the general-purpose type.

(2) Transformers and Similar Equipment. The windings and terminal connections of transformers, choke coils, and similar equipment shall be provided with tight metal enclosures without ventilating openings.

(3) Resistors and Similar Equipment. Resistors, resistance devices, thermionic tubes, rectifiers, and similar equipment shall comply with (a)(3).

Exception: Enclosures for thermionic tubes, nonadjustable resistors, or rectifiers for which maximum operating temperature will not exceed 120°C (248°F) shall be permitted to be of the general-purpose type.

(4) Rotating Machinery. Motors, generators, and other rotating electric machinery shall comply with Section 502-8(b).

(5) Wiring Methods. The wiring method shall comply with Section 502-4(b).

502-15. Live Parts, Class II, Divisions 1 and 2. Live parts shall not be exposed.

502-16. Grounding, Class II, Divisions 1 and 2 Wiring and equipment in Class II, Divisions 1 and 2 locations shall be grounded as specified in Article 250 and with the following additional requirements.

(a) Bonding. The locknut-bushing and double-locknut types of contact shall not be depended on for bonding purposes, but bonding jumpers with proper fittings or other approved means of bonding shall be used. Such means of bonding shall apply to all intervening raceways, fittings, boxes, enclosures, etc., between Class II locations and the point of grounding for service equipment or point of grounding of a separately derived system.

Exception: The specific bonding means shall only be required to the nearest point where the grounded circuit conductor and the grounding electrode conductor are connected together on the line side of the building or structure disconnecting means as specified in Sections 250-32(a), (b), and (c), if the branch-circuit overcurrent protection is located on the load side of the disconnecting means.

FPN: See Section 250-100 for additional bonding requirements in hazardous (classified) locations.

(b) Types of Equipment Grounding Conductors. Where flexible conduit is used as permitted in Section 502-4, it shall be installed with internal or external bonding jumpers in parallel with each conduit and complying with Section 250-102.

Exception: In Class II, Division 2 locations, the bonding jumper shall be permitted to be deleted where all the following conditions are met.
a. Listed liquidtight flexible metal conduit 1.8 m (6 ft) ~~(1.83 m)~~ or less in length, with fittings listed for grounding, is used.
b. Overcurrent protection in the circuit is limited to 10 amperes or less.
c. The load is not a power utilization load.

502-17. Surge Protection — Class II, Divisions 1 and 2. Surge arresters, including their installation and connection, shall comply with Article 280. In addition, surge arresters, if installed in a Class II, Division 1 location, shall be in suitable enclosures. Surge-protective capacitors shall be of a type designed for specific duty.

502-18. Multiwire Branch Circuits. In a Class II, Division 1 location, a multiwire branch circuit shall not be permitted.

Exception: Where the disconnect device(s) for the circuit opens all ungrounded conductors of the multiwire circuit simultaneously.

PANEL STATEMENT: The action on this Comment, which is a rewrite of Article 502, incorporates all applicable actions on Comments 14-85 through 14-96.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #154)

14- 91 - (502-1-Dust-ignitionproof): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 14-203
RECOMMENDATION: The Technical Correlating Committee directs that the Panel clarify the Panel Action and Statement on this Proposal. Companion Proposal 1-127 was rejected by Code-Making Panel 1. Code-Making Panel 14 has included a definition for Dust-ignitionproof in both Articles 500 (Proposal 14-2a) and 502 (Proposal 14-200a) and has not deleted the text as recommended by the submitter. This action will be considered by the Panel as a Public Comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
Delete the definition of "dust-ignitionproof" and its Fine Print Note in 502-1.
PANEL STATEMENT: The definition and the Fine Print Note now appears in Section 500-2.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #1398)

14- 92 - (502-4(b)): Reject
SUBMITTER: Kari Barrett, American Chemistry Council
COMMENT ON PROPOSAL NO: 14-217
RECOMMENDATION: New text as follows:
(6) Types CATVP, CATVR, or CATV in cable trays, in raceways, supported by messenger wire, or otherwise adequately supported and mechanically protected by angles, struts, channels, or other mechanical means.
SUBSTANTIATION: To agree with the action taken by Panel 16 on proposal 16-319.
PANEL ACTION: Reject.
PANEL STATEMENT: See action on Comment 14-63.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #2195)

14- 93 - (502-4(b)): Accept
SUBMITTER: Mark Goodman, BP (ARCO)
COMMENT ON PROPOSAL NO: 14-220
RECOMMENDATION: Replace "Ordinary" with "Unclassified".
SUBSTANTIATION: This comment is in support of the original proposal and substantiation.
This proposal should have been "Accept" and not "Accept in Principle". The Panel Action is contrary to the submitter's intent and justification. The correct term is "unclassified" and should be used consistently throughout the code sections to avoid confusion and misapplication.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #2328)

14- 94 - (502-4(b)): Accept in Principle in Part
Note: The Technical Correlating Committee understands that the accepted text modifies the Panel Action on Comment 14-90 and is added to 502-4(b)(3), as shown in the text of the rewrite to Article 502 in Comment 14-90.
SUBMITTER: Nicholas Ludlam, Factory Mutual Research
COMMENT ON PROPOSAL NO: 14-218
RECOMMENDATION: I think that the Panel misunderstood the problems associated with Nonincendive Field Wiring.
Separation of Nonincendive Field Wiring Conductors
(a) From Nonincendive Field Wiring Conductors.
(1) Open Wiring. Conductors and cables of nonincendive field wiring circuits not in raceways or cable trays shall be separated at least 1.97 in. (50 mm) and secured from conductors and cables of any other circuits.
(2) In Raceways, Cable Trays, and Cables. Conductors of nonincendive field wiring circuits shall not be placed in any raceway, cable tray, or cable with conductors of any other circuit.
Exception No. 1: Where conductors of nonincendive field wiring circuits are separated from conductors of incendive field wiring circuits by a distance of at least 1.97 in. (50 mm) and secured, or by a grounded metal partition or an approved insulating partition.
FPN: No. 20 gauge sheet metal partitions 0.0359 in. (912 mm) or thicker are generally considered acceptable.
Exception No. 2: Where either (1) all of the nonincendive field wiring circuit conductors or (2) all of the incendive field wiring circuit conductors are in grounded metal-sheathed or metal-clad cables where the sheathing or cladding is capable of carrying fault current to ground.
FPN: Cables meeting the requirements of Articles 330 and 334 are typical of those considered acceptable.
(3) Within Enclosures.
a. Conductors of nonincendive field wiring circuits shall be separated at least 1.97 in. (50 mm) from conductors of any incendive field wiring circuits, or as specified in Section 501-4(b)(a)(2).
b. All conductors shall be secured so that any conductor that might come loose from a terminal cannot come in contact with another terminal.
FPN No. 1: The use of separate wiring compartments for the nonincendive field wiring and incendive field wiring terminals is the preferred method of complying with this requirement.
FPN No. 2: Physical barriers such as grounded metal partitions or approved insulating partitions or approved restricted access wiring ducts separated from other such ducts by at least 3/4 in. (19 mm) can be used to help ensure the required separation of the wiring.
(b) From Different Nonincendive Field Wiring Circuit Conductors. Different nonincendive field wiring circuits shall be in separate cables or shall be separated from each other by one of the following means.
FPN No. 2: Physical barriers such as grounded metal partitions or approved insulating partitions or approved restricted access wiring ducts separated from other such ducts by at least 3/4 in. (19 mm) can be used to help ensure the required separation of the wiring.
(b) From Different Nonincendive Field Wiring Circuit Conductors. Different nonincendive field wiring circuits shall be in separate cables or shall be separated from each other by one of the following means.
1. The conductors of each circuit are within a grounded metal shield.
2. The conductors of each circuit have insulation with a minimum thickness of 0.01 in. (254 mm).
Exception: Unless otherwise approved.
SUBSTANTIATION: The Exception to allow ordinary location wiring in Class III hazardous (Classified) locations should be added to correspond with 501-4(b) and 502-4(b). Class 2 circuits [725-41 and Chapter 9 Tables 11(a) and 11(b)] are circuits in which the power is limited and which as a result can be considered not to be a source risk of fire or shock. By comparison with the tables in ISA 12.12:1994, any Associated Nonincendive Field Wiring output can also be categorized as a Class 2 power supply. Class 2 and 3 circuits can be wired in any cable suitable for ordinary locations [726-61 Exception 1]. In addition, faults are not considered to occur in the wiring for a Class 2 or Class 3 circuit, and Class 2 or Class 3 power sources shall not have the output connections paralleled or otherwise interconnected unless listed for such interconnection. But Nonincendive Field wiring circuits do consider the wiring opening, shorting and grounding. So if you have a Class 2 circuit which is also a Nonincendive field wiring circuit, then it can be run in ordinary location wiring with no regard to the mechanical protection afforded by the PLTC cable that are to be used for other Class 2 circuits in Hazardous Locations. (It can also be wired in any other type of cable provided it is adequately supported and protected from mechanical damage, and not just PLTC - 725-61(d). Considering also that Class 2 circuits cannot be mixed with any other circuit [except Class 3 circuits 725-54(b)(2)] unless by the exception listed in 504b. But since there is no restriction on the number and type of circuits run in the same ordinary location cable, and because we have to consider the faults, we can have the situation where a shorting of the outputs of the circuit gives rise to a situation where the voltage and current in the cable no longer are nonignition capable, and are no longer Class 2 circuits.
Some examples of this are: A 4-20mA circuit will normally operate at 24V, and a maximum current under normal operation of 22mA. For nonincendive field wiring we have to consider the case where the outputs are shorted together. The maximum current is then dependent on the current limiting within the power source. This typically is 100mA but could be as much as 245mA. 24V 100mA is nonignition capable for Class I Groups A and B by comparison with the ignition curves in ISA 12.12:1994. But if you have a circuit such as a PLC then you will have more than one output. If there are more than 3 outputs for this PLC, and the outputs are all 24V 100mA then by comparison with the ignition curves in ISA 12.12:1994 this IS ignition capable for Class I Groups A and B. In order to make this Nonincendive Field Wiring a usable concept, we need to define a method of segregating circuits. The proposal was an attempt to correct this omission from the NEC. The added text is based on the current 504-30.
Note: Although this example is for Class I the same problems apply for Class III although the ignition energies permitted are higher.
PANEL ACTION: Accept in Principle in Part.
Add the following text to 502-4(b):
"Simple apparatus, not shown on the control drawing, shall be permitted in a nonincendive field wiring circuit provided the simple apparatus does not interconnect the nonincendive field wiring circuit to any other circuit.
FPN: Simple apparatus is defined in Section 504-2.
Separate nonincendive field wiring circuits shall be:
a) in separate cables, or
b) in multiconductor cables where the conductors of each circuit are within a grounded metal shield, or
c) in multiconductor cables where the conductors of each circuit have insulation with a minimum thickness of 0.25 mm (0.01 in)."
Also, delete "including Chapter 7 and 8 wiring methods" from the first sentence.
PANEL STATEMENT: The panel action satisfies the intent of the submitter, with regard to separation of conductors in cables. Information from Comment 14-60 was also inserted to provide consistency between 501-4(b) and 502-4(b).
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #155)

14- 95 - (502-4(b)(1)): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 14-221
RECOMMENDATION: It was the action of the Technical Correlating Committee that this Proposal be reconsidered and correlated with the action on Proposal 14-222. This action will be considered by the Panel as a Public Comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
PANEL STATEMENT: The panel accepts the direction to reconsider. The correlation has been achieved in the rewrite of Article 502. See Comment 14-90.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #687)

14- 96 - (502-16(a)): Reject
SUBMITTER: William E. Bickner, Stillwater, MN
COMMENT ON PROPOSAL NO: 14-273
RECOMMENDATION: This proposal should be accepted, either as is, or in principle.
SUBSTANTIATION: It is unclear whether the panel statement means the existing text is intended to be more stringent than Article 250 or the proposed changes would make it more stringent (the proposed change would bring this section into agreement with Article 250, which is not the case now). This part of this section could also simply state "Bonding shall comply with Section 250-100," and still have the same effect.
PANEL ACTION: Reject.
PANEL STATEMENT: Article 502 grounding rules are intentionally more stringent than those of Article 250.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
EXPLANATION OF NEGATIVE:
COOK: I agree with submitter of comment and proposal. Current text in 502-16(a) addresses bonding where locknut-bushing and double-locknut contacts are encountered. Proposed text would also address wiring methods with single locknuts and shoulders of connectors, which I believe is the intent of the panel. I do not agree with the Panel Statement.

ARTICLE 503 — CLASS III LOCATIONS

(Log #156)

14- 97 - (503): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 14-275
RECOMMENDATION: It was the action of the Technical Correlating Committee that this Proposal be reconsidered by the Panel. The issues of raceway trade size, extracts, and use of soft versus hard metrication were all studied in detail and resolutions were communicated to the Panel prior to the Panel Meeting. It should be noted that all of the other Code-Making Panels accepted the metrication directive. This action will be considered by the Panel as a Public Comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
Incorporate into Article 503 the changes proposed by Proposal 14-275.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #2329)

14- 98 - (503-3(b)): Reject
SUBMITTER: Nicholas Ludlam, Factory Mutual Research
COMMENT ON PROPOSAL NO: 14-280
RECOMMENDATION: I think that the committee misunderstood the problems associated with Nonincendive Field Wiring.
Exception No. 2: Nonincendive field wiring shall be permitted using any of the methods suitable for wiring in ordinary locations.
Separation of Nonincendive Field Wiring Conductors
(a) From Nonincendive Field Wiring Conductors.
(1) Open Wiring. Conductors and cables of nonincendive field wiring circuits not in raceways or cable trays shall be separated at least 1.97 in. (50 mm) and secured from conductors and cables of any other wiring.
Exception: Where either (1) all of the nonincendive field wiring circuit conductors are in Type MI or MC cables or (2) all of the other circuit conductors are in raceways or Type MI or MC cables where the sheathing or cladding is capable of carrying fault current to ground.
(2) In Raceways, Cable Trays, and Cables. Conductors of nonincendive field wiring circuits shall not be placed in any raceway, cable tray, or cable with conductors of any other wiring.
Exception No. 1: Where conductors of nonincendive field wiring circuits are separated from conductors of incendive field wiring circuits by a distance of at least 1.97 in. (50 mm) and secured, or by a grounded metal partition or an approved insulating partition.
FPN: No. 20 gauge sheet metal partitions 0.0359 in. (912 mm) or thicker are generally considered acceptable.
Exception No. 2: Where either (1) all of the nonincendive field wiring circuit conductors or (2) all of the other wiring conductors are in grounded metal-sheathed or metal-clad cables where the sheathing or cladding is capable of carrying fault current to ground.
FPN: Cables meeting the requirements of Articles 330 and 334 are typical of those considered acceptable.
(3) Within Enclosures.
a.) Conductors of nonincendive field wiring circuits shall be separated at least 1.97 in. (50 mm) from conductors of any other field wiring, or as specified in Section 503-(?)(a)(2).
b.) All conductors shall be secured so that any conductor that might come loose from a terminal cannot come in contact with another terminal.
FPN No. 1: The use of separate wiring compartments for the nonincendive field wiring and other field wiring terminals is the preferred method of complying with this requirement.
1. The conductors of each circuit are within a grounded metal shield.
2. The conductors of each circuit have insulation with a minimum thickness of 0.01 in. (254 mm).
Exception: Unless otherwise approved.
SUBSTANTIATION: It seems to me that there is a hole in the current NEC for nonincendive field wiring circuits. Class 2 circuits [725-41 and Chapter 9 tables 11(a) and 11(b)] are circuits in which the power is limited and which as a result can be considered not to be a source risk of fire or shock. By comparison with the tables in ISA 12.12:1994, any Associated Nonincendive Field Wiring output can also be categorized as a Class 2 power supply. Class 2 and 3 circuits can be wired in any cable suitable for ordinary locations [726-61 Exception 1]. In addition, faults are not considered to occur in the wiring for a Class 2 or Class 3 circuit, and Class 2 or Class 3 power sources shall not have the output connections paralleled or otherwise interconnected unless listed for such interconnection. But Nonincendive Field wiring circuits do consider the wiring opening, shorting and grounding. So if you have a Class 2 circuit which is also a Nonincendive field wiring circuit, then it can be run in ordinary location wiring with no regard to the mechanical protection afforded by the PLTC cable that are to be used for other Class 2 circuits in Hazardous Locations. (It can also be wired in any other type of cable provide it is adequately supported and protected from mechanical damage, and not just PLTC - 725-61(d). Considering also that Class 2 circuits cannot be mixed with any other circuit [except Class 3 circuits 725-54(b)(2)] unless by the exception listed in 504 b. But since there is no restriction on the number and type of circuits run in the same ordinary location cable, and because we have to consider the faults, we can have the situation where a shorting of the outputs of the circuit gives rise to a situation where the voltage and current in the cable no longer are nonignition capable, and are no longer Class 2 circuits.
Some examples of this are: A 4-20mA circuit will normally operate at 24V, and a maximum current under normal operation of 22mA. For nonincendive field wiring we have to consider the case where the outputs are shorted together. The maximum current is then dependent on the current limiting within the power source. This typically is 100mA but could be as much as 250mA. 24V 100mA is nonignition capable for Class I Groups A and B by comparison with

the ignition curves in ISA 12.12:1994. But if you have a circuit such as a PLC then you will have more than one output. If there are more than 3 outputs for this PLC, and the outputs are all 24V 100mA then by comparison with the ignition curves in ISA 12.12:1994 this IS ignition capable for Class I Groups A and B. In order to make this Nonincendive Field Wiring a usable concept, we need to define a method of segregating circuits. The proposal was an attempt to correct this omission from the NEC. The added text is based on the current 504-30.
PANEL ACTION: Reject.
PANEL STATEMENT: The proposed wiring method is not applicable as presented as an exception.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
COMMENT ON AFFIRMATIVE:
SABAN: Below are identified concerns of safety with regards to installation practices which cause for very unsafe conditions.
1) Armored cable U.G.
a) Shovels nick outerjacket
b) Earth settles "pulls out."
c) Rock drop on it more than 2 1/2 #/ft
d) Not to use outside if 20 degrees Fahrenheit or less
e) How to maintain? UG? Inspect UG? Outer jacket damage visible?
f) Bending crunches cable
g) People worker walk on it, before cover
2) Issues A.G.
a) bending radius done too tight
b) C1D1 connectors don't (seems, only my opinion) bond to the copper ceil inside terminator to continuous corrugated sheath
c) Need to have 45 degree terminators
d) When larger MC cables are used ... can wobble a little (breaks seal and the armor cracks).
e) Cable tray installation not allowed room above equipment, cable trays installed horizontal above switchgear, MCCs are being installed with vertical distance between too close, therefore not allowing proper radius bending and results in outer jacket and metal sheath being damaged.
f) Sidewall pressure will damage metal sheath when pulling at 90 degrees utilizing a pulley if proper rigging and sufficient manpower is not utilized.
g) supports - utilizing unistrut strap damages jacket and armor of the armored cable and the same with other types of straps utilized for conduit shall not be utilized for armor cables.
h) as a conduit sleeve is utilized for a armored cable, as it emerges through the sleeve a grommeted type connector shall be used so the outer jacket does not get damaged against the bushing or the side of the conduit.
i) Due to the concerns of bonding the armored cable shall always have a ground wire.
j) Manufacturing criteria and installation practices are different between USA and Canada and why Canada installs (if they do) outside when manufacturers' information states not to be used when temperatures less than 17 degrees F. Marking of this type of cable is not consistent with installation practices.

(Log #369)

14- 99 - (503-13(a)): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
COMMENT ON PROPOSAL NO: 14-289
RECOMMENDATION: Accept proposal.
SUBSTANTIATION: The Style Manual states words and terms shall be specific and clear in meaning. The definition of "isolated" does not indicate an ungrounded power supply, but must be inferred. Isolated or isolating transformer secondaries are many times required to be grounded or may be impedence-grounded and use a ground detector. Similar proposals (18-86 and 20-36) have been accepted.
PANEL ACTION: Reject.
PANEL STATEMENT: The original proposal (14-289) says the proposed change is editorial, but in fact a technical change (ungrounded) was introduced, without technical substantiation.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #688)

14- 100 - (503-16(a)): Reject
SUBMITTER: William E. Bickner, Stillwater, MN
COMMENT ON PROPOSAL NO: 14-292
RECOMMENDATION: This proposal should be accepted, either as is, or in principle.
SUBSTANTIATION: It is unclear whether the panel statement means the existing text is intended to be more stringent than Article 250 or the proposed changes would make it more stringent (the proposed change would bring this section into agreement with Article 250, which is not the case now). This part of this section could also simply state "Bonding shall comply with Section 250-100," and still have the same effect.
PANEL ACTION: Reject.
PANEL STATEMENT: Article 503 is intentionally more stringent than Article 250.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
COOK: I agree with submitter of comment and proposal. Current text in 503-16(a) addresses bonding where locknut-bushing and double-locknut contacts are encountered. Proposed text would also address wiring methods with single locknuts and shoulders of connectors, which I believe is the intent of the panel. I do not agree with the Panel Statement.

ARTICLE 504 — INTRINSICALLY SAFE SYSTEMS

(Log #157)

14- 101 - (504): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 14-294
RECOMMENDATION: It was the action of the Technical Correlating Committee that this Proposal be reconsidered by the Panel. The issues of raceway trade size, extracts, and use of soft versus hard metrication were all studied in detail and resolutions were communicated to the Panel prior to the Panel Meeting. It should be noted that all of the other Code-Making Panels accepted the metrication directive. This action will be considered by the Panel as a Public Comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
Incorporate into Article 504 the changes proposed by Proposal 14-294.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #1949)

14- 102 - (504): Reject
SUBMITTER: David Wechsler, Union Carbide Corp.
COMMENT ON PROPOSAL NO: 14-294a
RECOMMENDATION: Replace "identified" with the prior NEC wording.
SUBSTANTIATION: The proposed definition for "identified" contains an important FPN that is fundamental to the entire reason for having this definition. This definition also differs from the Article 100 definition. It was the action of the Technical Correlating Committee that the Article 100 definition be used and that the FPN be eliminated since it contains permissive language that is not permitted by the NEC Style Manual. With the elimination of this definition, the text must be reverted to that of the current code.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel has concluded that the correct terms are now being used.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #158)

14- 103 - (504-2): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 14-294a
RECOMMENDATION: It was the action of the Technical Correlating Committee that further consideration be given to the comments expressed in the voting. The Technical Correlating Committee further directs that the action on this Proposal be rewritten to comply with the NEC Style Manual, with respect to the use of mandatory language in Fine Print Notes. This action will be considered by the Panel as a Public Comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
PANEL STATEMENT: See action on Comment 14-104.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #495)

14- 104 - (504-2, FPN No. 2, FPN No. 3): Accept
SUBMITTER: William T. Fiske, Intertek Testing Services
COMMENT ON PROPOSAL NO: 14-294a
RECOMMENDATION: Omit proposed FPN No. 2 and FPN No. 3.
SUBSTANTIATION: As Mr. Cook suggests in comment on vote, FPN No. 2 contains requirements, contradicting the style manual. FPN No. 3 is so far off the subject, it would tend to confuse more than clarify. Acceptance of this comment would change panel action from accept to accept in part.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #1016)

14- 105 - (504-2-Control Drawing): Accept in Principle
SUBMITTER: Nicholas Ludlam, Factory Mutual Research
COMMENT ON PROPOSAL NO: 14-296
RECOMMENDATION: Proposal 14-296, Move the definition of "Control Drawing" to 500.2 Definitions
Control Drawing. A drawing or other document provided by the manufacturer of the intrinsically safe or associated apparatus, or of the nonincendive field wiring equipment or associated nonincendive field wiring equipment, that details the allowed interconnections between the intrinsically safe and associated apparatus, or between the nonincendive field wiring equipment or associated nonincendive field wiring equipment.
SUBSTANTIATION: The panel has already accepted that control drawings are used for nonincendive field wiring in Proposal 14-83 to 501-4(b), so this definition needs to be in the general section and not just in 504.
PANEL ACTION: Accept in Principle.
Revise the proposed definition as follows and add to 500-2: "Control Drawing. A drawing or other document provided by the manufacturer of the intrinsically safe or associated apparatus, or of the nonincendive field wiring apparatus or associated nonincendive field wiring apparatus, that details the allowed interconnections between the intrinsically safe and associated apparatus, or between the nonincendive field wiring apparatus or associated nonincendive field wiring apparatus."
Replace the definition in 504-2 with the following: "Control Drawing. See definition in 500-2."
PANEL STATEMENT: The panel recognizes the need to define "control drawing" for nonincendive and intrinsic safety and has added an appropriate definition to 500-2.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
COMMENT ON AFFIRMATIVE:
SABAN: Definition of control drawing does and will confuse installers since a point to point drawing is truly required to be done by qualified registered professional engineer. Therefore, definition really should stay inside 504 so that no installation problems will be borne on the installer in the field.

(Log #496)

14- 106 - (504-4): Accept in Principle
SUBMITTER: William T. Fiske, Intertek Testing Services
COMMENT ON PROPOSAL NO: 14-300, 14-301
RECOMMENDATION: Revise as follows:
"All intrinsically safe apparatus shall be ~~approved~~ listed."
SUBSTANTIATION: Listed i.s. apparatus is readily available. Techniques for evaluating intrinsically safe apparatus are highly specialized, and could not be performed outside a qualified testing laboratory. The probable consequences of (allegedly) intrinsically safe apparatus' failure to perform are grave. Acceptance of this comment would change panel action from accept to accept in principle.
PANEL ACTION: Accept in Principle.
Revise 504.4 to read: "Equipment. All intrinsically safe apparatus and associated apparatus shall be listed."
Retain the exception as currently worded.
PANEL STATEMENT: The panel has concluded that "listed" is the proper term and that associated apparatus also should be listed. Removal of the word "approval" from the title is editorial and provides consistency with Article 505.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #497)

14- 107 - (504-4, Exception): Accept
SUBMITTER: William T. Fiske, Intertek Testing Services
COMMENT ON PROPOSAL NO: 14-302
RECOMMENDATION: Panel action should be upheld.
SUBSTANTIATION: This comment relates to Mr. Cook's comment on vote. Per 110-2, all electric apparatus must be approved. The question is whether or not simple apparatus need be listed. By virtue of the very low energy levels involved, simple apparatus is not listed.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
COOK: I disagree with the panel action that prohibits an AHJ from requiring some basis for approval. The definition of simple apparatus in 504-2 requires the device to neither generate nor store more than 1.2 volts, .1 ampere, 25 milliwatts, or 20 microjoules. These devices might not require "listing" for hazardous locations, but as indicated in the comment, very low energy levels are required and determining these energy levels is not something that could be done without some basis acceptable to the authority having jurisdiction. Measuring milliwatts and microjoules is not a task that field inspectors should be required to perform. The basis for approval could be that the device was listed for use in ordinary (unclassified) locations.

(Log #498)

14- 108 - (504-4, Exception): Accept
SUBMITTER: William T. Fiske, Intertek Testing Services
COMMENT ON PROPOSAL NO: 14-303
RECOMMENDATION: Panel action should be upheld.
SUBSTANTIATION: A comment on this proposal, separate from comment on 14-302, is warranted because the panel statement on 14-303 referred back to the 14-302 statement. It should not. Proposal 14-303 was different, and deserves a different response. The panel's reason for rejecting 14-303 should be that the substantiation does not support the proposed removal of the exception.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
COOK: I disagree with the comment and substantiation. The text of the 1999 NEC said "Simple apparatus, as described on control drawing, shall not be required to be approved." The substantiation for the removal of the Exception was that Section 110-2 requires all equipment to be approved. The 1999 text was in direct conflict with one of the most basic requirements of the NEC.

(Log #499)

14- 109 - (504-30(2) Exception No. 1): Reject
SUBMITTER: William T. Fiske, Intertek Testing Services
COMMENT ON PROPOSAL NO: 14-309, 14-310
RECOMMENDATION: Revise as follows:
"... a grounded metal partition or an ~~approved~~ insulating partition."
SUBSTANTIATION: "Identifying" an insulating barrier would accomplish nothing. As component parts, barriers are not generally "listed," and there are no apparent methods available to authorities having jurisdiction to "approve" them. Thus, as noted in Mr. Cook's comment on vote, the best adjective is none at all. Acceptance of this comment changes the panel's action from reject to accept in part.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel concludes that "approved" is the appropriate term in this application.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
COOK: I agree with the submitter. I do not see that there is any difference in an approved insulating partition and an insulating partition. If the AHJ needs to look for something special, then the panel should provide some guidelines for the AHJ to determine if the special insulating partition has been provided.

(Log #500)

14- 110 - (504-30(a)(3)b, FPN No. 2): Reject
SUBMITTER: William T. Fiske, Intertek Testing Services
COMMENT ON PROPOSAL NO: 14-311, 14-312
RECOMMENDATION: Revise as follows:
"Physical barriers such as grounded metal partitions or ~~approved~~ insulating partitions or ~~approved~~ restricted access wiring ducts...".
SUBSTANTIATION: In this context, "approved," makes the fine print note a requirement.
Acceptance of this comment would change panel action from reject to accept in part.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel concludes that "approved" is the appropriate term in this application.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
COOK: I disagree with panel action and panel statement. Restricted access wiring ducts are certainly identified and available with listings from many manufacturers under category (ZOYX) in the UL Green Book. With listed products available, I can not understand any reason for using an unlisted product.

(Log #423)

14- 111 - (504-60(b)): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
COMMENT ON PROPOSAL NO: 14-315
RECOMMENDATION: Accept in principle, revise panel action:
(b) Unclassified or nonhazardous locations. In unclassified or nonhazardous locations where metal raceways <u>metal-covered cables, metal cable trays, or metal auxiliary gutters</u> are used for intrinsically safe system wiring <u>and extended into</u> hazardous (classified) locations <u>they and</u> associated apparatus shall be bonded in accordance with 501-16(a), 502-16(a), 503-16(a), or 502-52, as applicable.
SUBSTANTIATION: Present wording is somewhat confusing. It covers bonding of associated apparatus in unclassified locations where metal raceways are used but doesn't include use of metal-covered cables or metal cable trays. Use of metal raceways is the only reason to require the special bonding. It doesn't seem to require the bonding of metal raceways which extend from the unclassified locations into the classified location. Metal-covered cables can also have junction points where bonding can be done.
PANEL ACTION: Reject.
PANEL STATEMENT: The comment does not address the panel's statement that cable trays and auxiliary gutters are covered elsewhere.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #2196)

14- 112 - (504-60(b)): Accept in Principle
SUBMITTER: Mark Goodman, BP (ARCO)
COMMENT ON PROPOSAL NO: 14-315
RECOMMENDATION: Replace "Nonhazardous" with "Unclassified" in both the section title and text.
SUBSTANTIATION: This comment is in support of the original proposal to change nonhazardous to unclassified.
This proposal should have been "Accept" and not "Accept in Principle". The Panel Action is contrary to the submitter's intent and justification. The correct term is "unclassified" and should be used consistently throughout the code sections to avoid confusion and misapplication.
PANEL ACTION: Accept in Principle.
Change section title to "Unclassified Locations" and delete the words "or nonhazardous" in the text.
PANEL STATEMENT: The panel action removes redundant terms.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #2197)

14- 113 - (504-60(b)): Accept
SUBMITTER: Mark Goodman, BP (ARCO)
COMMENT ON PROPOSAL NO: 14-316
RECOMMENDATION: Replace "Nonhazardous" with "Unclassified" in both the title and text.
SUBSTANTIATION: This comment is in support of the original proposal and substantiation.
This proposal should have been "Accept" and not "Accept in Principle in Part". The Panel Action is contrary to the submitter's intent and justification. The correct term is "unclassified" and should be used consistently throughout the code sections to avoid confusion and misapplication. This proposal along with other companion proposals referenced in the submitter's substantiation are designed to remove the term "nonhazardous" from the NEC, not add and define the term.
PANEL ACTION: Accept.
PANEL STATEMENT: See action on Comment 14-112.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #689)

14- 114 - (504-80(b)): Accept in Principle
Note: The Technical Correlating Committee understands that the action on this comment further modifies the action on Comment 14-115.
SUBMITTER: William E. Bickner, Stillwater, MN
COMMENT ON PROPOSAL NO: 14-317
RECOMMENDATION: This proposal should be accepted.
SUBSTANTIATION: What is the panel's definition of the term "open wiring"? My understanding is that it is individual conductors that are not part of a cable assembly or are not installed in a raceway, and I believe that the term is used in that context in other Code Articles.
PANEL ACTION: Accept in Principle.
Replace the words "open wiring" with "other wiring methods".
PANEL STATEMENT: This action meets the intent of the commenter and provides the required identification in all wiring methods.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #1529)

14- 115 - (504-80(b)): Accept in Principle in Part
SUBMITTER: Michael J. Johnston, International Association of Electrical Inspectors
COMMENT ON PROPOSAL NO: 14-318
RECOMMENDATION: This proposal should be accepted in principle and revised as follows:
(b) Wiring. Raceways, cable trays, and open wiring for intrinsically safe system wiring shall be identified with permanently affixed labels with the wording "Intrinsic Safety Wiring" or equivalent. The label

shall be located so as to be visible after installation and placed so that they may be readily traced through the entire length of the installation. Exposed isolated sections of raceways, cables, and open wiring shall be labeled. Spacing between labels shall not be more than ~~25~~ 10 ft (7.62 m).
SUBSTANTIATION: We request that the panel reconsider the panel action on proposal 14-318. This proposal has identified a probable safety concern relating to rooms or spaces less than 25 feet which can leave sections of these raceways or cables without the proper identification labels. By reducing the spacing requirement from 25 feet to 10 feet the possibility of having isolated sections of unmarked intrinsically safe circuits is reduced. Examples include intrinsically safe conduit and cabling systems that run through small rooms, blind stairwells, corridors, and other similar isolated or congested areas.
PANEL ACTION: Accept in Principle in Part.
Revise 504-80(b) to read: "Raceways, cable trays, and open wiring for intrinsically safe system wiring shall be identified with permanently affixed labels with the wording "Intrinsic Safety Wiring" or equivalent. The label shall be located so as to be visible after installation and placed so that they may be readily traced through the entire length of the installation. Intrinsic safety circuit labels shall appear in every section of the wiring system that is separated by enclosures, walls, partitions, or floors. Spacing between labels shall not be more than 7.5 m (25 ft)."
PANEL STATEMENT: The panel action meets the intent of the commenter. This action ensures that the I.S. circuit can be traced through separated areas. Reducing the maximum length between labels may not accomplish this objective.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #1906)

14- 116 - (504-80(b)): Accept in Principle in Part
SUBMITTER: Michael I. Callanan, International Brotherhood of Electrical Workers
COMMENT ON PROPOSAL NO: 14-318
RECOMMENDATION: Accept this proposal in principle, revised as follows:
(b) Wiring. Raceways, cable trays, and open wiring for intrinsically safe system wiring shall be identified with permanently affixed labels with the wording "Intrinsic Safety Wiring" or equivalent. The labels shall be located so as to be visible after installation and placed so that they may be readily traced through the entire length of the installation. Exposed Isolated sections of raceways, cables, and open wiring shall be labeled. Spacing between labels shall not be more than ~~25~~ 10-ft (7.62 m).
SUBSTANTIATION: We request that the panel reconsider the panel action on proposal 14-318. This proposal has identified a probable safety concern relating to rooms or spaces less that 25 feet which can leave sections of these raceways or cables without the proper Identification labels. By reducing the spacing requirement from 25 feet to 10 feet the possibility of having isolated sections of unmarked Intrinsically safe circuits is reduced. Examples include Intrinsically safe conduit and cabling systems that run through small rooms, blind stairwells, corridors, and other similar isolated or congested areas.
This comment represents the official position of the International Brotherhood of Electrical Workers Codes & Standards Committee.
PANEL ACTION: Accept in Principle in Part.
PANEL STATEMENT: See action on Comment 14-115.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

ARTICLE 505 — CLASS I, ZONE 0, 1 AND 2 LOCATIONS

(Log #159)

14- 117 - (505): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 14-318a
RECOMMENDATION: The Technical Correlating Committee advises that Article Scope statements are the responsibility of the Technical Correlating Committee and the Technical Correlating Committee accepts the Panel Action. Further, it was the action of the Technical Correlating Committee that this Proposal be reconsidered by the Panel, with further consideration given to the comments expressed in the voting, specifically with respect to comments that the accepted Proposal does not accurately reflect what was agreed upon by the Panel. It is the understanding of the Technical Correlating Committee that this proposal is modified by Proposals 14-323, 14-324, 14-325, 14-326 14-327, 14-328, 14-329, 14-330, 14-331, 14-334, 14-335, 14-336, 14-338, 14-339, 14-340, 14-341, 14-342, 14-344, 14-345, 14-346, 14-349, 14-350, 14-352, 14-354, 14-355, 14-356, 14-357, 14-358, 14-359, 14-360, 14-361, 14-365, 14-366, 14-368, 14-369, 14-370, 14-371, 14-372, 14-374, and 14-375. This action will be considered by the Panel as a Public Comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
See action on Comment 14-126.
PANEL STATEMENT: The panel action on Comment 14-126 will reflect the complete text of Article 505.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #160)

14- 118 - (505): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 14-319
RECOMMENDATION: It was the action of the Technical Correlating Committee that this Proposal be reconsidered by the Panel. The issues of raceway trade size, extracts, and use of soft versus hard metrication were all studied in detail and resolutions were communicated to the Panel prior to the Panel Meeting. It should be noted that all of the other Code-Making Panels accepted the metrication directive. This action will be considered by the Panel as a Public Comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
See action on Comment 14-126.
PANEL STATEMENT: The panel action on Comment 14-126 will reflect the complete text of Article 505.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #1341)

14- 119 - (505): Accept
SUBMITTER: Mike O'Meara, A.P.S.
COMMENT ON PROPOSAL NO: 14-318a
RECOMMENDATION: Revise text as follows:
I agree with the panel action to accept this proposal but feel the proposal should not incorporate the panel actions on Proposals 14-319 or 14-348.
SUBSTANTIATION: By rejecting proposal #14-319 the proposed wording in the Article 505 rewrite is not in compliance with the NFPA Manual of Style, Chapter 4. The panel action on Proposal 14-348 should not be included so that the requirement for a "qualified registered professional engineer" is maintained.
PANEL ACTION: Accept.
See action on Comment 14-126.
PANEL STATEMENT: The panel action on Comment 14-126 will reflect the complete text of Article 505.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #1395)

14- 120 - (505): Accept in Principle
SUBMITTER: Kari Barrett, American Chemistry Council
COMMENT ON PROPOSAL NO: 14-320
RECOMMENDATION: Use the rewrite from Mr. Wechsler's ballot as stated in the balloting comments for 14-318a, as the starting textual basis for all actions on public comments to Article 505 proposals.

SUBSTANTIATION: As stated under the balloting comments of the Panel 14 committee, due to the errors that the Committee felt existed with the presented rewrite texts, that are corrected by the rewrite addressed by the Wechsler submitted ballot, this "Wechsler" rewrite should be the starting textual basis for Panel actions.
PANEL ACTION: Accept in Principle.
See action on Comment 14-126.
PANEL STATEMENT: The panel action on Comment 14-126 will reflect the complete text of Article 505.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #1399)

14- 121 - (505): Accept in Principle
SUBMITTER: Kari Barrett, American Chemistry Council
COMMENT ON PROPOSAL NO: 14-318a
RECOMMENDATION: Use the rewrite from Mr. Wechsler's ballot as stated in the balloting comments for this proposal, as the starting textual basis for all actions on public comments to Article 505 proposals.
SUBSTANTIATION: As stated under the balloting comments of the Panel 14 committee, due to the errors that the Committee felt existed with the presented rewrite texts, that are corrected by the rewrite addressed by the Wechsler submitted ballot, this "Wechsler" rewrite should be the starting textual basis for Panel actions.
PANEL ACTION: Accept in Principle.
See action on Comment 14-126.
PANEL STATEMENT: See action on Comment 14-126.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #1491)

14- 122 - (505): Accept
SUBMITTER: David N. Bishop, David N. Bishop, Consultant
COMMENT ON PROPOSAL NO: 14-318a
RECOMMENDATION: Delete: "Nonhazardous Locations. Locations which are not required to have been evaluated by the process defined in 500-~~3~~5 (a) or 505-~~3~~5(a).
SUBSTANTIATION: Inclusion of this definition will cause a most serious safety problem. Craftsmen engineers, etc., in the industry have used the term "nonhazardous location" of "unclassified location" as being synonymous for many years. This proposed definition would create "mass confusion" and likely would lead to unsafe installations. (Incidentally the word "which" should be "that" in accordance with prevailing style manuals.)
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #1950)

14- 123 - (505): Reject
SUBMITTER: David Wechsler, Union Carbide Corp.
COMMENT ON PROPOSAL NO: 14-318a
RECOMMENDATION: Replace "identified" with the prior NEC wording.
SUBSTANTIATION: The proposed definition for "identified" contains an important FPN that is fundamental to the entire reason for having this definition. This definition also differs from the Article 100 definition. It was the action of the Technical Correlating Committee that the Article 100 definition be used and that the FPN be eliminated since it contains permissive language that is not permitted by the NEC Style Manual. With the elimination of this definition, the text must be reverted to that of the current code.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel concludes that the appropriate wording has been used and is reflected in the action of Comment 14-126.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #2065)

14- 124 - (505): Accept in Principle
SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc.
COMMENT ON PROPOSAL NO: 14-318a
RECOMMENDATION: Relocate 505.15(D) to 505.20(E)
SUBSTANTIATION: This material covers an equipment installation requirement and not a wiring method provision. In addition, if it is moved, it will allow better editorial flexibility around however Proposal 14-364 needs to be worked through in the comment meeting.
PANEL ACTION: Accept in Principle.
Relocate the text in question to 505-7(d).
PANEL STATEMENT: The panel agrees that the text is not appropriate for wiring methods. The text has been relocated to 505-7(d).
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #2198)

14- 125 - (505): Accept
SUBMITTER: Mark Goodman, BP (ARCO)
COMMENT ON PROPOSAL NO: 14-318a
RECOMMENDATION: Delete the term and definition of "Nonhazardous" from the revised Article 505, Section 505-2 Definitions.
SUBSTANTIATION: This comment recommends the removal of the term, Nonhazardous, its definition, and use for the following reasons.
1. This term was added as part of the Panel Chairman assigned Task group responsible for reorganizing the information in Article 505. This term and definition are new material and beyond the scope of the Panel Chair's direction.
2. The added term and definition was not part of any proposal made to the panel and has no substantiation for its inclusion.
3. Several proposals (14-316, 14-323, and 14-352 &14-356) specifically requested that the term "nonhazardous" currently used in the Article be deleted and substituted with the term "unclassified".
4. This term adds an additional area classification location that does not currently exist in related standards and practices (API 500, 505, and NFPA 497 for example) or in most company documentation systems.
5. The term is misleading. The implication of "nonhazardous" is that there are no hazards. There are hazards other than electrical area classification such as caustics, acids, radiation, etc. Using the term "unclassified" is becoming widely accepted and recognized as specific to electrical area classification. "Nonhazardous" is much too broad.
6. The term is not needed. An area is either "Classified", requiring specifically identified or approved equipment suitable for the location or "Unclassified", not requiring equipment so identified or approved. The term will only add confusion and potential misapplication.
7. By its definition, "Nonhazardous Locations. Locations which are not required to have been evaluated". Whoever makes the determination that the location is not required to be evaluated has just evaluated the location. It is also not at all clear how or who would make that determination.
For the above reasons, the term "Nonhazardous", its definition and use should be removed from Article 505 (and 500).
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #2229)

14- 126 - (505): Accept in Principle

Note: The Technical Correlating Committee directs that the last sentence of the 505-2, FPN following the definition of Electrical and Electronic Equipment be deleted since it contains mandatory requirements which are not permitted in a FPN.

The Technical Correlating Committee directs that "Table 505-7" be changed to "Table 505-7(d)".

The Technical Correlating Committee directs that "Table 505-9(b)(2)" be changed to "Table 505-9(c)".

The Technical Correlating Committee directs that "Table 505-9(3)" be changed to "Table 505-9(d)(1)".

The Technical Correlating Committee directs that "Table 505-9(b)(2)" be changed to "Table 505-9(c)(2)(d)".

The Technical Correlating Committee directs that "Table 505-9(b)(2)" be changed to "Table 505-9(c)".

The Technical Correlating Committee directs that "Figure 505-9(b)(1)" be changed to "Figure 505-9(c)(2)".

The Technical Correlating Committee directs that "Figure 505-9(b)(1)" be changed to "Figure 505-9(c)(2)" and the reference in the 4th line of the Figure be changed from "505-5, FPN No.2" to "505-6, FPN No. 2".

The Technical Correlating Committee directs that "Table 505-9(b)(1)" be changed to "Table 505-9(c)(2)(d)".

The Technical Correlating Committee directs that "Table 505-9(b)(2)" be changed to "Table 505-9(c)".

SUBMITTER: James D. Cospolich, Waldemar S. Nelson & Co., Inc.

COMMENT ON PROPOSAL NO: 14-318a

RECOMMENDATION: Please see the following revised text which represents what I believe to be the correct wording that Code Making Panel 14 voted on and accepted during the January 2000 ROP meeting. The shaded wording represents what I consider to be revisions and corrections. Some of this shaded wording is very important for the technical accuracy and intent of the article.

ARTICLE 505 -- Class I, Zone 0, 1, and 2 Locations

505-1 Scope [unchanged]

This article covers the requirements for the zone classification system as an alternative to the division classification system covered in Article 500 for electrical and electronic equipment and wiring for all voltages in Class I, Zone 0, Zone 1, and Zone 2 hazardous (classified) locations where fire or explosion hazards may exist due to flammable gases, vapors, or liquids.

FPN: For the requirements for electrical and electronic equipment and wiring for all voltages in Class I, Division 1 or Division 2; Class II, Division 1 or Division 2; and Class III, Division 1 or Division 2 hazardous (classified) locations where fire or explosion hazards may exist due to flammable gases or vapors, flammable liquids, or combustible dusts or fibers, refer to Articles 500 through 504.

[new] 505-2 Definitions. For purposes of this article, the following definitions apply. [14-320,CP140x]

Identified (as applied to equipment). Recognizable as suitable for the specific purpose, function, use, environment, application, etc., where prescribed in a particular Code requirement.

FPN: Suitability of equipment for a specific purpose, environment, or application may be determined by:

1. equipment listing or labeling;
2. **evidence of equipment evaluation from a qualified testing laboratory or inspection agency concerned with product evaluation; or**
3. other evidence acceptable to the authority having jurisdiction such as a manufacturer's self certification or an owner's engineering judgment.

(See definitions of *Labeled* and *Listed*)

[CP140?-500 rewrite, Panel action Cook actions, correlation w/500]

Unclassified Locations. Locations that have been evaluated by the classification process defined in Section 500-5(a) or Section 505-5 (a) and determined to be neither Class I, Division 1; Class I, Division 2; Class I, Zone 0; Class I, Zone 1; Class I, Zone 2; Class II, Division 1; Class II, Division 2; Class III, Division 1; Class III, Division 2; or any combination thereof. [14-323, CP140x]

Nonhazardous Locations. Locations which are not required to have been evaluated by the process defined in 500-5 (a) or 505-5 (a). [CP140x]

Electrical and Electronic Equipment. Materials, fittings, devices, appliances, and the like that are part of, or in connection with an electrical installation, as well as any portable or transportable device having a battery or other electrical power source. (14-6)

Flameproof. Type of protection where the enclosure will withstand an internal explosion of a flammable mixture that has penetrated into the interior, without suffering damage and without causing ignition, through any joints or structural openings in the enclosure, of an external explosive gas atmosphere consisting of one or more of the gases or vapors for which it is designed.

FPN: See Electrical Apparatus for Use In Class I, Zone 1 and 2 Hazardous (Classified) Locations, Type of Protection — Flameproof "d," ISA S12.22.01-1998; Electrical Apparatus for Explosive Gas Atmospheres, Part 1 — Construction and Verification Test of Flameproof Enclosures of Electrical Apparatus, IEC 60079-1-1990 and Amendment No. 1 (1993).

Purged and Pressurized. Type of protection for electrical equipment that uses the technique of guarding against the ingress of the external atmosphere, which may be explosive, into an enclosure by maintaining a protective gas therein at a pressure above that of the external atmosphere.

FPN No. 1: See Standard for Purged and Pressurized Enclosures for Electrical Equipment, NFPA 496-1998.

FPN No. 2: See Electrical Apparatus for Explosive Gas Atmospheres - Part 2: Electrical Apparatus, Type of Protection "p," IEC 60079-2-1983; and Electrical Apparatus for Explosive Gas Atmospheres - Part 13: Construction and Use of Rooms or Buildings Protected by Pressurization, IEC 60079-13-1982.

Intrinsic Safety. Type of protection where any spark or thermal effect is incapable of causing ignition of a mixture of flammable or combustible material in air under prescribed test conditions.

FPN No. 1: See Intrinsically Safe Apparatus and Associated Apparatus for Use in Class I, II, and III, Hazardous Locations, ANSI/UL 913-1997; Electrical Apparatus for Use in Class I, Zones 0, 1 and 2 Hazardous (Classified) Locations - Intrinsic Safety "i", ISA S12.02.01-1999; Electrical Apparatus for Explosive Gas Atmospheres — Part 11: Intrinsic Safety "i," IEC 60079-11-1999.

FPN No. 2: Intrinsic safety is designated type of protection "ia" by ISA S12.02.01 and IEC 60079-11 for use in Zone 0 locations. Intrinsic safety is designated type of protection "ib" by ISA S12.02.01 and IEC 60079-11 for use in Zone 1 locations.

FPN No. 3: Intrinsically safe associated apparatus, designated by [ia] or [ib], is connected to intrinsically safe equipment ("ia" or "ib" respectively), but is located outside the hazardous (classified) location unless also protected by another type of protection (such as flameproof).

Type of Protection "n." Type of protection where electrical equipment, in normal operation, is not capable of igniting a surrounding explosive gas atmosphere and a fault capable of causing ignition is not likely to occur.

FPN: see Electrical Apparatus for Explosive Gas Atmospheres, Part 15 — Electrical Apparatus with Type of Protection "n," IEC 60079-15-1987.

Oil Immersion "o." Type of protection where electrical equipment is immersed in a protective liquid in such a way that an explosive atmosphere that may be above the liquid or outside the enclosure cannot be ignited.

FPN: See Electrical Apparatus for Use in Class I, Zone 1 Hazardous (Classified) Locations, Type of Protection — Oil-Immersion "o," ISA S12.26.01 — 1998; and Electrical Apparatus for Explosive Gas Atmospheres, Part 6 — Oil-Immersion "o," IEC 60079-6-1995.

Increased Safety "e." Type of protection applied to electrical equipment that does not produce arcs or sparks in normal service and under specified abnormal conditions, in which additional measures are applied so as to give increased security against the possibility of excessive temperatures and of the occurrence of arcs and sparks.

FPN: See Electrical Apparatus for Use in Class I,

Zone 1 Hazardous (Classified) Locations, Type of Protection — Increased Safety "e," ISA S12.16.01-1998; and Electrical Apparatus for Explosive Gas Atmospheres — Part 7: Increased Safety "e," IEC 60079-7-1990, Amendment No. 1 (1991), and Amendment No. 2 (1993).

Encapsulation "m." Type of protection where electrical parts that could ignite an explosive atmosphere by either sparking or heating are enclosed in a compound in such a way that this explosive atmosphere cannot be ignited.

FPN: See Electrical Apparatus for Use in Class I, Zone 1 Hazardous (Classified) Locations Type of Protection — Encapsulation "m," ISA S12.23.01-1998, and Electrical Apparatus for Explosive Gas Atmospheres — Part 18: Encapsulation "m," IEC 60079-18-1992.

Powder Filling "q." Type of protection where electrical parts capable of igniting an explosive atmosphere are fixed in position and completely surrounded by filling material (glass or quartz powder) to prevent the ignition of an external explosive atmosphere.
FPN: See Electrical Apparatus for Use in Class I, Zone 1 Hazardous (Classified) Locations Type of Protection — Powder Filling "q," ISA S12.25.01-1996, and Electrical Apparatus for Explosive Gas Atmospheres — Part 5: Powder Filling, Type of Protection "q," IEC 60079-5-1967.

505-3. ~~[505-2]~~Other Articles
All other applicable rules contained in this Code shall apply to electrical equipment and wiring installed in hazardous (classified) locations.
Exception: As modified by Article 504 and this article.

505-4 General
(a) ~~[505-10 (c)]~~ Documentation for Industrial Occupancies.
All areas in industrial occupancies designated as hazardous (classified) locations shall be properly documented. This documentation shall be available to those authorized to design, install, inspect, maintain, or operate electrical equipment at the location.

FPN: For examples of area classification drawings, see Recommended Practice for Classification of Locations for Electrical Installations Classified as Class I, Zone 0, Zone 1, or Zone 2, ISA RP12.24.01-1998; Recommended Practice for Classification of Locations for Electrical Installations at Petroleum Facilities Classified as Class I, Zone 0, Zone 1, or Zone 2, ANSI/API RP 505-1997; Electrical Apparatus for Explosive Gas Atmospheres, Classification of Hazardous Areas, IEC 60079-10-1995; and Model Code of Safe Practice in the Petroleum Industry, Part 15: Area Classification Code for Petroleum Installations, IP 15, The Institute of Petroleum, London.

(b) ~~[505-5]~~ Reference Standards.

FPN No. 1: It is important that the authority having jurisdiction be familiar with recorded industrial experience as well as with standards of the National Fire Protection Association (NFPA), the American Petroleum Institute (API), the Instrument Society of America (ISA), and the International Electrotechnical Committee (IEC) that may be of use in the classification of various locations, the determination of adequate ventilation, and the protection against static electricity and lightning hazards.
FPN No. 2: For further information on the classification of locations, see Recommended Practice for Classification of Locations for Electrical Installations Classified as Class I, Zone 0, Zone 1, or Zone 2, ISA RP12.24.01-1998; Recommended Practice for Classification of Locations for Electrical Installations at Petroleum Facilities Classified as Class I, Zone 0, Zone 1, or Zone 2, ANSI/API RP 505-1997; Electrical Apparatus for Explosive Gas Atmospheres, Classification of Hazardous Areas, IEC 60079-10-1995; and Model Code of Safe Practice in the Petroleum Industry, Part 15: Area Classification Code for Petroleum Installations, IP 15, The Institute of Petroleum, London.
FPN No. 3: For further information on protection against static electricity and lightning hazards in hazardous (classified) locations, see Recommended Practice on Static Electricity, NFPA 77-1993; Standard for the Installation of Lightning Protection Systems, NFPA 780-1997; and Protection Against Ignitions Arising Out of Static Lightning and Stray Currents, API RP 2003-1991.
FPN No. 4: For further information on ventilation, see Flammable and Combustible Liquids Code, NFPA 30-1996, and Recommended Practice for Classification of Locations for Electrical Installations at Petroleum Facilities Classified as Class I, Zone 0, Zone 1, or Zone 2, ANSI/API RP 505-1997, Section 6.6.
FPN No. 5: For further information on electrical systems for hazardous (classified) locations on offshore oil and gas producing platforms, see Recommended Practice for Design and Installation of Electrical Systems for Fixed and Floating Offshore Petroleum Facilities for Unclassifed and Class I, Zone 0, Zone 1, and Zone 2 Locations, ANSI/API RP 14FZ-2000.
FPN No. 6: For further information on the installation of electrical equipment in hazardous (classified) locations in general, see Electrical Apparatus for Explosive Gas Atmospheres — Part 14: Electrical Installations in Explosive Gas Atmospheres (Other than Mines), IEC 60079-14-1996, and Electrical Apparatus for Explosive Gas Atmospheres — Part 16: Artificial Ventilation for the Protection of Analyzer(s) Houses, IEC 60079-16-1990.
FPN No. 7: For further information on application of electrical equipment in hazardous (classified locations in general, see Electrical Apparatus for Use in Class I, Zones 0 and 1, Hazardous (Classified) Locations: General Requirements, ISA S12.00.01-1999; and Definitions and Information Pertaining to Electrical Apparatus in Hazardous (Classified) Locations, ISA S12.01.01-1999.

505-5 Classifications of Locations

(a) ~~[505-3(a)]~~Classification of Locations. Locations shall be classified depending on the properties of the flammable vapors, liquids, or gases that may be present and the likelihood that a flammable or combustible concentration or quantity is present. Where pyrophoric materials are the only materials used or handled, these locations shall not be classified.
Each room, section, or area shall be considered individually in determining its classification.

FPN No. 1: See Section 505-7 for restrictions on area classification.
FPN No. 2: Through the exercise of ingenuity in the layout of electrical installations for hazardous (classified) locations, it is frequently possible to locate much of the equipment in reduced level of classification or in an unclassified location and, thus, to reduce the amount of special equipment required. [14-323]

Rooms and areas containing ammonia refrigeration systems that are equipped with adequate mechanical ventilation, may be classified as "unclassified" locations.

FPN: For further information regarding classification and ventilation of areas involving ammonia, see Safety Code for Mechanical Refrigeration, ANSI/ASHRAE 15-1994, and Safety Requirements for the Storage and Handling of Anhydrous Ammonia, ANSI/CGA G2.1-1989 (14-39)

(b) Class I Zone Locations.
Class I Zone locations are those in which flammable gases or vapors are or may be present in the air in quantities sufficient to produce explosive or ignitible mixtures. Class I Zone locations shall include those specified in (1), (2) and (3).

(1) ~~[505-9 (a)]~~ Class I, Zone 0. A Class I, Zone 0 location is a location
(a) ~~[505-9 (a) (1)]~~ In which ignitible concentrations of flammable gases or vapors are present continuously, or
(b) ~~[505-9 (a) (2)]~~ In which ignitible concentrations of flammable gases or vapors are present for long periods of time.

FPN No. 1: As a guide in determining when flammable gases or vapors are present continuously or for long periods of time, refer to Recommended Practice for Classification of Locations for Electrical Installations of Petroleum Facilities Classified as Class I, Zone 0, Zone 1 or Zone 2, ANSI/API RP 505-1997; Recommended Practice for Classification of Locations for Electrical Installations Classified as Class I, Zone 0, Zone 1, or Zone 2, ISA S12.24.01-1998; Electrical Apparatus for Explosive Gas Atmospheres, Classifications of Hazardous Areas, IEC 60079-10-1995; and Area Classification Code for Petroleum Installations, Model Code, Part 15, Institute of Petroleum.

FPN No. 2: This classification includes locations inside vented tanks or vessels that contain volatile flammable liquids; inside inadequately vented spraying or coating enclosures, where volatile flammable solvents are used; between the inner and outer roof sections of a floating roof tank containing volatile flammable liquids; inside open vessels, tanks and pits containing volatile flammable liquids; the interior of an exhaust duct that is used to vent ignitible concentrations of gases or vapors; and inside inadequately ventilated enclosures that contain normally venting instruments utilizing or analyzing flammable fluids and venting to the inside of the enclosures.

FPN No. 3: It is not good practice to install electrical equipment in Zone 0 locations except when the equipment is essential to the process or when other locations are not feasible. [See Section 505-3(a) FPN No. 2.] If it is necessary to install electrical systems in a Zone 0 location, it is good practice to install intrinsically safe systems as described by Article 504.

(2) ~~[505-9 (b)]~~ **Class I, Zone 1**. A Class I, Zone 1 location is a location
(a) ~~[505-9 (b) (1)]~~ In which ignitible concentrations of flammable gases or vapors are likely to exist under normal operating conditions; or
(b) ~~[505-9 (b) (2)]~~ In which ignitible concentrations of flammable gases or vapors may exist frequently because of repair or maintenance operations or because of leakage; or
(c) ~~[505-9 (b) (3)]~~ In which equipment is operated or processes are carried on, of such a nature that equipment breakdown or faulty operations could result in the release of ignitible concentrations of flammable gases or vapors and also cause simultaneous failure of electrical equipment in a mode to cause the electrical equipment to become a source of ignition; or
(d) ~~[505-9 (b) (4)]~~ That is adjacent to a Class I, Zone 0 location from which ignitible concentrations of vapors could be communicated, unless communication is prevented by adequate positive pressure ventilation from a source of clean air and effective safeguards against ventilation failure are provided.

FPN No. 1: Normal operations is considered the situation when plant equipment is operating within its design parameters. Minor releases of flammable material may be part of normal operations. Minor releases include the releases from mechanical packings on pumps. Failures that involve repair or shutdown (such as the breakdown of pump seats and flange gaskets, and spillage caused by accidents) are not considered normal operation.

FPN No. 2: This classification usually includes locations where volatile flammable liquids or liquefied flammable gases are transferred from one container to another. In areas in the vicinity of spraying and painting operations where flammable solvents are used; adequately ventilated drying rooms or compartments for evaporation of flammable solvents; adequately ventilated locations containing fat and oil extraction equipment using volatile flammable solvents; portions of cleaning and dyeing plants where volatile flammable liquids are used; adequately ventilated gas generator rooms and other portions of gas manufacturing plants where flammable gas may escape; inadequately ventilated pump rooms for flammable gas or for volatile flammable liquids; the interiors of refrigerators and freezers in which volatile flammable materials are stored in the open, lightly stoppered, or easily ruptured containers; and other locations where ignitible concentrations of flammable vapors or gases are likely to occur in the course of normal operation, but not classified Zone 0.

(3) ~~[505-9 (c)]~~ **Class I, Zone 2**. A Class I, Zone 2 location is a location
(a) ~~[505-9 (c) (1)]~~ In which ignitible concentrations of flammable gases or vapors are not likely to occur in normal operation and if they do occur will exist only for a short period; or
(b) ~~[505-9 (c) (2)]~~ In which volatile flammable liquids, flammable gases, or flammable vapors are handled, processed, or used, but in which the liquids, gases, or vapors normally are confined within closed containers of closed systems from which they can escape, only as a result of accidental rupture or breakdown of the containers or system, or as a result of the abnormal operation of the equipment with which the liquids or gases are handled, processed, or used; or
(c) ~~[505-9 (c) (3)]~~ In which ignitible concentrations of flammable gases or vapors normally are prevented by positive mechanical ventilation, but which may become hazardous as a result of failure or abnormal operation of the ventilation equipment; or
(d) ~~[505-9 (c) (4)]~~ That is adjacent to a Class I, Zone 1 location, from which ignitible concentrations of flammable gases or vapors could be communicated, unless such communication is prevented by adequate positive-pressure ventilation from a source of clean air, and effective safeguards against ventilation failure are provided.

FPN: The Zone 2 classification usually includes locations where volatile flammable liquids or flammable gases or vapors are used, but which would become hazardous only in case of an accident or of some unusual operating condition.

505-6 ~~[505-7]~~ Material Groups

~~[505-7]~~ For purposes of testing, approval, and area classification, various air mixtures (not oxygen enriched) shall be grouped as required in (a), (b), and (c).

FPN: Group I is intended for use in describing atmospheres that contain firedamp (a mixture of gases, composed mostly of methane, found underground, usually in mines). This Code does not apply to installations underground in mines. See Section 90-2(b).

Group II shall be subdivided into IIC, IIB, and IIA, as noted in (a), (b), and (c), according to the nature of the gas or vapor, for protection techniques "d," "ia," "ib," "[ia]," and "[ib]," and, where applicable, "n" and "o."

FPN No. 1: The gas and vapor subdivision as described above is based on the maximum experimental safe gap (MESG), minimum igniting current (MIC), or both. Test equipment for determining the MESG is described in Construction and Verification Tests of Flameproof Enclosures of Electrical Apparatus, IEC 60079-1A-1975, Amendment No. 1 (1993) and UL Technical Report No. 58 (1993). The test equipment for determining MIC is described in Spark-Test Apparatus for Intrinsically-Safe Circuits, IEC 60079-3-1990. The classification of gases or vapors according to their maximum experimental safe gaps and minimum igniting currents is described in Classification of Mixtures of Gases or Vapours with Air According to Their Maximum Experimental Safe Gaps and Minimum Igniting Currents, IEC 60079-12-1978.

FPN No. 2: Verification of electrical equipment utilizing protection techniques "e," "m," "p," and "q," due to design technique, does not require tests involving MESG or MIC. Therefore, Group II is not required to be subdivided for these protection techniques.

FPN No. 3: It is necessary that the meanings of the different equipment markings and Group II classifications be carefully observed to avoid confusion with Class I, Divisions 1 and 2, Groups A, B, C, and D.

(a) Class I Zone Group Classifications. Class I Zone groups shall be as follows:

(1) ~~[505-7 (a)]~~ ˣGroup IIC. Atmospheres containing acetylene, hydrogen, or flammable gas, flammable liquid-produced vapor, or combustible liquid-produced vapor mixed with air that may burn or explode, having either a maximum experimental safe gap (MESG) value less than or equal to 0.50 mm or minimum igniting current ratio (MIC ratio) less than or equal to 0.45.

FPN: Group IIC is equivalent to a combination of Class I, Group A, and Class I, Group B, as described in Sections 500-6 (a) (1) and 6 (a) (2)).

(2) ~~[505-7 (b)]~~ ˣGroup IIB. Atmospheres containing acetaldehyde, ethylene, or flammable gas, flammable liquid-produced vapor, or combustible liquid-produced vapor mixed with air that may burn or explode, having either maximum experimental safe gap (MESG) values greater than 0.50 mm and less than or equal to 0.90 mm or minimum igniting current ratio (MIC ratio) greater than 0.45 and less than or equal to 0.80.

FPN: Group IIB is equivalent to Class I, Group C, as described in Section 500-6 (a)(3).

(3) ~~[505-7 (c)]~~ ˣGroup IIA. Atmospheres containing acetone, ammonia, ethyl alcohol, gasoline, methane, propane, or flammable gas, flammable liquid-produced vapor, or combustible liquid-produced vapor mixed with air that may burn or explode, having either a maximum experiment safe gap (MESG) value greater than 0.90 mm or minimum igniting current ratio (MIC ratio) greater than

0.80.

FPN: Group IIA is equivalent to Class I, Group D as described in Section 500-6 (a)(4).

505-7 ~~[505-6]~~ Special Precaution
Article 505 requires equipment construction and installation that will ensure safe performance under conditions of proper use and maintenance.

FPN No. 1: It is important that inspection authorities and users exercise more than ordinary care with regard to the installation and maintenance of electrical equipment in hazardous (classified) locations.

FPN No. 2: Low ambient conditions require special consideration. Electrical equipment depending on the protection techniques described by Section 505-8 (a) may not be suitable for use at temperatures lower than -25ºC (-13ºF) unless they are approved for use at lower temperatures. However, at low ambient temperatures, flammable concentrations of vapors may not exist in a location classified Class I, Zones 0, 1, or 2 at normal ambient temperature.

~~[505-6(a)]~~ (14-348)

(a) ~~[505-6(b)]~~ Dual Classification. In instances of areas within the same facility classified separately, Class I, Zone 2 locations shall be permitted to abut, but not overlap, Class I, Division 2 locations. Class I, Zone 0 or Zone 1 locations shall not abut Class I, Division 1 or Division 2 locations.

(b) ~~[505-6(c)]~~ Reclassification Permitted. A Class I, Division 1 or Division 2 location shall be permitted to be reclassified as a Class I, Zone 0, Zone 1, or Zone 2 location provided all of the space that is classified because of a single flammable gas or vapor source is reclassified under the requirements of this article.

(c) Solid Obstacles. Flameproof equipment with flanged joints shall not be installed such that the flange openings are closer than the distances shown in Table 505-7 ~~505-15~~ to any solid obstacle that is not a part of the equipment (such as steelworks, walls, weather guards, mounting brackets, pipes, or other electrical equipment) unless the equipment is listed for a smaller distance of separation. [14-364]

Table 505-7 ~~15~~. Minimum Distance of Obstructions from Flameproof "d" Flange Openings

Gas Group	Minimum Distance In.	Minimum Distance Mm
IIC	1 37/64	40
IIB	1 3/16	30
IIA	25/64	10

505- 8 ~~[505-4]~~ Protection Techniques
The following shall be acceptable protection techniques for electrical and electronic equipment in hazardous (classified) locations.

FPN: For additional information, see Electrical Apparatus for Use in Class I, Zones 0 and 1 Hazardous (Classified) Locations General Requirements, ISA S12.00.01-1999; Definitions and Information Pertaining to Electrical Apparatus in Hazardous (Classified) Locations, ISA S12.01.01-1999; Electrical Equipment for Use in Class I, Zone 0, 1, and 2 Hazardous (Classified) Locations, ANSI/UL 2279, 1997; and Electrical Apparatus for Explosive Gas Atmospheres - Part 0: General Requirements, IEC 60079-0-1983, Amendment No. 1 (1987), and Amendment No. 2 (1991).

(a) ~~[505-4(a)]~~ Flameproof "d." This protection technique shall be permitted for equipment in Class I, Zone 1 or Zone 2 locations.

(b) ~~[505-4(b)]~~ Purged and Pressurized. This protection technique shall be permitted for equipment in those Class I, Zone 1 or Zone 2 locations for which it is approved.

(c) ~~[505-4(c)]~~ Intrinsic Safety. This protection technique shall be permitted for equipment in Class I, Zone 0 or Zone 1 locations for which it is approved.

(d) ~~[505-4(d)]~~ Type of Protection "n." This protection technique shall be permitted for equipment in Class I, Zone 2 locations. Type of protection "n" is further subdivided into nA, nC, and nR.

FPN: See Table 505-9(b) (1) for the descriptions of subdivisions for type of protection "n."

(e) ~~[505-4(e)]~~ Oil Immersion "o." This protection technique shall be permitted for equipment in Class I, Zone 1 locations.

(f) ~~[505-4(f)]~~ Increased Safety "e." This protection technique shall be permitted for equipment in Class I, Zone 1 locations.

(g) ~~[505-4(g)]~~ Encapsulation "m." This protection technique shall be permitted for equipment in Class I, Zone 1 locations.

(h) ~~[505-4(h)]~~ Powder Filling "q." This protection technique shall be permitted for equipment in Class I, Zone 1 locations.

505-9 Equipment

(a) ~~[505-10 (a)]~~ Listing.
(1) Equipment that is listed for a Zone 0 location shall be permitted in a Zone 1 or Zone 2 location of the same gas or vapor. Equipment that is listed for a Zone 1 location shall be permitted in a Zone 2 location of the same gas or vapor.

(2) ~~[505-7(d)]~~ Equipment shall be permitted to be listed for a specific gas or vapor, specific mixtures of gases or vapors, or any specific combination of gases or vapors.

FPN: One common example is equipment marked for "IIB + H2."

(b) ~~[505-10(b)]~~ Marking
Equipment shall be marked in accordance with (1) or (2).
(1) ~~[505-10(b)(1)]~~ Division Equipment. Equipment identified for Class I, Division 1 or Class I, Division 2 shall, in addition to being marked in accordance with Section 500-6(d), be permitted to be marked with the following:
a. Class I, Zone 1 or Class I, Zone 2 (as applicable), and
b. Applicable gas classification group(s) in accordance with Table 505-9(b)(2), and
c. Temperature classification in accordance with Section 505-9(3)

(2) ~~[505-10(b)(2)]~~ Zone Equipment. Equipment meeting one or more of the protection techniques described in Section 505-5 shall be marked with the following in the order shown:
a. Class
b. Zone
c. Symbol "AEx"
d. Protection technique(s) in accordance with Table 505-9(b)(2)
e. Applicable gas classification group(s) in accordance with Table 505-9(b)(2)
f. Temperature classification in accordance with Section 505-9(c)
Exception: Intrinsically safe associated apparatus shall be required to be marked only with (c), (d), and (e).

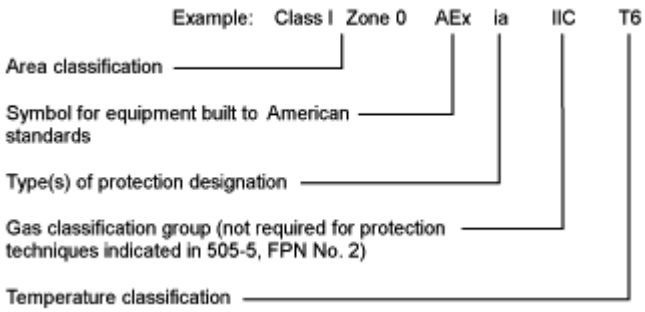
FPN No. 1: An example of such a required marking is "Class I, Zone 0, AEx ia IIC T6."

Electrical equipment of types of protection "e," "m," "p," or "q," shall be marked Group II. Electrical equipment of types of protection "d," "ia," "ib," "[ia]," or "[ib]" shall be marked Group IIA, or IIB, or IIC, or for a specific gas or vapor. Electrical equipment of types of protection "n" shall be marked Group II unless it contains enclosed-break devices, nonincendive components, or energy-limited equipment or circuits, in which case it shall be marked Group IIA, IIB, or IIC, or a specific gas or vapor. Electrical equipment of other types of protection shall be marked Group II unless the type of protection utilized by the equipment requires that it shall be marked Group IIA, IIB, or IIC, or a specific gas or vapor.

FPN No. 2: An explanation of the marking that is required follows.

Figure 505-9(b)(1) ~~[505-10(b)(1)]~~

[FIX THIS REFERENCE ERROR IN FIGURE 505-9: "…indicated in 505-5, FPN



No. 2)" should read "…indicated in 505-6, FPN No.2)"]

Table 505-9(b)(1). Types of Protection Designation

Designation	Technique	Zone*
d	Flameproof enclosure	1
e	Increased safety	1
ia	Intrinsic safety	0
ib	Intrinsic safety	1
[ia]	Intrinsically safe associated apparatus	Unclassified or Nonhazardous
[ib]	Intrinsically safe associated apparatus	Unclassified or Nonhazardous
m	Encapsulation	1
nA	Nonsparking equipment	2
nC	Sparking equipment in which the contacts are suitably protected other than by restricted breathing enclosure	2
nR	Restricted breathing enclosure	2
o	Oil immersion	1
p	Purged and pressurized	1 or 2
q	Powder filled	1

* Does not address use where a combination of techniques is used.

Table 505-9(b)(2). ~~[505-10(b)(2)]~~ Gas Classification Groups

Gas Group	Comment
IIC	See Section 505-6(a)(1)
IIB	See Section 505-6(a) (2)
IIA	See Section 505-6(a)(3)

(c)~~[505-8]~~ Class I Temperature

The temperature marking specified below ~~in Section 505-10(b)~~ shall not exceed the ignition temperature of the specific gas or vapor to be encountered.

FPN: For information regarding ignition temperatures of gases and vapors, see Recommended Practice for the Classification of Flammable Liquids, Gases, or Vapors and of Hazardous (Classified) Locations for Electrical Installations in Chemical Process Areas, NFPA 497-1997; Guide to Fire Hazard Properties of Flammable Liquids, Gases, and Volatile Solids, NFPA 325-1994; and Electrical Apparatus for Explosive Gas Atmospheres, Data for Flammable Gases and Vapours, Relating to the Use of Electrical Apparatus, IEC 60079-20-1996.

(1) ~~[505-10(b)(3)]~~ **Temperature Classifications.** Approved equipment shall be marked to show the operating temperature or temperature class referenced to a 40ºC (104ºF) ambient. The temperature class, if provided, shall be indicated using the temperature class (T Code) shown in Table 505-9 (c).

Table 505-9(c). ~~[505-10(b)(3)]~~ Classification of Maximum Surface Temperature for Group II Electrical Equipment

Temperature Class (T Code)	Maximum Surface Temperature (ºC)
T1	≤450
T2	≤300
T3	≤200
T4	≤135
T5	≤100
T6	≤85

Electrical equipment designed for use in the ambient temperature range between -20ºC and +40ºC shall require no additional temperature marking.

Electrical equipment that is designed for use in a range of ambient temperatures other than -20ºC and +40ºC is considered to be special; and the ambient temperature range shall then be marked on the equipment, including either the symbol "Ta" or "Tamb" together with the special range of ambient temperatures. As an example, such a marking might be "-30ºC Ta + 40ºC."

Electrical equipment suitable for ambient temperatures exceeding 40ºC (104ºF) shall be marked with both the maximum ambient temperature and the operating temperature or temperature class at that ambient temperature.

Exception No. 1: Equipment of the nonheat-producing type, such as conduit fittings, and equipment of the heat-producing type having a maximum temperature of not more than 100ºC (212ºF) shall not be required to have a marked operating temperature or temperature class.

Exception No. 2: Equipment approved for Class I, Division 1 or Division 2 locations as permitted by Sections 505-20(b) and (c) shall be permitted to be marked in accordance with Section 500-6(d) and Table 500-6(d).

(d) ~~[505-3(b))]~~ **Threading**

All threaded conduit or fittings referred to herein shall be threaded with a National (American) Standard Pipe Taper (NPT) standard conduit cutting die that provides _-in. taper per foot. Such conduit shall be made wrenchtight to prevent sparking when fault current flows through the conduit system, and to ensure the explosionproof or flameproof integrity of the conduit system where applicable. Threaded joints shall be made up with at least five threads fully engaged.

Equipment provided with threaded entries for field wiring connections shall be installed in accordance with (1) or (2).

(1) Equipment Provided with Threaded Entries for NPT Threaded Conduit or Fittings. For equipment provided with threaded entries for NPT threaded conduit or fittings, listed conduit, conduit fittings, or cable fittings shall be used.

FPN: Threading specifications for NPT threads are located in Pipe Threads, General Purpose (Inch), ANSI/ASME B1.20.1-1983.

(2) Equipment Provided with Threaded Entries for Metric Threaded Conduit or Fittings. For equipment with metric threaded entries, such entries shall be identified as being metric, or listed adapters to permit connection to conduit or NPT-threaded fittings shall be provided with the equipment. Adapters shall be used for connection to conduit or NPT-threaded fittings. Listed cable fittings that have metric threads shall be permitted to be used.

FPN: Threading specifications for metric threaded entries are located in Metric Screw Threads, ISO 965/1-1980, and Metric Screw Threads, ISO 965/3-1980.

505-15.~~[505-15]~~[14-364] Wiring Methods. Wiring methods shall maintain the integrity of protection techniques and shall comply with (a), (b), or (c).

(a) Class I, Zone 0. In Class I, Zone 0 locations, only intrinsically safe wiring methods in accordance with Article 504 shall be permitted.

FPN: Article 504 only includes protection technique "ia."

(b) Class I, Zone 1.

(1) In Class I, Zone 1 locations, the following wiring methods shall be permitted:

(a) Type MC-HL cable listed for use in Class I, Zone 1 or Division 1 locations, with a gas/vaportight continuous corrugated metallic sheath, an overall jacket of suitable polymeric material, separate grounding conductors in accordance with Section 250-122, and provided with termination fittings listed for the application.

FPN: See Sections 334-3 and 334-4 for restrictions on use of Type MC cable.

(b) Type ITC-HL cable, listed for use in Class I, Zone 1 or Division 1 locations, with a gas/vaportight continuous corrugated metallic sheath, an overall jacket of suitable polymeric material and provided with termination fittings listed for the application.

(c) In industrial establishments with restricted public access, where the conditions of maintenance and supervision ensure that only qualified persons will service the installation, and where the cable is not subject to physical damage, Type TC cable shall be permitted if listed as suitable for use as open wiring and provided with a gas/vaportight overall jacket of suitable polymeric material and provided with separate grounding conductors in accordance with Section 250-122. Cable termination fittings shall be listed for the application. The open wiring shall not exceed lengths of 15 feet.

FPN: Type TC cable listed for use as open wiring meets the crush and impact requirements of Type MC cable.

(d) Type MI cable with termination fittings approved for Class I, Zone 1 or Division 1 locations. Type MI cable shall be installed and supported in a manner to avoid tensile stress at the termination fittings.

(e) Threaded rigid metal conduit, or threaded steel intermediate metal conduit.

(f) Rigid nonmetallic conduit complying with Article 347 shall be permitted where encased in a concrete envelope a minimum of 2 in. (50.8 mm) thick and provided with not less than 24 in. (610 mm) of cover measured from the top of the conduit to grade. Threaded rigid metal conduit or threaded steel intermediate metal conduit shall be used for the last 24 in. (610 mm) of the underground run to emergence or to the point of connection to the aboveground raceway. An equipment grounding conductor shall be included to provide for electrical continuity of the raceway system and for grounding of noncurrent-carrying metal parts.

(2) Where necessary to employ flexible connections, flexible fittings listed for Class I, Zone 1 or Division 1 locations or flexible cord in accordance with the provisions of Section 505-17 shall be permitted.

(c) Class I, Zone 2.

(1) In Class I, Zone 2 locations, the following wiring methods shall be permitted:

(a) All wiring methods permitted by Article 505-15(b).

(b) Types MI, MC, MV, or TC cable with approved termination fittings, or in cable tray systems and installed in a manner to avoid tensile stress at the termination fittings;

(c) Type ITC cable in cable trays, in raceways, supported by messenger wire, where afforded mechanical protection and run as open wiring, or directly buried where the cable is listed for this use;

(d) Type PLTC cable in accordance with the provisions of Article 725, or in cable tray systems. PLTC shall be installed in a manner to avoid tensile stress at the termination fittings;

(e) enclosed gasketed busways, enclosed gasketed wireways;

(f) threaded rigid metal conduit, threaded steel intermediate metal conduit;

(g) Nonincendive field wiring using any of the wiring methods suitable for nonhazardous locations, including Chapter 7 and 8 wiring methods.

(2) Where provision must be made for limited flexibility, flexible metal fittings, flexible metal conduit with approved fittings, liquidtight flexible metal conduit with approved fittings, liquidtight flexible nonmetallic conduit with approved fittings, or flexible cord in accordance with the provisions of Section 505-17 shall be permitted.

FPN: See Section 505-25(b) for grounding requirements where flexible conduit is used.

[new- NFPA check formating]

505-16. Sealing and Drainage. Seals in conduit and cable systems shall comply with (a) through (e). Sealing compound shall be used in Type MI cable termination fittings to exclude moisture and other fluids from the cable insulation.

FPN No. 1: Seals are provided in conduit and cable systems to minimize the passage of gases and vapors and prevent the passage of flames from one portion of the electrical installation to another through the conduit. Such communication through Type MI cable is inherently prevented by construction of the cable. Unless specifically designed and tested for the purpose, conduit and cable seals are not intended to prevent the passage of liquids, gases, or vapors at a continuous pressure differential across the seal. Even at differences in pressure across the seal equivalent to a few inches of water, there may be a slow passage of gas or vapor through a seal, and through conductors passing through the seal. See Section 505-16(c)(2)(b). Temperature extremes and highly corrosive liquids and vapors can affect the ability of seals to perform their intended function. See Section 505-16(d)(2).

FPN No. 2: Gas or vapor leakage and propagation of flames may occur through the interstices between the strands of standard stranded conductors larger than No. 2. Special conductor constructions, e.g., compacted strands or sealing of the individual strands, are means of reducing leakage and preventing the propagation of flames.

(a) Zone 0. In Class I, Zone 0 locations, seals shall be located as follows.

(1) Seals shall be provided within 10 ft (3.05 m) of where a conduit leaves a Zone 0 location. There shall be no unions, couplings, boxes, or fittings, except reducers at the seal, in the conduit run between the seal and the point at which the conduit leaves the location.

Exception: A rigid unbroken conduit that passes completely through the Zone 0 location with no fittings less than 12 in. (305 mm) beyond each boundary, shall not be required to be sealed, if the termination points of the unbroken conduit are in unclassified locations.

(2) Seals shall be provided on cables at the first point of termination after entry into the Zone 0 location.

(3) Seals shall not be required to be explosionproof or flameproof.

(b) Zone 1. In Class I, Zone 1 locations, seals shall be located as follows.

(1) Conduit seals shall be provided for each conduit entering enclosures having type of protection 'd' or 'e'.

Exception: Where the enclosure having type of protection 'd' is marked to indicate that a seal is not required.

(2) Conduit seals shall be provided for each conduit entering explosionproof equipment as follows.

a. In each conduit entry into an explosionproof enclosure where either (1) the enclosure contains apparatus, such as switches, circuit breakers, fuses, relays, or resistors, that may produce arcs, sparks, or high temperatures that are considered to be an ignition source in normal operation, or (2) the entry is 2-in. size or larger and the enclosure contains terminals, splices, or taps. For the purposes of this section high temperatures shall be considered to be any

temperatures exceeding 80 percent of the autoignition temperature in degrees Celsius of the gas or vapor involved.

Exception: Conduit entering an enclosure where such switches, circuit breakers, fuses, relays, or resistors are

1. Enclosed within a chamber hermetically sealed against the entrance of gases or vapors, or

2. Immersed in oil, or

3. Enclosed within a factory-sealed explosionproof chamber located within the enclosure, approved for the location, and marked "factory sealed" or equivalent, unless the entry is 2 in. size or larger.

Factory-sealed enclosures shall not be considered to serve as a seal for another adjacent explosionproof enclosure that is required to have a conduit seal.

b. Conduit seals shall be installed within 18 in. (457 mm) from the enclosure. Only explosionproof unions, couplings, reducers, elbows, capped elbows, and conduit bodies similar to L, T, and Cross types that are not larger than the trade size of the conduit shall be permitted between the sealing fitting and the explosionproof enclosure.

c. Where two or more explosionproof enclosures for which conduit seals are required under (b)(2) are connected by nipples or by runs of conduit not more than 36 in. (914 mm) long, a single conduit seal in each such nipple connection or run of conduit shall be considered sufficient if located not more than 18 in. (457 mm) from either enclosure.

(3) In each conduit entry into a pressurized enclosure where the conduit is not pressurized as part of the protection system. Conduit seals shall be installed within 18 in. (457 mm) from the pressurized enclosure.

FPN No. 1: Installing the seal as close as possible to the enclosure will reduce problems with purging the dead airspace in the pressurized conduit.

FPN No. 2: For further information, see Standard for Purged and Pressurized Enclosures for Electrical Equipment, NFPA 496-1998.

(4) In each conduit run leaving a Class I, Zone 1 location. The sealing fitting shall be permitted on either side of the boundary of such location within 10 ft (3.05 m) of the boundary, and shall be designed and installed so to minimize the amount of gas or vapor within the Zone 1 portion of the conduit from being communicated to the conduit beyond the seal. Except for listed explosionproof reducers at the conduit seal, there shall be no union, coupling, box, or fitting between the conduit seal and the point at which the conduit leaves the Zone 1 location.

Exception: Metal conduit containing no unions, couplings, boxes, or fittings that passes completely through a Class I, Zone 1 location with no fittings less than 12 in. (305 mm) beyond each boundary shall not require a conduit seal if the termination points of the unbroken conduit are in unclassified locations.

(5) Conduits containing cables with a gas/vaportight continuous sheath capable of transmitting gases or vapors through the cable core shall be sealed in the Zone 1 location after removing the jacket and any other coverings so that the sealing compound will surround each individual insulated conductor and the outer jacket.

Exception: Multiconductor cables with a gas/vaportight continuous sheath capable of transmitting gases or vapors through the cable core shall be permitted to be considered as a single conductor by sealing the cable in the conduit within 18 in. (457 mm) of the enclosure and the cable end within the enclosure by an approved means to minimize the entrance of gases or vapors and prevent the propagation of flame into the cable core, or by other approved methods. For shielded cables and twisted pair cables, it shall not be required to remove the shielding material or separate the twisted pair.

(6) Each multiconductor cable in conduit shall be considered as a single conductor if the cable is incapable of transmitting gases or vapors through the cable core. These cables shall be sealed in accordance with (d).

(7) Cable seals shall be provided for each cable entering flameproof or explosionproof enclosures. The seal shall comply with (d).

(8) Cables shall be sealed at the point at which they leave the Zone 1 location.

Exception: Where cable is sealed at the termination point.

(c) Zone 2. In Class I, Zone 2 locations, seals shall be located as follows.

(1) Conduit seals shall be located as follows.

(a) For connections to enclosures that are required to be flameproof or explosionproof, a conduit seal shall be provided in accordance with (b)(1) and (b)(2). All portions of the conduit run or nipple between the seal and such enclosure shall comply with Section 505-16(b).

(2) In each conduit run passing from a Class I, Zone 2 location into an unclassified location. The sealing fitting shall be permitted on either side of the boundary of such location within 10 ft (3.05 m) of the boundary, and shall be designed and installed so to minimize the amount of gas or vapor within the Zone 2 portion of the conduit from being communicated to the conduit beyond the seal. Rigid metal conduit or threaded steel intermediate metal conduit shall be used between the sealing fitting and the point at which the conduit leaves the Zone 2 location, and a threaded connection shall be used at the sealing fitting. Except for listed explosionproof reducers at the conduit seal, there shall be no union, coupling, box, or fitting between the conduit seal and the point at which the conduit leaves the Zone 2 location.

Exception No. 1: Metal conduit containing no unions, couplings, boxes or fittings that passes completely through a Class I, Zone 2 location with no fittings less than 12 in. (305 mm) beyond each boundary shall not be required to be sealed if the termination points of the unbroken conduit are in unclassified locations.

Exception No. 2: Conduit systems terminating at an unclassified location where a wiring method transition is made to cable tray, cablebus, ventilated busway, Type MI cable, or open wiring shall not be required to be sealed where passing from the Class I, Zone 2 location into the unclassified location. The unclassified location shall be outdoors or, if the conduit system is all in one room, it shall be permitted to be indoors. The conduits shall not terminate at an enclosure containing an ignition source in normal operation.

Exception No. 3: Conduit systems passing from an enclosure or room that is unclassified as a result of pressurization into a Class I, Zone 2 location shall not require a seal at the boundary.

FPN: For further information, refer to Standard for Purged and Pressurized Enclosures for Electrical Equipment, NFPA 496-1998.

Exception No. 4: Segments of aboveground conduit systems shall not be required to be sealed where passing from a Class I, Zone 2 location into an unclassified location if the following conditions are met:

1. No part of the conduit system segment passes through a Class I, Zone 0 or Class I, Zone 1 location where the conduit contains unions, couplings, boxes, or fittings within 12 in. (305 mm) of the Class I, Zone 0 or Class I, Zone 1 location; and

2. The conduit system segment is located entirely in outdoor locations; and

3. The conduit system segment is not directly connected to canned pumps, process or service connections for flow, pressure, or analysis measurement, etc., that depend on a single compression seal, diaphragm, or tube to prevent flammable or combustible fluids from entering the conduit system; and

4. The conduit system segment contains only threaded metal conduit, unions, couplings, conduit bodies, and fittings in the unclassified location; and

5. The conduit system segment is sealed at its entry to each enclosure or fitting housing terminals, splices, or taps in Class I, Zone 2 locations.

(3) Cable seals shall be located as follows.

(a) Cables entering enclosures required to be flameproof or explosionproof shall be sealed at the point of entrance. The seal shall comply with (d). Multiconductor cables with a gas/vaportight continuous sheath capable of transmitting gases or vapors through the cable core shall be sealed in the Zone 2 location after removing the jacket and any other coverings so that the sealing compound will surround each individual insulated conductor in such a manner as to minimize the passage of gases and vapors. Multiconductor cables in conduit shall be sealed as described in (b)(4).

Exception No. 1: Cables passing from an enclosure or room that is unclassified as a result of Type Z pressurization into a Class I, Zone 2 location shall not require a seal at the boundary.

Exception No. 2: Shielded cables and twisted pair cables shall not require the removal of the shielding material or separation of the twisted pairs provided the termination is by an approved means to minimize the entrance of gases or vapors and prevent propagation of flame into the cable core.

(b) Cables with a gas/vaportight continuous sheath and that will not transmit gases or vapors through the cable core in excess of the quantity permitted for seal fittings shall not be required to be sealed except as required in (3)(a). The minimum length of such cable run shall not be less than that length that limits gas or vapor flow through the cable core to the rate permitted for seal fittings [0.007 ft3/hour (198 cm3/hour) of air at a pressure of 6 in. of water (1493 pascals)].

FPN No. 1: See Outlet Boxes and Fittings for Use in Hazardous (Classified) Locations, ANSI/UL 886-1994.

FPN No. 2: The cable core does not include the interstices of the conductor strands.

(c) Cables with a gas/vaportight continuous sheath capable of transmitting gases or vapors through the cable core shall not be required to be sealed except as required in (3)(a), unless the cable is attached to process equipment or devices that may cause a pressure in excess of 6 in. of water (1493 pascals) to be exerted at a cable end, in which case a seal, barrier, or other means shall be provided to prevent migration of flammables into an unclassified area.

Exception: Cables with an unbroken gas/vaportight continuous sheath shall be permitted to pass through a Class I, Zone 2 location without seals.

(d) Cables that do not have gas/vaportight continuous sheath shall be sealed at the boundary of the Zone 2 and unclassified location in such a manner as to minimize the passage of gases or vapors into an unclassified location.

FPN: The cable sheath may be either metal or a nonmetallic material.

(d) Class I, Zones 0, 1 and 2. Where required, seals in Class I, Zones 0, 1 and 2 locations shall comply with the following.

(1) Fittings. Enclosures for connections or equipment shall be provided with an integral means for sealing, or sealing fittings for Class I locations shall be used. Sealing fittings shall be accessible. Sealing fittings shall be listed for use with one or more specific compounds and shall be accessible.

(2) Compound. The compound shall provide a seal against passage of gas or vapors through the seal fitting, shall not be affected by the surrounding atmosphere or liquids, and shall not have a melting point of less than 93ºC (200ºF).

(3) Thickness of Compounds. In a completed seal, the minimum thickness of the sealing compound shall not be less than the trade size of the sealing fitting and, in no case, less than 5/8 in. (16 mm).

Exception: Listed cable sealing fittings shall not be required to have a minimum thickness equal to the trade size of the fitting.

(4) Splices and Taps. Splices and taps shall not be made in fittings intended only for sealing with compound, nor shall other fittings in which splices or taps are made be filled with compound.

(5) Conductor Fill. The cross-sectional area of the conductors permitted in a seal shall not exceed 25 percent of the cross-sectional area of a rigid metal conduit of the same trade size unless it is specifically listed for a higher percentage of fill.

(e) Drainage.

(1) Control Equipment. Where there is a probability that liquid or other condensed vapor may be trapped within enclosures for control equipment or at any point in the raceway system, approved means shall be provided to prevent accumulation or to permit periodic draining of such liquid or condensed vapor.

(2) Motors and Generators. Where the authority having jurisdiction judges that there is a probability that liquid or condensed vapor may accumulate within motors or generators, joints and conduit systems shall be arranged to minimize entrance of liquid. If means to prevent accumulation or to permit periodic draining are judged necessary, such means shall be provided at the time of manufacture and shall be considered an integral part of the machine.

(3) Canned Pumps, Process or Service Connections, Etc. For canned pumps, process or service connections for flow, pressure, or analysis measurement, etc., that depend upon a single compression seal, diaphragm, or tube to prevent flammable or combustible fluids from entering the electrical conduit system, an additional approved seal, barrier, or other means shall be provided to prevent the flammable or combustible fluid from entering the conduit system beyond the additional devices or means, if the primary seal fails.

The additional approved seal or barrier and the interconnecting enclosure shall meet the temperature and pressure conditions to which they will be subjected upon failure of the primary seal, unless other approved means are provided to accomplish the purpose above.

Drains, vents, or other devices shall be provided so that primary seal leakage will be obvious.

(14-368)

505-17. Flexible Cords, Class I, Zones 1 and 2. A flexible cord shall be permitted for connection between portable lighting equipment or other portable utilization equipment and the fixed portion of their supply circuit. Flexible cord shall also be permitted for that portion of the circuit where the fixed wiring methods of Section 505-15(b) cannot provide the necessary degree of movement for fixed and mobile electrical utilization equipment, in an industrial establishment where conditions of maintenance and engineering supervision ensure that only qualified persons will install and service the installation, and the flexible cord is protected by location or by a suitable guard from damage. The length of the flexible cord shall be continuous. Where flexible cords are used, the cords shall be as follows:

1. Of a type listed ~~approved~~ for extra-hard usage;
2. Contain, in addition to the conductors of the circuit, a grounding conductor complying with Section 400-23;
3. Connected to terminals or to supply conductors in an approved manner;
4. Be supported by clamps or by other suitable means in such a manner that there will be no tension no the terminal connections; and
5. Be provided with suitable seals where the flexible cord enters boxes, fittings, or enclosures that are required to be explosionproof or flameproof.

Exception: As provided in 505-15(c).

Electric submersible pumps with means for removal without entering the wet-pit shall be considered portable utilization equipment. The extension of the flexible cord within a suitable raceway between the wet-pit and the power source shall be permitted.

Electric mixers intended for travel into and out of open-type mixing tanks or vats shall be considered portable utilization equipment.

FPN: See Section 505-18 for flexible cords exposed to liquids having a deleterious effect on the conductor insulation.

[14-173]

505-18. Conductors and Conductor Insulation.

1) For Type of Protection “e”, field wiring conductors shall be copper. (14-365)

2) Where condensed vapors or liquids may collect on, or come in contact with, the insulation on conductors, such insulation shall be of a type approved for use under such conditions; or the insulation shall

be protected by a sheath of lead or by other approved means. (14-181)

505-19. Live Parts. There shall be no exposed live parts.(14-188)

505-20. Equipment

(a) Zone 0. In Class I, Zone 0 locations, only equipment specifically listed and marked as suitable for the location shall be permitted.

Exception: Intrinsically safe equipment listed for use in Class I, Division 1 locations for the same gas, or as permitted by Section 505-9(a)(2), and with a suitable temperature classification shall be permitted. [correlation Art500 temperature]

(b) Zone 1. In Class I, Zone 1 locations, only equipment specifically identified and marked as suitable for the location shall be permitted. [correlation with Cook identifed & Art 500, CP140?, CP140x,]

Exception: Equipment approved for use in Class I, Division 1 or listed for use in Class I, Zone 0 locations for the same gas, or as permitted by Section 505-9(a)(2) and with a suitable temperature classification shall be permitted.

(c) Zone 2. In Class I, Zone 2 locations, only equipment specifically identified and marked as suitable for the location shall be permitted. [see above]

Exception No. 1: Equipment identified for use in Class I, Zone 0 or Zone 1 locations for the same gas, or as permitted by Section 505-9(a)(2), and with a suitable temperature classification, shall be permitted.

Exception No. 2: Equipment identified for use in Class I, Division 1 or Division 2 locations for the same gas, or as permitted by Section 505-9(a)(2) and with a suitable temperature classification shall be permitted.

Exception No. 3: In Class I, Zone 2 locations, the installation of open or nonexplosionproof or nonflameproof enclosed motors, such as squirrel-cage induction motors without brushes, switching mechanisms, or similar arc-producing devices that are not identified for use in a Class I, Zone 2 location shall be permitted.

FPN No. 1: It is important to consider the temperature of internal and external surfaces that may be exposed to the flammable atmosphere.

FPN No. 2: It is important to consider the risk of ignition due to currents arcing across discontinuities and overheating of parts in multisection enclosures of large motors and generators. Such motors and generators may need equipotential bonding jumpers across joints in the enclosure and from enclosure to ground. Where the presence of ignitible gases or vapors is suspected, clean air purging may be needed immediately prior to and during start-up periods.

(d) Manufacturer's Instructions. Electrical equipment installed in hazardous (classified) locations shall be installed in accordance with the instructions (if any) provided by the manufacturer.

505-21. Multiwire Branch Circuits. In a Class I, Zone 1 location, a multiwire branch circuit shall not be permitted.

Exception: Where the disconnect device(s) for the circuit opens all ungrounded conductors of the multiwire circuit simultaneously. [14-198]

505-22.~~[505-21]~~Increased Safety "e" Motors and Generators. In Class I, Zone 1 locations, Increased Safety "e" motors and generators of all voltage ratings shall be listed for Class I, Zone 1 locations, and shall comply with the following.

1. Motors shall be marked with the current ratio, IA/IN, and time, tE;
2. Motors shall have controllers marked with the model or identification number, output rating (horsepower or kilowatt), full-load amperes, starting current ratio (IA/IN), and time (tE) of the motors that they are intended to protect; the controller marking shall also include the specific overload protection type (and setting, if applicable) that is listed with the motor or generator;
3. Connections shall be made with the specific terminals listed with the motor or generator;
4. Terminal housings shall be permitted to be of substantial, nonmetallic, nonburning material provided an internal grounding means between the motor frame and the equipment grounding connection is incorporated within the housing;
5. The provisions of Part C of Article 430 shall apply regardless of the voltage rating of the motor;
6. The motors shall be protected against overload by a separate overload device that is responsive to motor current. This device shall be selected to trip or shall be rated in accordance with the listing of the motor and its overload protection;
7. Sections 430-34 and 430-44 shall not apply to such motors; and
8. The motor overload protection shall not be shunted or cut out during the starting period.

505-25. Grounding and Bonding. Grounding and bonding shall comply with Article 250 and the following additional requirements.

(a) Bonding. The locknut-bushing and double-locknut types of contacts shall not be depended on for bonding purposes, but bonding jumpers with proper fittings or other approved means of bonding shall be used. Such means of bonding shall apply to all intervening raceways, fittings, boxes, enclosures, etc., between Class I locations and the point of grounding for service equipment or point of grounding of a separately derived system.

Exception: The specific bonding means shall only be required to the nearest point where the grounded circuit conductor and the grounding electrode are connected together on the line side of the building or structure disconnecting means as specified in Sections 250-32(a), (b), and (c), provided the branch-circuit overcurrent protection is located on the load side of the disconnecting means.

FPN: See Section 250-100 for additional bonding requirements in hazardous (classified) locations.

(b) Types of Equipment Grounding Conductors. Where flexible metal conduit or liquidtight flexible metal conduit is used as permitted in Section 505-15(c) and is to be relied on to complete a sole equipment grounding path, it shall be installed with internal or external bonding jumpers in parallel with each conduit and complying with Section 250-102.

Exception: In Class I, Zone 2 locations, the bonding jumper shall be permitted to be deleted where all the following conditions are met.

a. Listed liquidtight flexible metal conduit 6 ft (1.83 m) or less in length, with fittings listed for grounding, is used.

b. Overcurrent protection in the circuit is limited to 10 amperes or less.

c. The load is not a power utilization load.

SUBSTANTIATION: During the January 2000 ROP meeting, Code Making Panel 14 was challenged with a very difficult task due to the large number of proposals that required action, the technical content of the requested revisions, and the Technical Correlating Committee formatting changes. As a result, it was very difficult for the NEC staff assigned to Code Making Panel 14 to keep up with the actions taking place. This comment's intent is to clarify what took place and make necessary revisions.

PANEL ACTION: Accept in Principle.

Revise Article 505 to read as follow:

ARTICLE 505
[Comment 14-126]

Class I, Zone 0, 1, and 2 Locations

505-1 Scope. This article covers the requirements for the zone classification system as an alternative to the division classification system covered in Article 500 for electrical and electronic equipment and wiring for all voltages in Class I, Zone 0, Zone 1, and Zone 2 hazardous (classified) locations where fire or explosion hazards may exist due to flammable gases, vapors, or liquids.

FPN: For the requirements for electrical and electronic equipment and wiring for all voltages in Class I, Division 1 or Division 2; Class II, Division 1 or Division 2; and Class III, Division 1 or Division 2 hazardous (classified) locations where fire or explosion hazards may exist due to flammable gases or vapors, flammable liquids, or combustible dusts or fibers, refer to Articles 500 through 504.

505-2 Definitions. For purposes of this article, the following definitions apply.

Combustible Gas Detection System. A protection technique utilizing stationary gas detectors in industrial establishments which under specific conditions permits the use of equipment suitable for Class I, Zone 2 locations to be used in a Class I, Zone 1 location or the use of equipment suitable for unclassified locations to be used in a Class I, Zone 2 locations.

Electrical and Electronic Equipment. Materials, fittings, devices, appliances, and the like that are part of, or in connection with an electrical installation.

FPN: Portable or transportable equipment having self-contained power supplies, such as battery-operated equipment, could potentially become an ignition source in hazardous (classified) locations. Equipment suitable for the location or safety procedures to ensure safe operation of this equipment should be employed.

Encapsulation "m." Type of protection where electrical parts that could ignite an explosive atmosphere by either sparking or heating are enclosed in a compound in such a way that this explosive atmosphere cannot be ignited.

FPN: See Electrical Apparatus for Use in Class I, Zone 1 Hazardous (Classified) Locations Type of Protection — Encapsulation "m," ISA -- 12.23.01-1998, and Electrical Apparatus for Explosive Gas Atmospheres — Part 18: Encapsulation "m," IEC 60079-18-1992; Electrical Equipment for Use in Class I, Zone 0, 1, and 2 Hazardous (Classified) Locations, ANSI/UL 2279-1997(Part 18).

Flameproof "d". Type of protection where the enclosure will withstand an internal explosion of a flammable mixture that has penetrated into the interior, without suffering damage and without causing ignition, through any joints or structural openings in the enclosure, of an external explosive gas atmosphere consisting of one or more of the gases or vapors for which it is designed.

FPN: See Electrical Apparatus for Use In Class I, Zone 1 and 2 Hazardous (Classified) Locations, Type of Protection — Flameproof "d," ISA -- 12.22.01-1998; Electrical Apparatus for Explosive Gas Atmospheres, Part 1 — Construction and Verification Test of Flameproof Enclosures of Electrical Apparatus, IEC 60079-1-2000; Electrical Equipment for Use in Class I, Zone 0, 1, and 2 Hazardous (Classified) Locations, ANSI/UL 2279-1997(Part 1)

Increased Safety "e." Type of protection applied to electrical equipment that does not produce arcs or sparks in normal service and under specified abnormal conditions, in which additional measures are applied so as to give increased security against the possibility of excessive temperatures and of the occurrence of arcs and sparks.

FPN: See Electrical Apparatus for Use in Class I, Zone 1 Hazardous (Classified) Locations, Type of Protection — Increased Safety "e," ISA -- 12.16.01-1998; and Electrical Apparatus for Explosive Gas Atmospheres — Part 7: Increased Safety "e," IEC 60079-7-1990, Amendment No. 1 (1991), and Amendment No. 2 (1993); Electrical Equipment for Use in Class I, Zone 0, 1, and 2 Hazardous (Classified) Locations, ANSI/UL 2279-1997(Part 7).

Intrinsic Safety "i". Type of protection where any spark or thermal effect is incapable of causing ignition of a mixture of flammable or combustible material in air under prescribed test conditions.

FPN No. 1: See Intrinsically Safe Apparatus and Associated Apparatus for Use in Class I, II, and III, Hazardous Locations, ANSI/UL 913-1997; Electrical Apparatus for Use in Class I, Zones 0, 1 and 2 Hazardous (Classified) Locations - Intrinsic Safety "i", ISA --12.02.01-1999; Electrical Apparatus for Explosive Gas Atmospheres — Part 11: Intrinsic Safety "i," IEC 60079-11-1999; Electrical Equipment for Use in Class I, Zone 0, 1, and 2 Hazardous (Classified) Locations, ANSI/UL 2279-1997(Part 11)

FPN No. 2: Intrinsic safety is designated type of protection "ia" for use in Zone 0 locations. Intrinsic safety is designated type of protection "ib" for use in Zone 1 locations.

FPN No. 3: Intrinsically safe associated apparatus, designated by [ia] or [ib], is connected to intrinsically safe apparatus ("ia" or "ib" respectively), but is located outside the hazardous (classified) location unless also protected by another type of protection (such as flameproof).

Oil Immersion "o." Type of protection where electrical equipment is immersed in a protective liquid in such a way that an explosive atmosphere that may be above the liquid or outside the enclosure cannot be ignited.

FPN: See Electrical Apparatus for Use in Class I, Zone 1 Hazardous (Classified) Locations, Type of Protection — Oil-Immersion "o," ISA -- 12.26.01 — 1998; and Electrical Apparatus for Explosive Gas Atmospheres, Part 6 — Oil-Immersion "o," IEC 60079-6-1995; Electrical Equipment for Use in Class I, Zone 0, 1, and 2 Hazardous (Classified) Locations, ANSI/UL 2279-1997(Part 6).

Powder Filling "q." Type of protection where electrical parts capable of igniting an explosive atmosphere are fixed in position and completely surrounded by filling material (glass or quartz powder) to prevent the ignition of an external explosive atmosphere.

FPN: See Electrical Apparatus for Use in Class I, Zone 1 Hazardous (Classified) Locations Type of Protection — Powder Filling "q," ISA -- 12.25.01-1996, and Electrical Apparatus for Explosive Gas Atmospheres — Part 5: Powder Filling, Type of Protection "q," IEC 60079-5-1996; Electrical Equipment for Use in Class I, Zone 0, 1, and 2 Hazardous (Classified) Locations, ANSI/UL 2279-1997(Part 5).

Purged and Pressurized. Type of protection for electrical equipment that uses the technique of guarding against the ingress of the external atmosphere, which may be explosive, into an enclosure by maintaining a protective gas therein at a pressure above that of the external atmosphere.

FPN No. 1: See Standard for Purged and Pressurized Enclosures for Electrical Equipment, NFPA 496-1998.

FPN No. 2: See Electrical Apparatus for Explosive Gas Atmospheres - Part 2: Electrical Apparatus, Type of Protection "p," IEC 60079-2-2000; and Electrical Apparatus for Explosive Gas Atmospheres - Part 13: Construction and Use of Rooms or Buildings Protected by Pressurization, IEC 60079-13-1982.

Type of Protection "n." Type of protection where electrical equipment, in normal operation, is not capable of igniting a surrounding explosive gas atmosphere and a fault capable of causing ignition is not likely to occur.

FPN: see Electrical Apparatus for Explosive Gas Atmospheres, Part 15 — Electrical Apparatus with Type of Protection "n," IEC 60079-15-2000; Electrical Equipment for Use in Class I, Zone 0, 1, and 2 Hazardous (Classified) Locations, ANSI/UL 2279-1997(Part 15).

Unclassified Locations. Locations determined to be neither Class I, Division 1; Class I, Division 2; Class I, Zone 0; Class I, Zone 1; Class I, Zone 2; Class II, Division 1; Class II, Division 2; Class III, Division 1; Class III, Division 2; or any combination thereof.

505-3. Other Articles. All other applicable rules contained in this Code shall apply to electrical equipment and wiring installed in hazardous (classified) locations.

Exception: As modified by Article 504 and this article.

505-4 General

(a) Documentation for Industrial Occupancies. All areas in industrial occupancies designated as hazardous (classified) locations shall be properly documented. This documentation shall be available to those authorized to design, install, inspect, maintain, or operate electrical equipment at the location.

FPN: For examples of area classification drawings, see Recommended Practice for Classification of Locations for Electrical Installations at Petroleum Facilities Classified as Class I, Zone 0, Zone 1, or Zone 2, ANSI/API RP 505-1997; Recommended Practice for Classification of Locations for Electrical Installations Classified as Class I, Zone 0, Zone 1, or Zone 2, ISA -- RP12.24.01-1998; Electrical Apparatus for Explosive Gas Atmospheres, Classification of Hazardous Areas, IEC 60079-10-1995; and Model Code of Safe Practice in the Petroleum Industry, Part 15: Area Classification Code for Petroleum Installations, IP 15, The Institute of Petroleum, London.

(b) Reference Standards. Important information relating to topics covered in Chapter 5 may be found in other publications.

FPN No. 1: It is important that the authority having jurisdiction be familiar with recorded industrial experience as well as with standards of the National Fire Protection Association (NFPA), the American Petroleum Institute (API), the ISA — Instrumentation, Systems, and Automation Society (ISA), and the International Electrotechnical Commission (IEC) that may be of use in the classification of various locations, the determination of adequate ventilation, and the protection against static electricity and lightning hazards.

FPN No. 2: For further information on the classification of locations, see Recommended Practice for Classification of Locations for Electrical Installations at Petroleum Facilities Classified as Class I, Zone 0, Zone 1, or Zone 2, ANSI/API RP 505-1997; Recommended Practice for Classification of Locations for Electrical Installations Classified as Class I, Zone 0, Zone 1, or Zone 2, ISA -- RP12.24.01-1998; Electrical Apparatus for Explosive Gas Atmospheres, Classification of Hazardous Areas, IEC 60079-10-1995; and Model Code of Safe Practice in the Petroleum Industry, Part 15: Area Classification Code for Petroleum Installations, IP 15, The Institute of Petroleum, London.

FPN No. 3: For further information on protection against static electricity and lightning hazards in hazardous (classified) locations, see Recommended Practice on Static Electricity, NFPA 77-2000; Standard for the Installation of Lightning Protection Systems, NFPA 780-1997; and Protection Against Ignitions Arising Out of Static Lightning and Stray Currents, API RP 2003-1998.

FPN No. 4: For further information on ventilation, see Flammable and Combustible Liquids Code, NFPA 30-2000, and Recommended Practice for Classification of Locations for Electrical Installations at Petroleum Facilities Classified as Class I, Zone 0, Zone 1, or Zone 2, ANSI/API RP 505-1997.

FPN No. 5: For further information on electrical systems for hazardous (classified) locations on offshore oil and gas producing platforms, see Recommended Practice for Design and Installation of Electrical Systems for Fixed and Floating Offshore Petroleum Facilities for Unclassifed and Class I, Zone 0, Zone 1, and Zone 2 Locations, ANSI/API RP 14FZ-2000.

FPN No. 6: For further information on the installation of electrical equipment in hazardous (classified) locations in general, see Electrical Apparatus for Explosive Gas Atmospheres — Part 14: Electrical Installations in Explosive Gas Atmospheres (Other than Mines), IEC 60079-14-1996, and Electrical Apparatus for Explosive Gas Atmospheres — Part 16: Artificial Ventilation for the Protection of Analyzer(s) Houses, IEC 60079-16-1990.

FPN No. 7: For further information on application of electrical equipment in hazardous (classified locations in general, see Electrical Apparatus for Use in Class I, Zones 0 and 1, Hazardous (Classified) Locations: General Requirements, ISA -- 12.00.01-1999; and Definitions and Information Pertaining to Electrical Apparatus in Hazardous (Classified) Locations, ISA -- 12.01.01-1999;; Electrical Equipment for Use in Class I, Zone 0, 1, and 2 Hazardous (Classified) Locations, ANSI/UL 2279-1997(Part 0).

505-5 Classifications of Locations

(a) Classification of Locations. Locations shall be classified depending on the properties of the flammable vapors, liquids, or gases that may be present and the likelihood that a flammable or combustible concentration or quantity is present. Where pyrophoric materials are the only materials used or handled, these locations shall not be classified. Each room, section, or area shall be considered individually in determining its classification.

FPN No. 1: See Section 505-7 for restrictions on area classification.

FPN No. 2: Through the exercise of ingenuity in the layout of electrical installations for hazardous (classified) locations, it is frequently possible to locate much of the equipment in reduced level of classification or in an unclassified location and, thus, to reduce the amount of special equipment required. [14-323]

Rooms and areas containing ammonia refrigeration systems that are equipped with adequate mechanical ventilation, may be classified as "unclassified" locations.

FPN: For further information regarding classification and ventilation of areas involving ammonia, see Safety Code for Mechanical Refrigeration, ANSI/ASHRAE 15-1994, and Safety Requirements for the Storage and Handling of Anhydrous Ammonia, ANSI/CGA G2.1-1989 (14-39)

(b) Class I, Zone 0, 1, and 2 Locations. Class I, Zone 0, 1, and 2 locations are those in which flammable gases or vapors are or may be present in the air in quantities sufficient to produce explosive or ignitible mixtures. Class I, Zone 0, 1, and 2 locations shall include those specified in (1), (2) and (3).

(1) Class I, Zone 0. A Class I, Zone 0 location is a location

(a) In which ignitible concentrations of flammable gases or vapors are present continuously, or
(b) In which ignitible concentrations of flammable gases or vapors are present for long periods of time.

FPN No. 1: As a guide in determining when flammable gases or vapors are present continuously or for long periods of time, refer to Recommended Practice for Classification of Locations for Electrical Installations of Petroleum Facilities Classified as Class I, Zone 0, Zone 1 or Zone 2, ANSI/API RP 505-1997; Recommended Practice for Classification of Locations for Electrical Installations Classified as Class I, Zone 0, Zone 1, or Zone 2, ISA -- 12.24.01-1998; Electrical Apparatus for Explosive Gas Atmospheres, Classifications of Hazardous Areas, IEC 60079-10-1995; and Area Classification Code for Petroleum Installations, Model Code, Part 15, Institute of Petroleum.

FPN No. 2: This classification includes locations inside vented tanks or vessels that contain volatile flammable liquids; inside inadequately vented spraying or coating enclosures, where volatile flammable solvents are used; between the inner and outer roof sections of a floating roof tank containing volatile flammable liquids; inside open vessels, tanks and pits containing volatile flammable liquids; the interior of an exhaust duct that is used to vent ignitible concentrations of gases or vapors; and inside inadequately ventilated enclosures that contain normally venting instruments utilizing or analyzing flammable fluids and venting to the inside of the enclosures.

FPN No. 3: It is not good practice to install electrical equipment in Zone 0 locations except when the equipment is essential to the process or when other locations are not feasible. [See Section 505-3(a) FPN No. 2.] If it is necessary to install electrical systems in a Zone 0 location, it is good practice to install intrinsically safe systems as described by Article 504.

(2) Class I, Zone 1. A Class I, Zone 1 location is a location

(a) In which ignitible concentrations of flammable gases or vapors are likely to exist under normal operating conditions; or
(b) In which ignitible concentrations of flammable gases or vapors may exist frequently because of repair or maintenance operations or because of leakage; or
(c) In which equipment is operated or processes are carried on, of such a nature that equipment breakdown or faulty operations could result in the release of ignitible concentrations of flammable gases or vapors and also cause simultaneous failure of electrical equipment in a mode to cause the electrical equipment to become a source of ignition; or
(d) That is adjacent to a Class I, Zone 0 location from which ignitible concentrations of vapors could be communicated, unless communication is prevented by

adequate positive pressure ventilation from a source of clean air and effective safeguards against ventilation failure are provided.

FPN No. 1: Normal operations is considered the situation when plant equipment is operating within its design parameters. Minor releases of flammable material may be part of normal operations. Minor releases include the releases from mechanical packings on pumps. Failures that involve repair or shutdown (such as the breakdown of pump seals and flange gaskets, and spillage caused by accidents) are not considered normal operation.

FPN No. 2: This classification usually includes locations where volatile flammable liquids or liquefied flammable gases are transferred from one container to another. In areas in the vicinity of spraying and painting operations where flammable solvents are used; adequately ventilated drying rooms or compartments for evaporation of flammable solvents; adequately ventilated locations containing fat and oil extraction equipment using volatile flammable solvents; portions of cleaning and dyeing plants where volatile flammable liquids are used; adequately ventilated gas generator rooms and other portions of gas manufacturing plants where flammable gas may escape; inadequately ventilated pump rooms for flammable gas or for volatile flammable liquids; the interiors of refrigerators and freezers in which volatile flammable materials are stored in the open, lightly stoppered, or easily ruptured containers; and other locations where ignitible concentrations of flammable vapors or gases are likely to occur in the course of normal operation, but not classified Zone 0.

(3) Class I, Zone 2. A Class I, Zone 2 location is a location

(a) In which ignitible concentrations of flammable gases or vapors are not likely to occur in normal operation and if they do occur will exist only for a short period; or
(b) In which volatile flammable liquids, flammable gases, or flammable vapors are handled, processed, or used, but in which the liquids, gases, or vapors normally are confined within closed containers of closed systems from which they can escape, only as a result of accidental rupture or breakdown of the containers or system, or as a result of the abnormal operation of the equipment with which the liquids or gases are handled, processed, or used; or
(c) In which ignitible concentrations of flammable gases or vapors normally are prevented by positive mechanical ventilation, but which may become hazardous as a result of failure or abnormal operation of the ventilation equipment; or
(d) That is adjacent to a Class I, Zone 1 location, from which ignitible concentrations of flammable gases or vapors could be communicated, unless such communication is prevented by adequate positive-pressure ventilation from a source of clean air, and effective safeguards against ventilation failure are provided.

FPN: The Zone 2 classification usually includes locations where volatile flammable liquids or flammable gases or vapors are used, but which would become hazardous only in case of an accident or of some unusual operating condition.

505-6 Material Groups. For purposes of testing, approval, and area classification, various air mixtures (not oxygen enriched) shall be grouped as required in (a), (b), and (c).

FPN: Group I is intended for use in describing atmospheres that contain firedamp (a mixture of gases, composed mostly of methane, found underground, usually in mines). This Code does not apply to installations underground in mines. See Section 90-2(b).

Group II shall be subdivided into IIC, IIB, and IIA, as noted in (a), (b), and (c), according to the nature of the gas or vapor, for protection techniques "d," "ia," "ib," "[ia]," and "[ib]," and, where applicable, "n" and "o."

FPN No. 1: The gas and vapor subdivision as described above is based on the maximum experimental safe gap (MESG), minimum igniting current (MIC), or both. Test equipment for determining the MESG is described in Construction and Verification Tests of Flameproof Enclosures of Electrical Apparatus, IEC 60079-1A-1975, Amendment No. 1 (1993) and UL Technical Report No. 58 (1993). The test equipment for determining MIC is described in Electrical Apparatus for Explosive Gas Atmospheres — Part 11: Intrinsic Safety "i," IEC 60079-11-1999. The classification of gases or vapors according to their maximum experimental safe gaps and minimum igniting currents is described in Classification of Mixtures of Gases or Vapours with Air According to Their Maximum Experimental Safe Gaps and Minimum Igniting Currents, IEC 60079-12-1978.

FPN No. 2: Verification of electrical equipment utilizing protection techniques "e," "m," "p," and "q," due to design technique, does not require tests involving MESG or MIC. Therefore, Group II is not required to be subdivided for these protection techniques.

FPN No. 3: It is necessary that the meanings of the different equipment markings and Group II classifications be carefully observed to avoid confusion with Class I, Divisions 1 and 2, Groups A, B, C, and D.

(a) Class I, Zone 0, 1, and 2, Group Classifications. Class I, Zone 0, 1, and 2, groups shall be as follows:

(1) ˝Group IIC. Atmospheres containing acetylene, hydrogen, or flammable gas, flammable liquid-produced vapor, or combustible liquid-produced vapor mixed with air that may burn or explode, having either a maximum experimental safe gap (MESG) value less than or equal to 0.50 mm or minimum igniting current ratio (MIC ratio) less than or equal to 0.45.

FPN: Group IIC is equivalent to a combination of Class I, Group A, and Class I, Group B, as described in Sections 500-6 (a) (1) and 6 (a) (2)).

(2) ˝Group IIB. Atmospheres containing acetaldehyde, ethylene, or flammable gas, flammable liquid-produced vapor, or combustible liquid-produced vapor mixed with air that may burn or explode, having either maximum experimental safe gap (MESG) values greater than 0.50 mm and less than or equal to 0.90 mm or minimum igniting current ratio (MIC ratio) greater than 0.45 and less than or equal to 0.80.

FPN: Group IIB is equivalent to Class I, Group C, as described in Section 500-6 (a)(3).

(3) ˝Group IIA. Atmospheres containing acetone, ammonia, ethyl alcohol, gasoline, methane, propane, or flammable gas, flammable liquid-produced vapor, or combustible liquid-produced vapor mixed with air that may burn or explode, having either a maximum experiment safe gap (MESG) value greater than 0.90 mm or minimum igniting current ratio (MIC ratio) greater than 0.80.

FPN: Group IIA is equivalent to Class I, Group D as described in Section 500-6 (a)(4).

505-7 Special Precaution. Article 505 requires equipment construction and installation that will ensure safe performance under conditions of proper use and maintenance.

FPN No. 1: It is important that inspection authorities and users exercise more than ordinary care with regard to the installation and maintenance of electrical equipment in hazardous (classified) locations.

FPN No. 2: Low ambient conditions require special consideration. Electrical equipment depending on the protection techniques described by Section 505-8 (a) may not be suitable for use at temperatures lower than -20ºC (-4ºF) unless they are identified for use at lower temperatures. However, at low ambient temperatures, flammable concentrations of vapors may not exist in a location classified Class I, Zones 0, 1, or 2 at normal ambient temperature.

(a) Supervision of Work. Classification of areas and selection of equipment and wiring methods shall be under the supervision of a qualified Registered Professional Engineer.

(b) Dual Classification. In instances of areas within the same facility classified separately, Class I, Zone 2 locations shall be permitted to abut, but not overlap, Class I, Division 2 locations. Class I, Zone 0 or Zone 1 locations shall not abut Class I, Division 1 or Division 2 locations.

(c) Reclassification Permitted. A Class I, Division 1 or Division 2 location shall be permitted to be reclassified as a Class I, Zone 0, Zone 1, or Zone 2 location provided all of the space that is classified because of a single flammable gas or vapor source is reclassified under the requirements of this article.

(d) Solid Obstacles. Flameproof equipment with flanged joints shall not be installed such that the flange openings are closer than the distances shown in Table 505-7 to any solid obstacle that is not a part of the equipment (such as steelworks, walls, weather guards, mounting brackets, pipes, or other electrical equipment) unless the equipment is listed for a smaller distance of separation.

Table 505-7. Minimum Distance of Obstructions from Flameproof "d" Flange Openings

	Minimum Distance	
Gas Group	mm	In.
IIC	40	1 37/64
IIB	30	1 3/16
IIA	10	25/64

505- 8 Protection Techniques. The following shall be acceptable protection techniques for electrical and electronic equipment in hazardous (classified) locations.

FPN: For additional information, see Electrical Apparatus for Use in Class I, Zones 0 and 1 Hazardous (Classified) Locations General Requirements, ISA -- 12.00.01-1999; Definitions and Information Pertaining to Electrical Apparatus in Hazardous (Classified) Locations, ISA -- 12.01.01-1999; Electrical Equipment for Use in Class I, Zone 0, 1, and 2 Hazardous (Classified) Locations, ANSI/UL 2279, 1997; and Electrical Apparatus for Explosive Gas Atmospheres - Part 0: General Requirements, IEC 60079-0-1998.

(a) Flameproof "d." This protection technique shall be permitted for equipment in Class I, Zone 1 or Zone 2 locations.

(b) Purged and Pressurized. This protection technique shall be permitted for equipment in those Class I, Zone 1 or Zone 2 locations for which it is identified.

(c) Intrinsic Safety. This protection technique shall be permitted for apparatus and associated apparatus in Class I, Zone 0, Zone 1, or Zone 2 locations for which it is listed.

(d) Type of Protection "n." This protection technique shall be permitted for equipment in Class I, Zone 2 locations. Type of protection "n" is further subdivided into nA, nC, and nR.

FPN: See Table 505-9(b) (1) for the descriptions of subdivisions for type of protection "n."

(e) Oil Immersion "o." This protection technique shall be permitted for equipment in Class I, Zone 1 or Zone 2 locations.

(f) Increased Safety "e." This protection technique shall be permitted for equipment in Class I, Zone 1, or Zone 2 locations.

(g) Encapsulation "m." This protection technique shall be permitted for equipment in Class I, Zone 1, or Zone 2 locations.

(h) Powder Filling "q." This protection technique shall be permitted for equipment in Class I, Zone 1, or Zone 2 locations.

(i) Combustible Gas Detection System. A combustible gas detection system incorporating combustible gas detectors used in industrial establishments with restricted public access, where the conditions of maintenance and supervision ensure that only qualified persons will service the installation, is a protection technique permitted under the following conditions:

(1) In a Class I, Zone 1 location that is so classified due to inadequate ventilation, electrical equipment suitable for Class I, Zone 2 locations shall be permitted.
(2) In a building located in, or with an opening into, a Class I, Zone 2 location where the interior does not contain a source of flammable gas or vapor, electrical equipment for unclassified locations shall be permitted.
(3) In the interior of a control panel containing instrumentation utilizing or measuring flammable liquids, gases or vapors, electrical equipment suitable for Class I, Zone 2 locations shall be permitted.
Gas detection equipment shall be listed for detection of the specific gas or vapor to be encountered.

FPN: For further information, see ANSI/ISA-12.13.01, Performance Requirements, Combustible Gas Detectors.

Use of this technique for each of the applications above includes adherence to established industrial practices and requirements.

FPN No. 1: For further information, see ANSI/API RP 505, Recommended Practice for Classification of Locations for Electrical Installations at Petroleum Facilities Classified as Class I, Zone 0, Zone 1 or Zone 2.

FPN No. 2: For further information, see ISA-RP12.13.02, Installation, Operation, and Maintenance of Combustible Gas Detection Instruments.

505-9 Suitability of Equipment

(a) Suitability. Suitability of identified equipment shall be determined by:

(1) Equipment listing or labeling, or
(2) Evidence of equipment evaluation from a qualified testing laboratory or inspection agency concerned with product evaluation, or
(3) Evidence acceptable to the authority having jurisdiction such as a manufacturer's self-evaluation or an owner's engineering judgment.

(b) Listing.

(1) Equipment that is listed for a Zone 0 location shall be permitted in a Zone 1 or Zone 2 location of the same gas or vapor. Equipment that is listed for a Zone 1 location shall be permitted in a Zone 2 location of the same gas or vapor.

(2) Equipment shall be permitted to be listed for a specific gas or vapor, specific mixtures of gases or vapors, or any specific combination of gases or vapors.

FPN: One common example is equipment marked for "IIB + H2."

(c) Marking. Equipment shall be marked in accordance with (1) or (2).

(1) Division Equipment. Equipment identified for Class I, Division 1 or Class I, Division 2 shall, in addition to being marked in accordance with Section 500-6(d), be permitted to be marked with the following:

(a) Class I, Zone 1 or Class I, Zone 2 (as applicable), and
(b) Applicable gas classification group(s) in accordance with Table 505-9(b)(2), and
(c) Temperature classification in accordance with Section 505-9(3)

(2) Zone Equipment. Equipment meeting one or more of the protection techniques described in Section 505-5 shall be marked with the following in the order shown:

(a) Class
(b) Zone
(c) Symbol "AEx"
(d) Protection technique(s) in accordance with Table 505-9(b)(2)
(e) Applicable gas classification group(s) in accordance with Table 505-9(b)(2)
(f) Temperature classification in accordance with Section 505-9(c)

Exception: Intrinsically safe associated apparatus shall be required to be marked only with (c), (d), and (e).

Electrical equipment of types of protection "e," "m," "p," or "q," shall be marked Group II. Electrical equipment of types of protection "d," "ia," "ib," "[ia]," or "[ib]" shall be marked Group IIA, or IIB, or IIC, or for a specific gas or vapor. Electrical equipment of types of protection "n" shall be marked Group II unless it contains enclosed-break devices, nonincendive components, or energy-limited equipment or circuits, in which case it shall be marked Group IIA, IIB, or IIC, or a specific gas or vapor. Electrical equipment of other types of protection shall be marked Group II unless the type of protection utilized by the equipment requires that it shall be marked Group IIA, IIB, or IIC, or a specific gas or vapor.

FPN : An example of such a required marking is "Class I, Zone 0, AEx ia IIC T6." An explanation of the marking that is required is shown in Figure 505-9(b)(1).

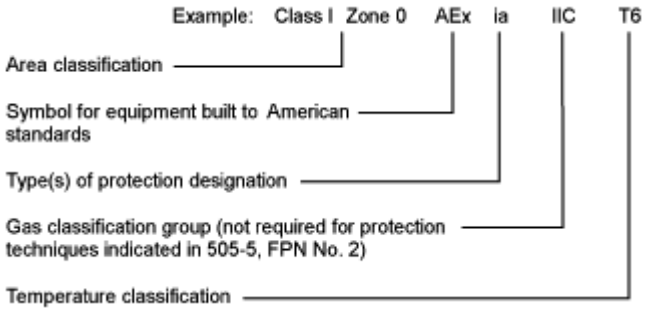


Figure 505-9(b)(1) ~~[505-10(b)(1)]~~

Table 505-9(b)(1). Types of Protection Designation

Designation	Technique	Zone*
d	Flameproof enclosure	1
e	Increased safety	1
ia	Intrinsic safety	0
ib	Intrinsic safety	1
[ia]	Intrinsically safe associated apparatus	Unclassified
[ib]	Intrinsically safe associated apparatus	Unclassified
m	Encapsulation	1
nA	Nonsparking equipment	2
nC	Sparking equipment in which the contacts are suitably protected other than by restricted breathing enclosure	2
nR	Restricted breathing enclosure	2
o	Oil immersion	1
p	Purged and pressurized	1 or 2
q	Powder filled	1

* Does not address use where a combination of techniques is used.

Table 505-9(b)(2). ~~[505-10(b)(2)]~~ Gas Classification Groups

Gas Group	Comment
IIC	See Section 505-6(a)(1)
IIB	See Section 505-6(a) (2)
IIA	See Section 505-6(a)(3)

(c) Class I Temperature. The temperature marking specified below ~~in Section 505-10(b)~~ shall not exceed the ignition temperature of the specific gas or vapor to be encountered.

FPN: For information regarding ignition temperatures of gases and vapors, see Recommended Practice for the Classification of Flammable Liquids, Gases, or Vapors and of Hazardous (Classified) Locations for Electrical Installations in Chemical Process Areas, NFPA 497-1997; and Electrical Apparatus for Explosive Gas Atmospheres, Data for Flammable Gases and Vapours, Relating to the Use of Electrical Apparatus, IEC 60079-20-1996.

(1) Temperature Classifications. Equipment shall be marked to show the operating temperature or temperature class referenced to a 40ºC (104ºF) ambient. The temperature class, if provided, shall be indicated using the temperature class (T Code) shown in Table 505-9 (c).

Table 505-9(c). ~~[505-10(b)(3)]~~ Classification of Maximum Surface Temperature for Group II Electrical Equipment

Temperature Class (T Code)	Maximum Surface Temperature (ºC)
T1	≤450
T2	≤300
T3	≤200
T4	≤135
T5	≤100
T6	≤85

Electrical equipment designed for use in the ambient temperature range between -20ºC and +40ºC shall require no additional ambient temperature marking.
Electrical equipment that is designed for use in a range of ambient temperatures other than -20ºC and +40ºC is considered to be special; and the ambient temperature range shall then be marked on the equipment, including either the symbol "Ta" or "Tamb" together with the special range of ambient temperatures. As an example, such a marking might be "-30ºC ≤ Ta ≤ + 40ºC."
Electrical equipment suitable for ambient temperatures exceeding 40ºC (104ºF) shall be marked with both the maximum ambient temperature and the operating temperature or temperature class at that ambient temperature.

Exception No. 1: Equipment of the nonheat-producing type, such as conduit fittings, and equipment of the heat-producing type having a maximum temperature of not more than 100ºC (212ºF) shall not be required to have a marked operating temperature or temperature class.
Exception No. 2: Equipment identified for Class I, Division 1 or Division 2 locations as permitted by Sections 505-20(b) and (c) shall be permitted to be marked in accordance with Section 500-6(d) and Table 500-6(d).

(d) Threading. All threaded conduit referred to herein shall be threaded with a National (American) Standard Pipe Taper (NPT) standard conduit cutting die that provides a taper of 1 in 16 (_-in. taper per foot). Such conduit shall be made wrenchtight to prevent sparking when fault current flows through the conduit system, and to ensure the explosionproof or flameproof integrity of the conduit system where applicable. Threaded joints shall be made up with at least five threads fully engaged for entries into flameproof or explosionproof equipment.

Equipment provided with threaded entries for field wiring connections shall be installed in accordance with (1) or (2).

(1) Equipment Provided with Threaded Entries for NPT Threaded Conduit or Fittings. For equipment provided with threaded entries for NPT threaded conduit or fittings, listed conduit, conduit fittings, or cable fittings shall be used.

FPN: Thread form specifications for NPT threads are located in Pipe Threads, General Purpose (Inch), ANSI/ASME B1.20.1-1983.

(2) Equipment Provided with Threaded Entries for Metric Threaded Conduit or Fittings. For equipment with metric threaded entries, such entries shall be identified as being metric, or listed adapters to permit connection to conduit or NPT-threaded fittings shall be provided with the equipment. Adapters shall be used for connection to conduit or NPT-threaded fittings. Listed cable fittings that have metric threads shall be permitted to be used.

FPN: Threading specifications for metric threaded entries are located in Metric Screw Threads, ISO 965/1-1980, and Metric Screw Threads, ISO 965/3-1980.

505-15. Wiring Methods. Wiring methods shall maintain the integrity of protection techniques and shall comply with (a), (b), or (c).

(a) Class I, Zone 0. In Class I, Zone 0 locations, only intrinsically safe wiring methods in accordance with Article 504 shall be permitted.

FPN: Article 504 only includes protection technique "ia."

(b) Class I, Zone 1.

(1) In Class I, Zone 1 locations, the following wiring methods shall be permitted:

(a) In industrial establishments with restricted public access, where the conditions of maintenance and supervision ensure that only qualified persons will service the installation, and where the cable is not subject to physical damage, Type MC-HL cable listed for use in Class I, Zone 1 or Division 1 locations, with a gas/vaportight continuous corrugated metallic sheath, an overall jacket of suitable polymeric material, separate grounding conductors in accordance with Section 250-122, and provided with termination fittings listed for the application.

FPN: See Sections 334-3 and 334-4 for restrictions on use of Type MC cable.

(b) In industrial establishments with restricted public access, where the conditions of maintenance and supervision ensure that only qualified persons will service the installation, and where the cable is not subject to physical damage, Type ITC-HL cable, listed for use in Class I, Zone 1 or Division 1 locations, with a gas/vaportight continuous corrugated metallic sheath, an overall jacket of suitable polymeric material and provided with termination fittings listed for the application.

(c) Type MI cable with termination fittings listed for Class I, Zone 1 or Division 1 locations. Type MI cable shall be installed and supported in a manner to avoid tensile stress at the termination fittings.

(d) Threaded rigid metal conduit, or threaded steel intermediate metal conduit.

(e) Rigid nonmetallic conduit complying with Article 347 shall be permitted where encased in a concrete envelope a minimum of 50 mm (2 in.) thick and provided with not less than 600 mm (24 in.) of cover measured from the top of the conduit to grade. Threaded rigid metal conduit or threaded steel intermediate metal conduit shall be used for the last 600 mm (24 in.) of the underground run to emergence or to the point of connection to the aboveground raceway. An equipment grounding conductor shall be included to provide for electrical continuity of the raceway system and for grounding of noncurrent-carrying metal parts.

(2) Where necessary to employ flexible connections, flexible fittings listed for Class I, Zone 1 or Division 1 locations or flexible cord in accordance with the provisions of Section 505-17 shall be permitted.

(c) Class I, Zone 2.

(1) In Class I, Zone 2 locations, the following wiring methods shall be permitted:

(a) All wiring methods permitted by Article 505-15(b).
(b) Types MI, MC, MV, or TC cable with termination fittings, or in cable tray systems and installed in a manner to avoid tensile stress at the termination fittings;
(c) Type ITC cable in cable trays, in raceways, supported by messenger wire, where afforded mechanical protection and run as open wiring, or directly buried where the cable is listed for this use;
(d) Type PLTC cable in accordance with the provisions of Article 725, or in cable tray systems. PLTC shall be installed in a manner to avoid tensile stress at the termination fittings;
(e) enclosed gasketed busways, enclosed gasketed wireways;
(f) threaded rigid metal conduit, threaded steel intermediate metal conduit;
(g) Nonincendive field wiring shall be permitted using any of the wiring methods permitted for unclassified locations. Nonincendive field wiring systems shall be installed in accordance with the control drawing(s). Simple apparatus, not shown on the control drawing, shall be permitted in a nonincendive field wiring circuit provided the simple apparatus does not interconnect the nonincendive field wiring circuit to any other circuit.

FPN: Simple apparatus is defined in Section 504-2.

Separate nonincendive field wiring circuits shall be:

(a) in separate cables, or
(b) in multiconductor cables where the conductors of each circuit are within a grounded metal shield, or
(c) in multiconductor cables where the conductors of each circuit have insulation with a minimum thickness of 0.25 mm (0.01 in).

(2) Where provision must be made for limited flexibility, flexible metal fittings, flexible metal conduit with listed fittings, liquidtight flexible metal conduit with listed fittings, liquidtight flexible nonmetallic conduit with listed fittings, or flexible cord in accordance with the provisions of Section 505-17 shall be permitted.

FPN: See Section 505-25(b) for grounding requirements where flexible conduit is used.

505-16. Sealing and Drainage. Seals in conduit and cable systems shall comply with (a) through (e). Sealing compound shall be used in Type MI cable termination fittings to exclude moisture and other fluids from the cable insulation.

FPN No. 1: Seals are provided in conduit and cable systems to minimize the passage of gases and vapors and prevent the passage of flames from one portion of the electrical installation to another through the conduit. Such communication through Type MI cable is inherently prevented by construction of the cable. Unless specifically designed and tested for the purpose, conduit and cable seals are not intended to prevent the passage of liquids, gases, or vapors at a continuous pressure differential across the seal. Even at differences in pressure across the seal equivalent to a few inches of water, there may be a slow passage of gas or vapor through a seal, and through conductors passing through the seal. See Section 505-16(c)(2)(b). Temperature extremes and highly corrosive liquids and vapors can affect the ability of seals to perform their intended function. See Section 505-16(d)(2).

FPN No. 2: Gas or vapor leakage and propagation of flames may occur through the interstices between the strands of standard stranded conductors larger than No. 2. Special conductor constructions, e.g., compacted strands or sealing of the individual strands, are means of reducing leakage and preventing the propagation of flames.

(a) Zone 0. In Class I, Zone 0 locations, seals shall be located as follows.

(1) Seals shall be provided within 3.05 m (10 ft.) of where a conduit leaves a Zone 0 location. There shall be no unions, couplings, boxes, or fittings, except listed reducers at the seal, in the conduit run between the seal and the point at which the conduit leaves the location.

Exception: A rigid unbroken conduit that passes completely through the Zone 0 location with no fittings less than 300 mm (12 in.) beyond each boundary, shall not be required to be sealed, if the termination points of the unbroken conduit are in unclassified locations.

(2) Seals shall be provided on cables at the first point of termination after entry into the Zone 0 location.

(3) Seals shall not be required to be explosionproof or flameproof.

(b) Zone 1. In Class I, Zone 1 locations, seals shall be located as follows.

(1) Conduit seals shall be provided for each conduit entering enclosures having type of protection 'd' or 'e'.

Exception: Where the enclosure having type of protection 'd' is marked to indicate that a seal is not required.

(2) Conduit seals shall be provided for each conduit entering explosionproof equipment as follows.

(a) In each conduit entry into an explosionproof enclosure where either (1) the enclosure contains apparatus, such as switches, circuit breakers, fuses, relays, or resistors, that may produce arcs, sparks, or high temperatures that are considered to be an ignition source in normal operation, or (2) the entry is metric designator 53 (trade size 2) or larger and the enclosure contains terminals, splices, or taps. For the purposes of this section high temperatures shall be considered to be any temperatures exceeding 80 percent of the autoignition temperature in degrees Celsius of the gas or vapor involved.

Exception: Conduit entering an enclosure where such switches, circuit breakers, fuses, relays, or resistors are

1. Enclosed within a chamber hermetically sealed against the entrance of gases or vapors, or
2. Immersed in oil, or
3. Enclosed within a factory-sealed explosionproof chamber located within the enclosure,identified for the location, and marked "factory sealed" or equivalent, unless the entry is metric designator 53 (trade size 2) or larger.
Factory-sealed enclosures shall not be considered to serve as a seal for another adjacent explosionproof enclosure that is required to have a conduit seal.

(b) Conduit seals shall be installed within 450 mm (18 in.) from the enclosure. Only explosionproof unions, couplings, reducers, elbows, capped elbows, and conduit bodies similar to L, T, and Cross types that are not larger than the trade size of the conduit shall be permitted between the sealing fitting and the explosionproof enclosure.

(c) Where two or more explosionproof enclosures for which conduit seals are required under (b)(2) are connected by nipples or by runs of conduit not more than 900 mm (36 in.) long, a single conduit seal in each such nipple connection or run of conduit shall be considered sufficient if located not more than 450 mm (18 in.) from either enclosure.

(3) In each conduit entry into a pressurized enclosure where the conduit is not pressurized as part of the protection system. Conduit seals shall be installed within 450 mm (18 in.) from the pressurized enclosure.

FPN No. 1: Installing the seal as close as possible to the enclosure will reduce problems with purging the dead airspace in the pressurized conduit.

FPN No. 2: For further information, see Standard for Purged and Pressurized Enclosures for Electrical Equipment, NFPA 496-1998.

(4) In each conduit run leaving a Class I, Zone 1 location. The sealing fitting shall be permitted on either side of the boundary of such location within 3.05 m (10 ft) of the boundary, and shall be designed and installed so to minimize the amount of gas or vapor within the Zone 1 portion of the conduit from being communicated to the conduit beyond the seal. Except for listed explosionproof reducers at the conduit seal, there shall be no union, coupling, box, or fitting between the conduit seal and the point at which the conduit leaves the Zone 1 location.

Exception: Metal conduit containing no unions, couplings, boxes, or fittings that passes completely through a Class I, Zone 1 location with no fittings less than 300 mm (12 in.) beyond each boundary shall not require a conduit seal if the termination points of the unbroken conduit are in unclassified locations.

(5) Conduits containing cables with a gas/vaportight continuous sheath capable of transmitting gases or vapors through the cable core shall be sealed in the Zone 1 location after removing the jacket and any other coverings so that the sealing compound will surround each individual insulated conductor and the outer jacket.

Exception: Multiconductor cables with a gas/vaportight continuous sheath capable of transmitting gases or vapors through the cable core shall be permitted to be considered as a single conductor by sealing the cable in the conduit within 450 mm (18 in.) of the enclosure and the cable end within the enclosure by an approved means to minimize the entrance of gases or vapors and prevent the propagation of flame into the cable core, or by other approved methods. For shielded cables and twisted pair cables, it shall not be required to remove the shielding material or separate the twisted pair.

(6) Each multiconductor cable in conduit shall be considered as a single conductor if the cable is incapable of transmitting gases or vapors through the cable core. These cables shall be sealed in accordance with 505-16(d).

(7) Cable seals shall be provided for each cable entering flameproof or explosionproof enclosures. The seal shall comply with 505-16(d).

(8) Cables shall be sealed at the point at which they leave the Zone 1 location.

Exception: Where cable is sealed at the termination point.

(c) Zone 2. In Class I, Zone 2 locations, seals shall be located as follows.

(1) Conduit seals shall be located as follows.

(a) For connections to enclosures that are required to be flameproof or explosionproof, a conduit seal shall be provided in accordance with 505-16 (b)(1) and 505-16 (b)(2). All portions of the conduit run or nipple between the seal and such enclosure shall comply with Section 505-16(b).

(b) In each conduit run passing from a Class I, Zone 2 location into an unclassified location. The sealing fitting shall be permitted on either side of the boundary of such location within 3.05 m (10 ft) of the boundary, and shall be designed and installed so to minimize the amount of gas or vapor within the Zone 2 portion of the conduit from being communicated to the conduit beyond the seal. Rigid metal conduit or threaded steel intermediate metal conduit shall be used between the sealing fitting and the point at which the conduit leaves the Zone 2 location, and a threaded connection shall be used at the sealing fitting. Except for listed explosionproof reducers at the conduit seal, there shall be no union, coupling, box, or fitting between the conduit seal and the point at which the conduit leaves the Zone 2 location.

Exception No. 1: Metal conduit containing no unions, couplings, boxes or fittings that passes completely through a Class I, Zone 2 location with no fittings less than 300 mm (12 in.) beyond each boundary shall not be required to be sealed if the termination points of the unbroken conduit are in unclassified locations.

Exception No. 2: Conduit systems terminating at an unclassified location where a wiring method transition is made to cable tray, cablebus, ventilated busway, Type MI cable, or open wiring shall not be required to be sealed where passing from the Class I, Zone 2 location into the unclassified location. The unclassified location shall be outdoors or, if the conduit system is all in one room, it shall be permitted to be indoors. The conduits shall not terminate at an enclosure containing an ignition source in normal operation.

Exception No. 3: Conduit systems passing from an enclosure or room that is unclassified as a result of pressurization into a Class I, Zone 2 location shall not require a seal at the boundary.

FPN: For further information, refer to Standard for Purged and Pressurized Enclosures for Electrical Equipment, NFPA 496-1998.

Exception No. 4: Segments of aboveground conduit systems shall not be required to be sealed where passing from a Class I, Zone 2 location into an unclassified location if the following conditions are met:

1. No part of the conduit system segment passes through a Class I, Zone 0 or Class I, Zone 1 location where the conduit contains unions, couplings, boxes, or fittings within 300 mm (12 in.) of the Class I, Zone 0 or Class I, Zone 1 location; and

2. The conduit system segment is located entirely in outdoor locations; and

3. The conduit system segment is not directly connected to canned pumps, process or service connections for flow, pressure, or analysis measurement, etc., that depend on a single compression seal, diaphragm, or tube to prevent flammable or combustible fluids from entering the conduit system; and

4. The conduit system segment contains only threaded metal conduit, unions, couplings, conduit bodies, and fittings in the unclassified location; and

5. The conduit system segment is sealed at its entry to each enclosure or fitting housing terminals, splices, or taps in Class I, Zone 2 locations.

(2) Cable seals shall be located as follows.

(a) Cables entering enclosures required to be flameproof or explosionproof shall be sealed at the point of entrance. The seal shall comply with 505-16(d). Multiconductor cables with a gas/vaportight continuous sheath capable of transmitting gases or vapors through the cable core shall be sealed in the Zone 2 location after removing the jacket and any other coverings so that the sealing compound will surround each individual insulated conductor in such a manner as to minimize the passage of gases and vapors. Multiconductor cables in conduit shall be sealed as described in 505-16 (b)(4).

Exception No. 1: Cables passing from an enclosure or room that is unclassified as a result of Type Z pressurization into a Class I, Zone 2 location shall not require a seal at the boundary.

Exception No. 2: Shielded cables and twisted pair cables shall not require the removal of the shielding material or separation of the twisted pairs provided the termination is by an approved means to minimize the entrance of gases or vapors and prevent propagation of flame into the cable core.

(b) Cables with a gas/vaportight continuous sheath and that will not transmit gases or vapors through the cable core in excess of the quantity permitted for seal fittings shall not be required to be sealed except as required in 505-16 (c)(2)(a). The minimum length of such cable run shall not be less than that length that limits gas or vapor flow through the cable core to the rate permitted for seal fittings [200 cm3/hour (0.007 ft3/hour) of air at a pressure of 1500 pascals (6 in. of water)].

FPN No. 1: See Outlet Boxes and Fittings for Use in Hazardous (Classified) Locations, ANSI/UL 886-1994.

FPN No. 2: The cable core does not include the interstices of the conductor strands.

(c) Cables with a gas/vaportight continuous sheath capable of transmitting gases or vapors through the cable core shall not be required to be sealed except as required in 505-16(c)(2)(a), unless the cable is attached to process equipment or devices that may cause a pressure in excess of 1500 pascals (6 in. of water) to be exerted at a cable end, in which case a seal, barrier, or other means shall be provided to prevent migration of flammables into an unclassified area.

Exception: Cables with an unbroken gas/vaportight continuous sheath shall be permitted to pass through a Class I, Zone 2 location without seals.

(d) Cables that do not have gas/vaportight continuous sheath shall be sealed at the boundary of the Zone 2 and unclassified location in such a manner as to minimize the passage of gases or vapors into an unclassified location.

FPN: The cable sheath may be either metal or a nonmetallic material.

(d) Class I, Zones 0, 1 and 2. Where required, seals in Class I, Zones 0, 1 and 2 locations shall comply with the following.

(1) Fittings. Enclosures for connections or equipment shall be provided with an integral means for sealing, or sealing fittings listed for the location shall be used. Sealing fittings shall be listed for use with one or more specific compounds and shall be accessible.

(2) Compound. The compound shall provide a seal against passage of gas or vapors through the seal fitting, shall not be affected by the surrounding atmosphere or liquids, and shall not have a melting point of less than 93ºC (200ºF).

(3) Thickness of Compounds. In a completed seal, the minimum thickness of the sealing compound shall not be less than the trade size of the sealing fitting and, in no case, less than 16 mm (5/8 in.).

Exception: Listed cable sealing fittings shall not be required to have a minimum thickness equal to the trade size of the fitting.

(4) Splices and Taps. Splices and taps shall not be made in fittings intended only for sealing with compound, nor shall other fittings in which splices or taps are made be filled with compound.

(5) Conductor Fill. The cross-sectional area of the conductors permitted in a seal shall not exceed 25 percent of the cross-sectional area of a rigid metal conduit of the same trade size unless it is specifically listed for a higher percentage of fill.

(e) Drainage.

(1) Control Equipment. Where there is a probability that liquid or other condensed vapor may be trapped within enclosures for control equipment or at any point in the raceway system, approved means shall be provided to prevent accumulation or to permit periodic draining of such liquid or condensed vapor.

(2) Motors and Generators. Where the authority having jurisdiction judges that there is a probability that liquid or condensed vapor may accumulate within motors or generators, joints and conduit systems shall be arranged to minimize entrance of liquid. If means to prevent accumulation or to permit periodic draining are judged necessary, such means shall be provided at the time of manufacture and shall be considered an integral part of the machine.

(3) Canned Pumps, Process or Service Connections, Etc. For canned pumps, process or service connections for flow, pressure, or analysis measurement, etc., that depend upon a single compression seal, diaphragm, or tube to prevent flammable or combustible fluids from entering the electrical conduit system, an additional approved seal, barrier, or other means shall be provided to prevent the flammable or combustible fluid from entering the conduit system beyond the additional devices or means, if the primary seal fails.

The additional approved seal or barrier and the interconnecting enclosure shall meet the temperature and pressure conditions to which they will be subjected upon failure of the primary seal, unless other approved means are provided to accomplish the purpose above.

Drains, vents, or other devices shall be provided so that primary seal leakage will be obvious.

505-17. Flexible Cords, Class I, Zones 1 and 2. A flexible cord shall be permitted for connection between portable lighting equipment or other portable utilization equipment and the fixed portion of their supply circuit. Flexible cord shall also be permitted for that portion of the circuit where the fixed wiring methods of Section 505-15(b) cannot provide the necessary degree of movement for fixed and mobile electrical utilization equipment, in an industrial establishment where conditions of maintenance and engineering supervision ensure that only qualified persons will install and service the installation, and the flexible cord is protected by location or by a suitable guard from damage. The length of the flexible cord shall be continuous. Where flexible cords are used, the cords shall be as follows:

1. Of a type listed ~~approved~~ for extra-hard usage;
2. Contain, in addition to the conductors of the circuit, a grounding conductor complying with Section 400-23;
3. Connected to terminals or to supply conductors in an approved manner;
4. Be supported by clamps or by other suitable means in such a manner that there will be no tension no the terminal connections; and

5. Be provided with listed seals where the flexible cord enters boxes, fittings, or enclosures that are required to be explosionproof or flameproof.

Exception: As provided in 505-15(c).

Electric submersible pumps with means for removal without entering the wet-pit shall be considered portable utilization equipment. The extension of the flexible cord within a suitable raceway between the wet-pit and the power source shall be permitted.

Electric mixers intended for travel into and out of open-type mixing tanks or vats shall be considered portable utilization equipment.

FPN: See Section 505-18 for flexible cords exposed to liquids having a deleterious effect on the conductor insulation.

505-18. Conductors and Conductor Insulation.

(1) For Type of Protection "e", field wiring conductors shall be copper.

(2) Where condensed vapors or liquids may collect on, or come in contact with, the insulation on conductors, such insulation shall be of a type identified for use under such conditions; or the insulation shall be protected by a sheath of lead or by other approved means.

505-19. Live Parts. There shall be no exposed live parts.

505-20. Equipment

(a) Zone 0. In Class I, Zone 0 locations, only equipment specifically listed and marked as suitable for the location shall be permitted.

Exception: Intrinsically safe apparatus listed for use in Class I, Division 1 locations for the same gas, or as permitted by Section 505-9(b)(2), and with a suitable temperature class shall be permitted.

(b) Zone 1. In Class I, Zone 1 locations, only equipment specifically listed and marked as suitable for the location shall be permitted.

Exception No. 1: Equipment identified for use in Class I, Division 1 or listed for use in Class I, Zone 0 locations for the same gas, or as permitted by Section 505-9(b)(2) and with a suitable temperature class shall be permitted.

Exception No. 2: Equipment identified for Class I, Zone 1, type of protection "p" shall be permitted.

(c) Zone 2. In Class I, Zone 2 locations, only equipment specifically listed and marked as suitable for the location shall be permitted.

Exception No. 1: Equipment listed for use in Class I, Zone 0 or Zone 1 locations for the same gas, or as permitted by Section 505-9(b)(2), and with a suitable temperature class, shall be permitted.

Exception No. 2: Equipment identified for Class I, Zone 1 or Zone 2, type of protection "p" shall be permitted.

Exception No. 3: Equipment identified for use in Class I, Division 1 or Division 2 locations for the same gas, or as permitted by Section 505-9(b)(2) and with a suitable temperature class shall be permitted.

Exception No. 3: In Class I, Zone 2 locations, the installation of open or nonexplosionproof or nonflameproof enclosed motors, such as squirrel-cage induction motors without brushes, switching mechanisms, or similar arc-producing devices that are not identified for use in a Class I, Zone 2 location shall be permitted.

FPN No. 1: It is important to consider the temperature of internal and external surfaces that may be exposed to the flammable atmosphere.

FPN No. 2: It is important to consider the risk of ignition due to currents arcing across discontinuities and overheating of parts in multisection enclosures of large motors and generators. Such motors and generators may need equipotential bonding jumpers across joints in the enclosure and from enclosure to ground. Where the presence of ignitible gases or vapors is suspected, clean air purging may be needed immediately prior to and during start-up periods.

(d) Manufacturer's Instructions. Electrical equipment installed in hazardous (classified) locations shall be installed in accordance with the instructions (if any) provided by the manufacturer.

505-21. Multiwire Branch Circuits. In a Class I, Zone 1 location, a multiwire branch circuit shall not be permitted.

Exception: Where the disconnect device(s) for the circuit opens all ungrounded conductors of the multiwire circuit simultaneously.

505-22. Increased Safety "e" Motors and Generators. In Class I, Zone 1 locations, Increased Safety "e" motors and generators of all voltage ratings shall be listed for Class I, Zone 1 locations, and shall comply with the following.

1. Motors shall be marked with the current ratio, I_A / I_N, and time, t_E;
2. Motors shall have controllers marked with the model or identification number, output rating (horsepower or kilowatt), full-load amperes, starting current ratio (I_A / I_N), and time (t_E) of the motors that they are intended to protect; the controller marking shall also include the specific overload protection type (and setting, if applicable) that is listed with the motor or generator;
3. Connections shall be made with the specific terminals listed with the motor or generator;
4. Terminal housings shall be permitted to be of substantial, nonmetallic, nonburning material provided an internal grounding means between the motor frame and the equipment grounding connection is incorporated within the housing;
5. The provisions of Part C of Article 430 shall apply regardless of the voltage rating of the motor;
6. The motors shall be protected against overload by a separate overload device that is responsive to motor current. This device shall be selected to trip or shall be rated in accordance with the listing of the motor and its overload protection;
7. Sections 430-32(c) and 430-44 shall not apply to such motors; and
8. The motor overload protection shall not be shunted or cut out during the starting period.

505-25. Grounding and Bonding. Grounding and bonding shall comply with Article 250 and the following additional requirements.

(a) Bonding. The locknut-bushing and double-locknut types of contacts shall not be depended on for bonding purposes, but bonding jumpers with proper fittings or other approved means of bonding shall be used. Such means of bonding shall apply to all intervening raceways, fittings, boxes, enclosures, etc., between Class I locations and the point of grounding for service equipment or point of grounding of a separately derived system.

Exception: The specific bonding means shall only be required to the nearest point where the grounded circuit conductor and the grounding electrode are connected together on the line side of the building or structure disconnecting means as specified in Sections 250-32(a), (b), and (c), provided the branch-circuit overcurrent protection is located on the load side of the disconnecting means.

FPN: See Section 250-100 for additional bonding requirements in hazardous (classified) locations.

(b) Types of Equipment Grounding Conductors. Where flexible metal conduit or liquidtight flexible metal conduit is used as permitted in Section 505-15(c) and is to be relied on to complete a sole equipment grounding path, it shall be installed with internal or external bonding jumpers in parallel with each conduit and complying with Section 250-102.

Exception: In Class I, Zone 2 locations, the bonding jumper shall be permitted to be deleted where all the following conditions are met.

a. Listed liquidtight flexible metal conduit 1.8 m (6 ft) or less in length, with fittings listed for grounding, is used.
b. Overcurrent protection in the circuit is limited to 10 amperes or less.
c. The load is not a power utilization load.

PANEL STATEMENT: The action on this Comment, which is a rewrite of Article 505, incorporates all applicable actions on Comments 14-117 through 14-156. The revised text also includes modifications to provide consistency and correlation with other Articles of Chapter 5.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
COMMENT ON AFFIRMATIVE:
BRIESCH: Editorial Corrections:
In Section 505-9(c)(2)(d), the reference should be to table 505-9(b)(1) not 505-9(b)(2).
In Section 505-9(d) in the parentheses at the end of the first sentence,add "3/4" so that it reads "(3/4 in. taper per foot)." This was inadvertently deleted.
There are two sections designated 505-9(c). The first being "Marking" and the second being "Class I Temperature." "Class I Temperature" should become 505-9(d) and then "Threading" which is now 505-9(d) becomes 505-9(e).
COOK: I agree with the reorganization of Article 505 and most of the actions taken by the panel. I do not support action on comment 14-155 and expressed the negative on that comment. I also believe that the following are typing and/or editorial errors:
• pages 9 & 10, Section 505-9, has two part (c)'s
• page 11, Section 505-9(d), should read; .....taper of 1 in 16 (3/4-in. taper per foot).
In Section 505-8(d) FPN, change "Table 505-9(b)(1)" to "Table 505-9(c)(2)(d)". (correlation)
Adjust references and numbering throughout Section 505-9 for subsections, figures, and tables as follows to keep from having two subsections marked (c):

505-9 Suitability of Equipment

(a) Suitability. Suitability of identified equipment shall be determined by:

(1) Equipment listing or labeling, or
(2) Evidence of equipment evaluation from a qualified testing laboratory or inspection agency concerned with product evaluation, or
(3) Evidence acceptable to the authority having jurisdiction such as a manufacturer's self-evaluation or an owner's engineering judgment.

(b) Listing.

(1) Equipment that is listed for a Zone O location shall be permitted in a Zone 1 or Zone 2 location of the same gas or vapor. Equipment that is listed for a Zone 1 location shall be permitted in a Zone 2 location of the same gas or vapor.

(2) Equipment shall be permitted to be listed for a specific gas or vapor, specific mixtures of gases or vapors, or any specific combination of gases or vapors.

FPN: One common example is equipment marked for "IIB + H_2."

(c) Marking. Equipment shall be marked in accordance with (1) or (2).

(1) Division Equipment. Equipment identified for Class I, Division 1 or Class I, Division 2 shall, in addition to being marked in accordance with Section ~~500-6(d),~~ 500-8(b), be permitted to be marked with the following:

I. Class I, Zone 1 or Class I, Zone 2 (as applicable), and
II. Applicable gas classification group(s) in accordance with Table 505-9~~(b)(2),~~ (c)(2)(e)and
III. Temperature classification in accordance with Section 505-9~~(3)~~(d)

(2) Zone Equipment. Equipment meeting one or more or the protection techniques described in Section 505-~~5~~ 8 shall be marked with the following in the order shown:

I. Class
II. Zone
III. Symbol "AEx"
IV. Protection technique(s) in accordance with Table 505-9~~(b)(2)~~(c)(2)(d)
V. Applicable gas classification group(s) in accordance with Table 505-9~~(b)(2)~~(c)(2)(e)
VI. Temperature classification in accordance with Section 505-9~~(c)~~(d)

Exception: Intrinsically safe associated apparatus shall be required to be marked only with (c), (d), and (e).

Electrical equipment of types or protection "e," "m," "p," or "q," shall be marked Group II. Electrical equipment of types of protection "d," "ia," " ib," "[ia]," or "[ib,]" shall be marked Group IIA, or IIB, or IIC, or for a specific gas or vapor. Electrical equipment of types of protection "n" shall be marked Group II unless it contains enclosed-break devices, nonincendive components, or energy-limited equipment or circuits, in which case it shall be marked Group IIA, IIB, or IIC, or a specific gas or vapor. Electrical equipment of other types of protection shall be marked Group II unless the type of protection utilized by the equipment requires that it shall be marked Group IIA, IIB, or IIC, or a specific gas or vapor.

FPN: An example of such a required marking is "Class I, Zone 0, AEx ia IIC T6." An explanation of the marking that is required is shown in Figure 505-9~~(b)(1).~~(c)(2)

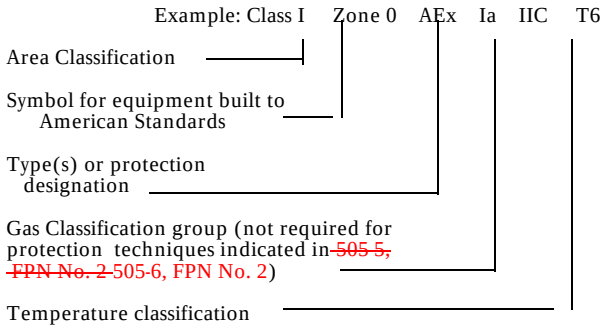


Figure 505-9~~(b)(1)~~(c)(2)

Table 505-9~~(b)(1).~~ (c)(2)(d) Types of Protection Designation

Designation	Technique	Zone*
d	Flameproof enclosure	1
e	Increased safety	1
ia	Intrinsic safety	0
ib	Intrinsic safety	1
[ia]	Intrinsically safe associated apparatus	Unclassified
[ib]	Intrinsically safe associated apparatus	Unclassified
m	Encapsulation	1
nA	Nonsparking equipment	2
nC	Sparking equipment in which the contacts are suitably protected other than by restricted breathing enclosure	2
nR	Restricted breathing enclosure	2
o	Oil immersion	1
p	Purged and pressurized	1 or 2
q	Powder filled	1

*Does not address use where a combination of techniques is used.

Table 505-9~~(b)(2).~~ (c)(2)(e)Gas Classification Groups

Gas Group	Comment
IIC	See Section 505-6(a)(1)
IIB	See Section 505-6(a)(2)
IIA	See Section 505-6(a)(3)

(~~c~~d) Class I Temperature. The temperature marking specified below shall not exceed the ignition temperature of the specific gas or vapor to be encountered.
FPN: For information regarding ignition temperatures of gases and vapors, see Recommended Practice for the Classification of Flammable Liquids, Gases, or Vapors and of Hazardous (Classified) Locations for Electrical

Installations in Chemical Process Areas, NFPA 497-1997; and Electrical Apparatus for Explosive Gas Atmospheres, Data for Flammable Gases or Vapours, Relating to the Use of Electrical Apparatus, IEC 60079-20-1996.

(1) Temperature Classifications. Equipment shall be marked to show the operating temperature or temperature class referenced to a 40°C (104°F) ambient. The temperature class, if provided, shall be indicated using the temperature class (T Code) shown in Table 505-9~~(c).~~(d).

Table 505-9~~(c).~~(d). Classification of Maximum Surface Temperature for Group II Electrical Equipment

Temperature Class (T Code)	Maximum Surface Temperature (°C)
T1	≤450
T2	≤300
T3	≤200
T4	≤135
T5	≤100
T6	≤85

Electrical equipment designed for use in the ambient temperature range between –20°C and +40°C shall require no additional ambient temperature marking.
Electrical equipment that is designed for use in a range of ambient temperatures other than –20°C and +40°C is considered to be special; and the ambient temperature range shall then be marked on the equipment, including either the symbol "Ta" or "Tamb" together with the special range of ambient temperatures. As an example, such a marking might be "-30°C≤Ta≤+40°C."
Electrical equipment suitable for ambient temperatures exceeding 40°C (104°F) shall be marked with both the maximum ambient temperature and the operating temperature class at that ambient temperature.

Exception No. 1: Equipment of the nonheat-producing type, such as conduit fittings, and equipment of the heat-producing type having a maximum temperature of not more than 100°C (212°F) shall not be required to have a marked operating temperature or temperature class.
Exception No. 2: Equipment identified for Class I, Division 1 or Division 2 locations as permitted by Sections 505-20(b) Exception No.1 and (c) Exception No. 3 shall be permitted to be marked in accordance with Section ~~500-6(d)~~ 500-8(b) and Table ~~500-6(d).~~500-8(b).

(~~d~~e) Threading. All threaded conduit referred to herein shall be threaded with a National (American) Standard Pipe Taper (NPT) standard conduit cutting die that provides a taper of 1 in 16 (3/4-in. taper per foot). Such conduit shall be made wrenchtight to prevent sparking when fault current flows through the conduit system, and to ensure the explosionproof or flameproof integrity of the conduit system where applicable. Threaded joints shall be made up with at least five threads fully engaged for entries into flameproof or explosionproof equipment.

Equipment provided with threaded entries for field wiring connections shall be installed in accordance with (1) or (2).

(1) Equipment Provided with Threaded Entries for NPT Threaded Conduit or Fittings. For equipment provided with threaded entries for NPT threaded conduit or fittings, listed conduit, conduit fittings, or cable fittings shall be used.

FPN: Thread form specifications for NPT threads are located in Pipe Threads, General Purpose (Inch), ANSI/ASME B1.20.1-1983.

(2) Equipment Provided with Threaded Entries for Metric Threaded Conduit or Fittings. For equipment with metric threaded entries, such entries shall be identified as being metric, or listed adapters to permit connection to conduit or NPT-threaded fittings shall be provided with the equipment. Adapters shall be used for connection to conduit or NPT-threaded fittings. Listed cable fittings that have metric threads shall be permitted to be used.

FPN: Threading specifications for metric threaded entries are located in Metric Screw Threads, ISO 965/1-1980, and Metric Screw Threads, ISO 965/3-1980.

- In Section 505-17(4), change "no tension no the terminal" to "no tension on the terminal".

GOODMAN: Panel members Mr. Briesch, Mr. Cook, and Mr. O'Meara have identified typographical, syntax, cross-reference, and other minor errors in the section. I support the correction of these items as "editorial" by the Panel Chair and NFPA staff, provided no changes are made to the content of the effected sections.
OMEARA: Recommend making editorial and other changes (corrections) to this rewrite of Section 505 as follows:
505-2, Electrical and Electronic Equipment definition. Last sentence of the added FPN contains language not permitted by the style manual (Equipment ...should be employed). I recommend changing this sentence to make it advisory in nature as follows: "Using equipment suitable for the hazardous location or using safety procedures to ensure the safe operation of equipment in hazardous (classified) locations are two ways to ensure personnel, safety."
505-5(a): Delete "14-323" in brackets after FPN No. 2. Delete "14-39" in parentheses after the last FPN.
505-9: During the rewrite of this section, a paragraph (a) was added. This caused problems with subsequent paragraph numbering, which should be corrected as follows:
1) The figure now marked "Figure 505-9(b)(1)" is no longer associated with paragraph 505-9(b)(1). Change the figure to "Figure 505-9(c)(2)" to indicate its proper association.
2) The table now marked "Table 505-9(b)(1)" is no longer associated with paragraph 505-9(b)(1). Change the title to "Table 505-9(c)(2)(a)" to indicate its proper association.
3) The table now marked "Table 505-9(b)(2)" is no longer associated with paragraph 505-9(b)(2). Change the title to "Table 505-9(c)(1)" to indicate its proper association.
4) Paragraph marked "(c) Class I Temperature" should be changed to "(d) Class I Temperature."
5) The table now marked "Table 505-9(c)" is no longer associated with paragraph 505-9(c). Change the title to "Table 505-9(d)."
6) Paragraph marked "(d) Threading." should be changed to "(e) Threading."
7) Delete "lined through" items/verbiage at the figure title, table titles, and first line of section titled Class I Temperature.
505-9(b)(2): In the FPN, change the "2" following the letter "H" to a subscript to indicate hydrogen; thus the sentence would read, "... equipment marked for "IIB + H_2".
505-9(c)(1): Change, "... in accordance with Section 500-6(d)..." to "in accordance with Section 505-8(b)...".
505-9(c)(1)(b): Change "...in accordance with Table 505-9(b)(2)..." to "in accordance with Table 505-9(c)(1)...".
505-9(c)(1)(c): Change, "...in accordance with Section 505-9(3)" to "...in accordance with Section 505-9(d)."
505-9(c)(2): Change, "...described in Section 505-5..." to "... described in Section 505-8...".
505-9(c)(2)(d): Change, "... in accordance with Table 505-9(b)(2)" to "... in accordance with Table 505-9(c)(2)(a)."
505-9(c)(2)(e): Change, "... in accordance with Table 505-9(b)(2)" to "... in accordance with Table 505-9(c)(1)."
505-9(c)(2)(f): Change, "... in accordance with Table 505-9(c)" to "... in accordance with Table 505-9(d)."
505-9(c)(2) FPN: Change, "...shown in Figure 505-9(b)(1)" to "... shown in Figure 505-9(c)(2)."
505-9(d)(1): Change, "...shown in Table 505-9(c)" to "...shown in Table 505-9(d)."
505-9(d)(1) Exception 2: Change, "... in accordance with Section 500-6(d) and Table 500-6(d)" to "... in accordance with Section 500-8(b) and Table 500-8(b)."
505-9(e) Threading: Insert "3/4 " at blank in first sentence to make it read, "... provides a taper of 1 in. 16 (3/4 in. taper per foot)."
505-17. In the description of useable flexible cords, line number 1, delete the lined through word "approved." In line number 4, change the second "no" to "on" so that the sentence reads, "...there will no tension on the terminal connections."

(Log #2361)

14- 127 - (505-Unclassified Locations): Accept
SUBMITTER: David Wechsler, Union Carbide Corp.
COMMENT ON PROPOSAL NO: 14-318a
RECOMMENDATION: Delete the definition "nonhazardous", replace the word "nonhazardous" with "unclassified" throughout Chapter 5, and modify the defined term "unclassified" as follows:
Unclassified Locations. Locations determined to be neither Class I, Division 1; Class I, Division 2; Class I, Zone 0; Class I, Zone 1; Class I, Zone 2; Class II, Division 1; Class II, Division 2; Class III, Division 1; Class III, Division 2; or any combination thereof.
SUBSTANTIATION: As stated in the original proposal, the term "unclassified" is the appropriate term that agrees with NFPA 497 and API terminology. The use of the term "nonhazardous" as expressed in the committee ballots should not be used, nor defined further, nor referenced within Chapter 5 articles. The term "unclassified" has been slightly modified to better apply in the text where the word "nonhazardous" was used.
PANEL ACTION: Accept.
PANEL STATEMENT:
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #2199)

14- 128 - (505-3(a), FPN No. 20): Accept
SUBMITTER: Mark Goodman, BP (ARCO)
COMMENT ON PROPOSAL NO: 14-323
RECOMMENDATION: Replace "nonhazardous" with "unclassified".
SUBSTANTIATION: This comment is in support of the original proposal and substantiation.
This proposal should have been "Accept" and not "Accept in Principle". The Panel Action is contrary to the submitter's intent and justification. The correct term is "unclassified" and should be used consistently throughout the code sections to avoid confusion and misapplication. This proposal along with other companion proposals referenced in the submitter's substantiation are designed to remove the term "nonhazardous" from the NEC, not add and define the term.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #669)

14- 129 - (505-3(b)): Accept
SUBMITTER: Jack A. Gruber, Wheatland Tube Co.
COMMENT ON PROPOSAL NO: 14-13
RECOMMENDATION: I agree with the proposed change for 505-3(b).
SUBSTANTIATION: With regard to the panel statement, I have the following comments:
The metric designators submitted for the conduit are the same ones currently listed in the 1999 NEC (346-6(b), FPN, and do not represent a change or new material. These metric designators are also currently listed in the UL Standards (6, 797, 1242) and also in the ANSI documents (C80.1, C80.3 and C80.6). These are designators and should not be an exact conversion because they are dimensionless designators. The UL and ANSI documents selected these designators because they were taken from the International Electrotechnical Commission IEC 981 which is an International Standard for Extra-Heavy Duty Rigid Steel Conduits for Electrical Installations. The metric designators should remain as presented by the NEC Metric Conversion Task Group.
The length of the conduit is correct at 3.05 m as it is currently produced by all U.S. conduit manufacturers. The NEC Metric Conversion Task Group retained the 3.05 m due to current industry practice and the finished conduit length should remain as presented by the NEC Metric Conversion Task Group.
The Metric Screw Threads in ISO 365 are true metric threads. However, all threaded domestic conduit is threaded to the ANSI/ASME B1.20.1 Standard for Pipe Threads, General Purpose (inch) and these inch-pound units have been soft converted to metric values in IEC 981 and have also been incorporated into the UL documents (UL 6, UL 797 and UL 1242, as well as the ANSI C80 documents (C80.1, C80.3 and C80.6). The IEC 981 International Standard for Extra-Heavy Duty Rigid Steel Conduits for Electrical Installations should also be referenced in the FPN as the standard to which all domestic conduit is threaded. The NEC Metric Conversion Task Group discussed this issue and the US Conduit threads are produced in conformance to the ANSI/ASME B 1.20.1 and the IEC 981 Standards.
PANEL ACTION: Accept.
See action on Comment 14-126.
PANEL STATEMENT: The panel action on Comment 14-126 will reflect the complete text of Article 505.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #161)

14- 130 - (505-6): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 14-344
RECOMMENDATION: The Technical Correlating Committee directs that the Panel clarify the Panel Action and Panel Statement on this Proposal. It is not clear what is meant by the statement "The referenced document is not yet published." This action will be considered by the Panel as a Public Comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
PANEL STATEMENT: The panel reconsidered the issue and determined that the panel action to Accept in Principle Proposal 14-344 was editorial. The panel statement regarding "reference document not yet published" applies to Proposal 14-333.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #501)

14- 131 - (505-6(a)): Reject
SUBMITTER: William T. Fiske, Intertek Testing Services
COMMENT ON PROPOSAL NO: 14-348
RECOMMENDATION: Panel action should be upheld.
SUBSTANTIATION: The comment supports the panel action; however, we do not fully agree with submitter's substantiation. The NEC does not set forth professional qualifications in any other section, and should not do so here. Whether the subject be area classification or some other aspect of electrical systems design, experienced and qualified people should be involved. Whether or not these individuals need to be licensed professional engineers is established by State regulations, as it should be.
PANEL ACTION: Reject.
PANEL STATEMENT: Based on the substantiation statements of Comments 14-132, 14-133, and 14-134, the panel has reinstated the text in question.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #1528)

14- 132 - (505-6(a)): Accept
SUBMITTER: Michael J. Johnston, International Association of Electrical Inspectors
COMMENT ON PROPOSAL NO: 14-348
RECOMMENDATION: This proposal should be rejected for the 2002 NEC.
SUBSTANTIATION: The proposal should be rejected because the zone classification system of classifying hazardous locations, although not new to the NEC, without doubt is still new to the field. We agree with the four comments to the negative to reject this proposal for at least one more code cycle. This will allow additional time for installers as well as registered professionals to become more familiar as this new method of classification is utilized on a more regular basis.

Typically industry learning curves can take up to 10 years to achieve minimum competency levels, and to totally adjust to new technologies and requirements. This should not be considered a restriction, but more as a continued safe guard to allow time for transition.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
ZIPSE: The requirement for only a "qualified Registered Professional Engineer" entered the code in Article 500 in 1996. At that time, I supported this requirement as a concession to a member in order to obtain his vote. (The lesson learned Do Not Horse Trade as you will not get your half.)
In the 1999 edition, the requirement was retained even though Article 505 was an almost exact copy of Article 500 and 501. Anyone familiar with the basic requirements of the division requirements, contained in Articles 500 and 501, should be familiar with the requirements of Article 505, since they read the same.
The cries of leave the requirement in for one more cycle were heard last code cycle. Now, the same cries are heard again. We hear that the requirements are new to the field. Does that mean that the field lacks the basic understanding of those ancient basic requirements of Articles 500 and 501?
If Article 505 had been written new from the ground up then one could accept the requirement, but it was copied from Articles 500 and 501.
What this isolated requirement means is restraint of trade. Those most knowledgeable in applying the zone requirements such as the Chairman of Code Making Panel 14, probably most of the writers of Code Books and Code Columns in magazines, salesmen, etc. are prohibited from designing Article 505 installations. Since Article 505 is similar to Articles 500 and 501, there should be no restriction just on Article 505, but the same restriction should apply to Articles 500, 501, 502, 503 and 504.
Again,the question begs answering; what makes Article 505 so different from Articles 500 and 501 that a restraint of trade requirement is required when Article 505 is used when it is basically the same as Article 500 and 501 except the word "division" is used in Article 500 and 501 where as in Article 505 the word "zone" is used.
This requirement, "qualified Registered Professional Engineer" gives the inspector and owner an unwarranted confidence that the work will be correctly designed and a license to all P.E.s to do zone work. As a P.E., I would like to have the whole code restricted to having just P.E.s doing all code associated work, including nonpublic designs where P.E.s are not normally required.

(Log #1907)

14- 133 - (505-6(a)): Accept
SUBMITTER: Michael I. Callanan, International Brotherhood of Electrical Workers
COMMENT ON PROPOSAL NO: 14-348
RECOMMENDATION: Reject this proposal.
SUBSTANTIATION: The proposal should be rejected because the zone classification system of classifying hazardous locations, although not new to the NEC, is without doubt still new to the field. We agree with the four comments to the negative to reject this proposal. As Mr. Cook pointed out in his explanation of negative, the use of Article 505 poses major challenges even to qualified registered professional engineers. Typically industry learning curves can take up to 10 years to achieve minimum competency levels, and to totally adjust to new technologies and requirements. This should not be considered a restriction, but more as a continued safe guard to allow time for transition. Subsection 505-6(a) must remain to clearly require that decisions involving classifications, equipment and wiring methods be made by qualified persons.
This comment represents the official position of the International Brotherhood of Electrical Workers Codes & Standards Committee.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #2200)

14- 134 - (505-6(a)): Accept
SUBMITTER: Mark Goodman, BP (ARCO)
COMMENT ON PROPOSAL NO: 14-348
RECOMMENDATION: Replace Section 500-6(a), Supervision of Work as written in the 1999 NEC.
SUBSTANTIATION: The comment recommends a Reject (reversal of the Panel Action) of the proposal to remove the section requiring supervision of work for Zone system installations. The removal of this section while the NEC requirements for Article 505 are still evolving is not yet warranted. Additional design and field personnel training and experience prior to the next code cycle should allow for the removal of this section in the 2005 Code.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #1479)

14- 135 - (505-7(f)): Hold
SUBMITTER: Robert L. Seitz, Artech Engineering
COMMENT ON PROPOSAL NO: 14-318a
RECOMMENDATION: Add the following words to this section:
Where type "e" equipment is installed, every conductor that enters the type "e" equipment shall be terminated, properly at an approved type "e" termination.
SUBSTANTIATION: What to do with "spare" conductors is what brought this issue to light. In Division 1 equipment there is no requirement for special termination so spare conductors are often not terminated and are just folded into the enclosure with wire nut caps or heat shrink to prevent exposed conductor from making contact with other parts of the enclosure. For Type "e" the method of protection is determined by the termination. The requirement to terminate is not included within the ANSI standard as these are field conductors. It is important that this requirement be stated somewhere and NFPA 70 is the only place left.
PANEL ACTION: Hold.
PANEL STATEMENT: This comment introduces a concept that has not had public review.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
COMMENT ON AFFIRMATIVE:
LAWRENCE: Panel statement notes that this comment "introduces a concept that has not had public review". The panel statement should have referenced 110-14(b) which states in part, "All splices and joints and the free ends of conductors shall be covered with an insulation equivalent to that of the conductor or with an insulating device identified for the purpose", which already requires insulation or termination of "spare" conductors. The submitter's comment is thus not new material, but a proposed limitation of the means by which "spare" conductors in an increased Safety "e" terminal box can be either insulated or terminated to include only "e" terminals. The panel statement as written could be construed to mean that "spare" cables in an increased safety terminal box require no additional treatment, which is not a true statement.

(Log #502)

14- 136 - (505-9(d)): Accept
SUBMITTER: William T. Fiske, Intertek Testing Services
COMMENT ON PROPOSAL NO: 14-352
RECOMMENDATION: Accept the proposal.
SUBSTANTIATION: We support Mr. Goodman's objection, as expressed in comment on vote.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #894)

14- 137 - (505-9(d)): Reject
SUBMITTER: William G. Lawrence, Jr., S. Yarmouth, MA
COMMENT ON PROPOSAL NO: 14-318a
RECOMMENDATION: The text of the proposed Section 505-9(d) needs to be correlated with the text of 501-4(a)(1) with respect to the minimum engagement of threaded joints. If a minimum of 3.5 is accepted in Article 500/501, the same value needs to be reflected here.

It should be noted the requirement for minimum thread engagement appears in the "general" requirements section [505.9(D) of the preprint] of Article 505, but appears in the "wiring methods" requirements section [501-4(a)(1)] of the existing Article 500. The requirement, be it 3.5 or 5, should be located in similar sections of the articles.
SUBSTANTIATION: The 3.5 minimum tapered thread engagement can be justified based on research work conducted by the Electrical Equipment Certification Service (EECS/BASEEFA/MECS) in the United Kingdom which concluded that 2.3 hand-tight tapered threads will not transmit an explosion. The 2.3 threads represents at least 150 percent safety factor on the proposed 3.5 minimum thread wrench-tight engagement. The conclusions of the research work are provided and demonstrate that the integrity of the installation is not compromised.

Note: Supporting material is available for review at NFPA Headquarters.
PANEL ACTION: Reject.
PANEL STATEMENT: While the information provided indicates that the reduced number of thread engagements proposed may not contribute to additional flame transmission, the panel believes that there are advantages to requiring an engagement of five threads.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
LAWRENCE: Comment 14-137 should have been accepted. In the panel's rejection of Comment 14-137, they agreed that the provided test report confirmed that the proposed reduced thread engagement would not contribute to an increased risk of flame transmission, but there are other "advantages" to the current five thread minimum engagement. The panel was remiss in their failure to detail how any of those undefined "advantages" affected the rationale for their rejection, and, therefore, did not comply with 4-4.6.3 of the Regulations Governing Committee Projects.

(Log #2201)

14- 138 - (505-9(d) (New)): Accept
SUBMITTER: Mark Goodman, BP (ARCO)
COMMENT ON PROPOSAL NO: 14-352
RECOMMENDATION: Add the definition of the term "unclassified" and delete the definition and use of the term "nonhazardous".
SUBSTANTIATION: This comment is in support of the original proposal and substantiation.

This proposal should have been "Accept" and not "Accept in Principle". The Panel Action is contrary to the submitter's intent and justification. The correct term is "unclassified" and should be used consistently throughout the code sections to avoid confusion and misapplication. This proposal along with the other companion proposals referenced in the submitter's substantiation are designed to remove the term "nonhazardous" from the NEC, not to add and define the term.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #2202)

14- 139 - (505-10(b)(1)): Accept
SUBMITTER: Mark Goodman, BP (ARCO)
COMMENT ON PROPOSAL NO: 14-356
RECOMMENDATION: Replace "nonhazardous" with "unclassified" in two places within the table.
SUBSTANTIATION: This comment is in support of the original proposal and substantiation.

This proposal should have been "Accept" and not "Accept in Principle". The Panel Action is contrary to the submitter's intent and justification. The correct term is "unclassified" and should be used consistently throughout the code sections to avoid confusion and misapplication. This proposal along with the other companion proposals referenced in the submitter's substantiation are designed to remove the term "nonhazardous" from the NEC.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #503)

14- 140 - (505-15): Reject
SUBMITTER: William T. Fiske, Intertek Testing Services
COMMENT ON PROPOSAL NO: 14-364
RECOMMENDATION: Accept the proposal as submitted.
SUBSTANTIATION: The panel action to broadly permit tray cable has not been substantiated.
PANEL ACTION: Reject.
PANEL STATEMENT: The recommendation and the substantiation do not correlate.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #2321)

14- 141 - (505-15):
Note: The Technical Correlating Committee directs that this Comment be reported as "Accept in Part", based on the Panel Action on Comment 14-126.
SUBMITTER: Arthur V. Pack, Jr., The Okonite Co.
COMMENT ON PROPOSAL NO: 14-364
RECOMMENDATION: I recommend that proposal 14-364 be rejected for safety considerations.
SUBSTANTIATION: We have conducted corona tests of multi-conductor 600V TC cables with an overall jacket in our laboratory. At a voltage of 2400V, the cable exhibited surface discharge (arcing) on the outside of the overall jacket. Under conditions of voltage surge due to equipment failure, switching variable frequency drives, etc., 2400V can be achieved. This can ignite or explode mixtures of flammable gasses and air.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #2357)

14- 142 - (505-15): Accept in Part
SUBMITTER: Will E. McBride, BP Exploration Alaska
COMMENT ON PROPOSAL NO: 14-364
RECOMMENDATION: Revise 505-15 to read:

505-15. Wiring Methods. Wiring methods shall maintain the integrity of protection techniques and shall comply with (a), (b), or (c).

(a) Class I, Zone 0. In Class I, Zone 0 locations only intrinsically safe wiring methods in accordance with Article 504 shall be permitted.

FPN: Article 504 only includes protection technique "ia".

(b) Class I, Zone 1.

(1) In Class I, Zone 1 locations, the following wiring methods shall be permitted:

(a) In industrial establishments with restricted public access, where the conditions of maintenance and supervision ensure that only qualified persons will service the installation, and where the cable is not subject to physical damage, Type MC-HL cable listed for use in Class I, Zone 1 or Division 1 locations, with a gas/vaportight continuous corrugated metallic sheath, an overall jacket of suitable polymeric material, separate equipment grounding conductors in accordance with Section 250-122, and provided with termination fittings listed for the application.

FPN: See Sections 334-3 and 334-4 for restrictions on use of Type MC cable.

(b) In industrial establishments with restricted public access, where the conditions of maintenance and supervision ensure that only qualified persons will service the installation, and where the cable is not subject to physical damage. Type ITC-HL cable listed for use in Class I, Zone 1 or Division 1 locations with a gas/vaportight continuous corrugated metallic sheath, an overall jacket of suitable polymeric material, provided with separate equipment grounding conductors in accordance with Section 250-122, and provided with termination fittings listed for the application.

(c) In industrial establishments with restricted public access, where the conditions of maintenance and supervision ensure that only qualified persons will service the installation, and where the cable is not subject to physical damage, Type TC cable shall be permitted if listed as suitable for use as open wiring and provided with a gas/vaportight overall jacket of suitable polymeric material and provided with separate equipment grounding conductors in accordance with Section 250-122. Cable termination fittings shall be listed for the application. The open wiring shall not exceed lengths of 6 ft.

FPN: Type TC cable listed for use as open wiring meets the crush and impact requirements of Type MC-HL cable.

(d) Type MI cable with termination fittings approved for Class I, Zone 1 or Division 1 locations. Type MI cable shall be installed and supported in a manner to avoid tensile stress at the termination fittings.

(e) Threaded rigid metal conduit, or threaded steel intermediate metal conduit.

(f) Rigid nonmetallic conduit complying with Article 347 shall be permitted where encased in a concrete envelope a minimum of 2 in. (50.8 mm) thick and provided with not less than 24 in. (610 mm) of cover measured from the top of the conduit to grade. Threaded rigid metal conduit or threaded steel intermediate metal conduit shall be used for the last 24 in. (610 mm) of the underground run to emergence or to the point of connection to the aboveground raceway. An equipment grounding conductor shall be included to provide for electrical continuity of the raceway system and for grounding of noncurrent-carrying metal parts.

(2) Where necessary to employ flexible connections, flexible fittings listed for Class I, Zone 1 or Division 1 locations or flexible cord in accordance with the provisions of Section 505-17 shall be permitted.

(3) All boxes and fittings shall be listed for Class I, Zone 1 or identified Class I, Division 1.

SUBSTANTIATION: Changes concerning MC-HL, ITC-HL, and TC-HL Cables.

a). For 505-15(b)(1)(a) and (b): The use of cable in Zone locations should be limited to "Industrial Establishments until the use of Zone equipment is better understood in the USA.

b). For 505-15(b)(1)(b): ITC-HL Cable should have a dedicated ground wire since the enclosures used on Zone Locations may be non-metalic.

c). For 505-15(b)(1)(c): The use of Type TC Cable listed for use as "Open Wiring" should be limited to 6 ft to assure it is neither subject to physical damage nor subjected to undue strain. The panel action to change this to 15 ft was without basis.

d). For 505-15(b)(1)(c): The exception to types MC-HL, and ITC-HL cables recognizes and permits the use of a special Tray Cable (suggested as TC-HL) between enclosures within Class I, Zone 1 that use the type of protection increased safety. This type of cable is appropriate for connection between enclosures utilizing the type of protection 'e' since this type of protection does not contain a source of ignition. TC cable complying with Article 340-4(6), per UL 1277 and must further meet the crush and impact requirements of type MC-HL cable, per UL 2225 cannot be located where it is subject to physical damage and must be identified for use. The Exception to permit this specific Type TC cable between enclosures with type protection 'e' is an important Exception because it recognizes perhaps the most important wiring method in Class I, Zone 1 locations. The wiring methods of Class I, Zone 1 locations are Increased Safety, Flameproof and Intrinsic Safety, and without this exception, the wiring methods would not be complete.

This wiring method recognizes the important fact of the Zone System that Class I, Zone 1 does not have the same level of risk as Class I, Division 1 locations. A cable that meets the crush and impact requirements of MC-HL cable, must be protected from physical abuse, can only be used in industrial establishments where the conditions of maintenance and supervision ensure that only qualified persons will service the installation and where the Classification of areas, selection of equipment and wiring methods are under the supervision of a qualified Registered Professional Engineer is not a source of ignition and is safe for connection between enclosures using the type of protection 'e'. The level of protection afforded by this type of TC Cable is consistent with the level of protection provided by enclosures with type of protection 'e'.

PANEL ACTION: Accept in Part.

See action on Comment 14-126.

PANEL STATEMENT: Item (c) [TC cable] has not been accepted, per action on Comment 14-144.

Item (3) is included in the requirements of 505-20.

Other modifications to this proposal are included in the action to Comment 14-126, Article 505 rewrite, based on actions on Comments 14-145 and 14-146.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:

AFFIRMATIVE: 14

COMMENT ON AFFIRMATIVE:

SABAN: See my affirmative comment on Comment 14-98.

(Log #963)

14- 143 - (505-15(b)): Reject

SUBMITTER: Robert L. Seitz, Artech Engineering

COMMENT ON PROPOSAL NO: 14-318a

RECOMMENDATION: Delete text as follows:

An explosion proof seal, constructed in accordance with Section 501-5(c), shall be provided for each conduit entering an enclosure having type of protection ~~"e" or~~ "d" except where the type of protection "d" enclosure is marked to indicate that a seal is not required.

SUBSTANTIATION: Type "e" enclosures cannot contain an explosion, or prevent the entrance of combustible gas. Where conduits connect between type "e" and type "d" enclosures ,the conduit would already be required to have a seal installed at the type "d" end. Connection of conduits between two or more type "e" enclosures should require no explosion proof seals.

PANEL ACTION: Reject.

PANEL STATEMENT: The proposed text that the commenter suggested be deleted and the substantiation is technically incorrect, as a conduit seal is required in a conduit run entering a Type "e" enclosure in order to prevent the conduit from propagating an explosion into the Type "e" enclosure and to maintain the IP54 rating of the enclosure.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:

AFFIRMATIVE: 14

(Log #451)

14- 144 - (505-15(b) Exception No. 1): Accept

SUBMITTER: H. R. Stewart, HRS Consulting

COMMENT ON PROPOSAL NO: 14-364

RECOMMENDATION: Delete in Total:

Exception No. 1: In industrial establishments with restricted public access, where the conditions of maintenance and supervision ensure that only qualified persons will service the installation, and where the cable is not subject to physical damage, listed Type TC cable with a gas/vapor tight overall jacket of suitable polymeric material, complying with the requirements of Article 340.4(6), with separate grounding conductors in accordance with Section 250.122, and provided with termination fittings listed for the application shall be permitted between enclosures utilizing the increased safety method of protection technique "e", within the Zone 1 location.

SUBSTANTIATION: The Exception No. 1 as proposed would allow Type TC cable which meets the crush and impact of Type MC cable to be used in a Zone 1 location. Meeting the crush and impact values of Type MC cable is not equivalent to meeting the currently required physical properties of cable approved for use in Zone 1 locations.

There is no assurance of having a "gas/vaportight sheath by any testing requirements". There is also no method to assure that the polymeric sheath is gas/vaportight after installation. It is very questionable that a suitable termination could be designed to meet the Type "e" protection technique and not damage a polymeric sheath beyond use.

In the substantiation statement 1(d), the last sentence which states "the level of protection afforded by the use of this type of TC cable is consistent with the level of protection provided by enclosures with type of protection 'e'." This is an undocumented statement with no technical support. There are test requirements for Type "e" enclosures and cable glands. There are no test requirements for the Type TC cable to show gas/vaportight withstand capability or continuity before or after installation.

In almost every industrialized country in the world, cable approved for use in a Zone 1 area is required to have a metallic sheath or armor. The use of an unarmored cable in a Zone 1 area is a drastic departure from worldwide practices with no technical substantiation to justify this position.
PANEL ACTION: Accept.
PANEL STATEMENT: Acceptance of this comment is intended to preclude the use of TC cable in a Zone 1 location.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
COMMENT ON AFFIRMATIVE:
SABAN: See my affirmative comment on Comment 14-98.

(Log #869)

14- 145 - (505-15(b)(1) and Exception): Reject
SUBMITTER: Frank H. Rocchio, The Okonite Co., Inc.
COMMENT ON PROPOSAL NO: 14-364
RECOMMENDATION: This comment is to support the Technical Correlating Committee instructions that 14-364 (505-15) be reported as "Reject" because less than two-thirds of the members eligible to vote have voted in the affirmative.
This proposal should be reworded to:
A. 505-15(b)(1) Remove "or ITC-HL".
B. 505-15(b)(1) Exception No. 1 Remove in its entirety.
SUBSTANTIATION: A. ITC-HL does not have a test protocol to determine the -HL listing and will likely never have one as much of this type cable contains bare drains which will prevent it from passing either an impact or crush test.
B. Type TC cable of the type known as "open wiring" is listed here. The test protocols for both UL 1569, Metal Clad cable and UL 1277, Electrical Power and Control Tray Cables with Optional Optical-Fiber Members are identical. The practical results of the test are greatly different. While Type MC cable has none or very few failures in the impact test, Type TC cable has to be built up to come close to passing the requirement of 8 out of 10 impacts for the open wiring listing. The electrical failure mechanism between a Type MC cable and a Type TC cable with the ground required for open wiring is completely different. Until such time as a Type TC cable will pass 10 out of 10 impact tests, this cable should not be permitted as open wiring and should not be permitted to leave the tray.
In addition, the crush and impact tests of Type MC-HL is greater than the crush and impact requirements of either Type MC or "open wiring" Type TC.

	Type MC-HL	Type MC or "open wiring" Type TC
Impact		
14 AWG	25 lbs at 1 ft = 25 ft-lbs	10 lbs at 1.5 ft = 15 ft-lbs
2 AWG	50 lbs at 1 ft = 50 ft-lbs	50 lbs at 1 ft = 50 ft lbs
Cold Impact		
at -25C	3 lbs at 3 ft = 9 ft-lbs	Not Required
Optional		
at -40C	3 lbs at 3 ft = 9 ft-lbs	Not Rquired
Crush		
14 AWG	1500 lbf	1000 lbf
2 AWG	2000 lbs	2000 lbf

Until such time as "open wiring" Type TC cable meets the requirements of Type MC-HL, it should not be permitted in any Class 1, Division 1 or Class 1, Zone 1 area.
PANEL ACTION: Reject.
PANEL STATEMENT: Panel actions on Comments 14-126 and 14-142 will retain certain portions of this section and ITC-HL cable is included as acceptable in the panel action on Comment 14-126. (Note: Exception No. 1 has been removed per Comment 14-144.)
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
COMMENT ON AFFIRMATIVE:
SABAN: See my affirmative comment on Comment 14-98.

(Log #2309)

14- 146 - (505-15(b)(1)): Accept in Principle
SUBMITTER: Joseph H. Kuczka, Killark
COMMENT ON PROPOSAL NO: 14-364
RECOMMENDATION: (1) At the beginning of the first sentence insert the following:
"In industrial establishments with restricted public access, where the conditions of maintenance and supervision ensure that only qualified persons will service the installation, and where the cable is not subject to physical damage, listed Type MC - HL ...
SUBSTANTIATION: This restriction needs to be continued for at least one more code cycle in the interest of safety.
PANEL ACTION: Accept in Principle.
See 505-15(b)(1) as shown in action on Comment 14-126 for the accepted version of the commenter's wording.
PANEL STATEMENT: Minor modifications were made for editorial consistency.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
COMMENT ON AFFIRMATIVE:
SABAN: See my affirmative comment on Comment 14-98.

(Log #2310)

14- 147 - (505-15(b)(1), Exception): Reject
SUBMITTER: Joseph H. Kuczka, Killark
COMMENT ON PROPOSAL NO: 14-364
RECOMMENDATION: After the reference to 340.4(6) add the words "that meets the crush and impact resistance of MC-HL and ITC-HL".
SUBSTANTIATION: Even though this cable does not have an armor jacket and must be protected from physical damage, it must meet the crush and impact requirements of the other cables permitted for Class I, Zone I locations.
PANEL ACTION: Reject.
PANEL STATEMENT: See action on Comment 14-142.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #1480)

14- 148 - (505-15(b)(2)): Reject
SUBMITTER: Robert L. Seitz, Artech Engineering
COMMENT ON PROPOSAL NO: 14-318a
RECOMMENDATION: Add new text to read as follows:
Allow the installation of liquidtight flexible metal conduit in certain applications in Zone 1 areas.
Exception No. 1: Where conduits or cables are connected to type "e" enclosures, liquidtight flexible metal conduit shall be permitted.
Exception No. 2: Where conduit or cables are connected to type "d" or Division 1 enclosures, liquidtight flexible metal conduit shall be permitted provided a conduit seal is installed between the flexible connections and the explosionproof enclosure.
SUBSTANTIATION: While the new language of Article 505 allows the use of Division 1 flexible fitting, more options are needed. For type "e" enclosures an explosion proof fitting is not necessary. Liquidtight would be more desirable than serve duty cord.
For Divison 1 or type "d" enclosures used in a Zone 1 where the enclosure only houses terminations, and no arcing or sparking components are installed, use of explosionproof flexible fittings adds no value to the safety but often results in less desirable installations.
NOTE: Supporting Material is available for review at NFPA Headquarters.
PANEL ACTION: Reject.
PANEL STATEMENT: No technical substantiation was submitted to support the recommendation.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #162)

14- 149 - (505-15(c)): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 14-367
RECOMMENDATION: The Technical Correlating Committee directs that the Panel clarify the Panel Statement on this Proposal. The Panel should address the technical merits of the proposal. This action will be considered by the Panel as a Public Comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
The panel accepts the Technical Correlating Committee's direction to clarify the Panel Statement on Proposal 14-367.
PANEL STATEMENT: "Energy-limited field wiring" is an undefined term. No technical substantiation was submitted to support the proposal.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #450)

14- 150 - (505-15(c)): Accept
SUBMITTER: H. R. Stewart, HRS Consulting
COMMENT ON PROPOSAL NO: 14-364
RECOMMENDATION: Delete in total Sub Clause (c):
(c) In industrial establishments with restricted public access, where the conditions of maintenance and supervision ensure that only qualified persons will service the installation, and where the cable is not subject to physical damage, Type TC cable shall be permitted if listed as suitable for use as open wiring and provided with a gas/vaportight overall jacket of suitable polymeric material and provided with separate equipment grounding conductors in accordance with Section 250-122. Cable termination fittings shall be listed for the application. The open wiring shall not exceed lengths of 15 ft.
FPN: Type TC cable listed for use as open wiring meets the crush and impact requirements of Type MC cable.
SUBSTANTIATION: This appears to be a rewrite of Exception No. 1 to put it into positive terms. This should be rejected for the same reason for rejecting the Exception No. 1. These are:
Sub Clause (c) as written would permit Type TC cable to be used in a Zone 1 location.
Meeting the crush and impact values of Type MC cable is not equivalent to meeting the currently required physical properties of cable approved for use in Zone 1 locations.
There is no assurance of having a "gas/vaportight sheath by any testing requirements." There is also no method to assure that the polymeric sheath is gas/vaportight after installation.
It is very questionable that a suitable termination could be designed to meet the Type "e" protection technique and not damage a polymeric sheath beyond use.
In the panel statement, it is indicated that the level of protection afforded by the use of this type TC cable is consistent with the level of protection provided by enclosures with type of protection "e". This is an undocumented statement with no technical support. There are test requirements for Type "e" enclosures and cable glands. There are no test requirements for the Type TC cable to show gas/vaportight withstand capability or continuity before or after installation.
In almost every industrialized country in the world, cable approved for use in a Zone 1 areas is required to have a metallic sheath or armor. The use of an unarmored cable in a Zone 1 area is a drastic departure from worldwide practices with no technical substantiation to justify this position.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
COMMENT ON AFFIRMATIVE:
SABAN: See my affirmative comment on Comment 14-98.

(Log #962)

14- 151 - (505-16(b)(1)): Reject
SUBMITTER: Robert L. Seitz, Artech Engineering
COMMENT ON PROPOSAL NO: 14-318a
RECOMMENDATION: Delete text as follows:
(1) Conduit seals shall be provided for each conduit entering enclosures having type of protection 'd'. ~~or 'e'.~~
SUBSTANTIATION: Type 'e' enclosures cannot contain explosion, or prevent the entry of combustible gas. Connection of conduit to a type 'e' enclosure does not automatically imply that the other end of the conduit is connected to a type 'd' or Division 4 type explosion proof enclosure. Conduits can be connected between two or more type 'e' enclosures and should require no conduit seal fitting in any case. Where conduits connect between type 'd' and type 'e' enclosures, this paragraph does require a conduit seal at the type 'd' end.
PANEL ACTION: Reject.
PANEL STATEMENT: The proposed text that the commenter suggested be deleted and the substantiation is technically incorrect, as a conduit seal is required in a conduit run entering a Type "e" enclosure in order to prevent the conduit from propagating an explosion into the Type "e" enclosure and to maintain the IP54 rating of the enclosure.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #2282)

14- 152 - (505-16(b)(4), Exception): Reject
SUBMITTER: Larry E. Fuhrman, City of Titusville
COMMENT ON PROPOSAL NO: 14-368
RECOMMENDATION: Revise text as follows:
Exception: Multiconductor cables with a gas/vaportight continuous sheath capable of transmitting gases or vapors through the cable core shall be permitted to be considered as a single conductor by sealing the cable in the conduit within 457 mm (18 in.) of the enclosure and the cable end within the enclosure by an ~~approved~~ "identified" means to minimize the entrance of gases or vapors and prevent the propagation of flame into the cable core, or by other ~~approved~~ "identified" methods. For shielded cables and twisted pair cables, it shall not be required to remove the shielding material or separate the twisted pair.
SUBSTANTIATION: Seal fittings are listed and supplied with the material the manufacturer intended to be utilized with the fitting. This material is identified as the correct accessory to accomplish the seal.
PANEL ACTION: Reject.
PANEL STATEMENT: As the panel has previously stated, means and methods cannot be identified, they can only be approved.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #2283)

14- 153 - (505-18(b)): Accept in Part
Note: The Technical Correlating Committee directs that the "(1)" be changed to "(a) C onductors" and "(2)" be changed to "(b) Conductor Insulation" to comply with 2.1.5 of the NEC Style Manual.
SUBMITTER: Larry E. Fuhrman, City of Titusville
COMMENT ON PROPOSAL NO: 14-181
RECOMMENDATION: Revise text as follows:
(B) Where condensed vapors or liquids may collect on, or come in contact with, the insulation on conductors, such insulation shall be of a type ~~approved~~ "identified" for use under such conditions, or the insulation shall be protected by a sheath of lead or by other ~~approved~~ "identified" means.
SUBSTANTIATION: Panel action on ROP 14-181 added this section to 505.18(B). Further Panel action was to act on changing approved to identified. Field approval of insulation of conductors is not possible without the insulation being identified by marking. Here identified or "listed" is the correct word.
PANEL ACTION: Accept in Part.
Revise 505-18(b) to read: "Where condensed vapors or liquids may collect on, or come in contact with, the insulation on conductors, such insulation shall be of a type identified for use under such conditions, or the insulation shall be protected by a sheath of lead or by other approved means."

PANEL STATEMENT: As the panel has previously stated, means and methods cannot be identified, they can only be approved.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #CC1400)

14- 153a - (505-20(b) and (c)): Accept
SUBMITTER: CMP 14
COMMENT ON PROPOSAL NO: 14-327
RECOMMENDATION: In both 505-20 (b) and (c), add a new Exception #2 to read as follows: "Exception No. 2: Equipment identified for Class I, Zone 1 or Zone 2, type of protection "p" shall be permitted."
SUBSTANTIATION: The new exceptions are added to correlate with the action on Proposal 14-327.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
COMMENT ON AFFIRMATIVE:
SABAN: Needs to have ... risk? Safety? Words of identify.

(Log #1952)

14- 154 - (505-20(e)): Accept in Principle
SUBMITTER: David Wechsler, Union Carbide Corp.
COMMENT ON PROPOSAL NO: 14-353
RECOMMENDATION: It is understood that the NEC is primarily an electrical installation document; however, the NEC does include installation techniques such as purged and pressurized areas and ventilating pipes. The use of gas detection equipment as a method of protection in hazardous (classified) locations is related to such techniques. Gas detection equipment is capable of providing indication of the presence of combustible gases prior to reaching lower explosive limits and is capable of providing alarms with ventilation or interlocks. The original proposed text has been modified to incorporate a more defined set of electrical installation criteria to allow for proper process evaluation.
Add the following new text:
505-20*(e) Permanently mounted combustible gas detection equipment may be used as a means for reducing the need for special electrical equipment provided that the location is continuously monitored by combustible gas detection equipment that is:
• listed and marked both as performance tested and as suitable for use in hazardous (classified) locations,
• installed in accordance with industrial practices,
• used in industrial establishments where the conditions of maintenance and supervision ensure that only qualified persons will service the installation,
• actuating ventilation equipment or other means designed to prevent the concentration of gas from reaching the lower explosive limit when the gas concentration reaches 20% of the lower explosive limit,
• automatically de-energizing the equipment being protected when the gas concentration reaches 40% of the lower explosive limit,
• automatically de-energizing the equipment being protected upon failure of the gas detection equipment; and
• providing an adequate number of installed sensors to ensure the sensing of combustible gas in the protected area covers all areas where such gas might accumulate.
FPN No. 1: For suggested minimum performance specifications and guidance in the selection of gas detection equipment, see ISA S12.13.01, Performance Requirements, Combustible Gas Detectors.
FPN No. 2: For suggested installation, operation and maintenance guidance, see ISA RP12.13.02, Installation, Operation, and Maintenance of Combustible Gas Detection Instruments.
FPN No. 3: For guidance in the installation of gas detection equipment, see ANSI/API RP 505, Recommended Practice for Classification of Electrical Installations at Petroleum Facilities Classified as Class I, Zone 0, Zone 1, or Zone 2.
SUBSTANTIATION: Equipment necessary to be placed in hazardous (classified) locations which cannot meet specific hazardous location protection techniques currently requires purged/pressurized protection techniques. This is not always possible or desirable under all installation considerations. For many years gas detection equipment has been used as a method of protection in petroleum facilities in accordance with ANSI/API RP 505, Recommended Practice Classification of Electrical Installations at Petroleum Facilities Classified as Class I, Zone 0, Zone 1 or Zone 2 and within hazardous location facilities in Canada in accordance with the Canadian Electrical Code (CEC) with no reported incidents. Gas detection equipment is capable of providing indication of the presence of combustible gases prior to reaching lower explosive limits and is capable of providing alarms with ventilation or interlocks. To ensure proper gas detection equipment functionality under such critical conditions, an existing ISA standard S12.13.01, Performance Requirements, Combustible Gas Detectors, will provide guidance on gas detection equipment performance requirements and an existing ISA recommended practice RP 12.13.02, Installation, Operation, and Maintenance of Combustible Gas Detection Instruments, will provide user guidance on the proper use of gas detection equipment. In conclusion, this additional method of protection should be considered for equipment which cannot meet the proper hazardous (classified) location requirements, but is necessary to be installed in such locations.
PANEL ACTION: Accept in Principle.
See action on Comment 14-155.
PANEL STATEMENT: The action on Comment 14-155 addresses this issue.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
COOK: See my Explanation of Negative on Comment 14-51
COMMENT ON AFFIRMATIVE:
SABAN: It was stated that a "smart box" should be included that prints out a tape which tells date, time, detector activated and why. I believe this is a good idea and I believe to declassify will make for very unsafe conditions, just as purge and pressurization are making conditions exist less safe.
I believe the above did not have public review.

(Log #2325)

14- 155 - (505-20(e)): Accept in Principle
Note: The Technical Correlating Committee directs that the definition in 505-2 read: "Combustible Gas Detection System. A protection technique utilizing stationary gas detectors in industrial establishments." to remove the mandatory requirements from the definition.
The Technical Correlating Committee further directs that the Panel Action on 505-8(I) be revised to read as follows to correct the style manual violation in the text:
"(I) Combustible Gas Detection System. A combustible gas detection system shall be permitted as a means of protection in industrial establishments with restricted public access and where the conditions of maintenance and supervision ensure that only qualified persons will service the installation. Gas detection equipment shall be listed for detection of the specific gas or vapor to be encountered. Where such a system is installed, equipment specified in (1), (2), or (3) shall be permitted.
(1) Inadequate Ventilation. In a Class I, Zone 1 location that is so classified due to inadequate ventilation, electrical equipment suitable for Class I, Zone 2 locations shall be permitted.
(2) Interior of a Building. In a building located in, or with an opening into, a Class I, Zone 2 location where the interior does not contain a source of flammable gas or vapor, electrical equipment for unclassified locations shall be permitted.
(3) Interior of a Control Panel. In the interior of a control panel containing instrumentation utilizing or measuring flammable liquids, gases or vapors, electrical equipment suitable for Class I, Zone 2 locations shall be permitted.
FPN No. 1: For further information, see ANSI/ISA-12.13.01, Performance Requirements, Combustible Gas Detectors.
FPN No. 2: For further information, see ANSI/API RP 500, Recommended Practice for Classification of Locations for Electrical Installations at Petroleum Facilities Classified as Class I, Division 1 or Division 2."
FPN No. 3: For further information, see ISA-RP12.13.02, Installation, Operation, and Maintenance of Combustible Gas Detection Instruments."
SUBMITTER: Jon Miller, Detector Electronics Corp.
COMMENT ON PROPOSAL NO: 14-373
RECOMMENDATION: The action of the panel to reject this proposal would eliminate a beneficial electrical installation practice that could be used in place of a purged and pressurized protection technique. The proposed wording has been developed based upon

the purged and pressurized enclosure Fine Print Note (FPN) in Article 501 of the NEC with additional text for electrical installation guidance. The use of gas detection equipment as a method of protection in hazardous (classified) locations has equivalent process evaluation and installation requirement complexity to that of purged and pressurized enclosures. It is recommended that further consideration be given to gas detection equipment as a method of protection in hazardous (classified) locations.

The initial proposed wording is as follows:

505-20(e): Permanently mounted combustible gas detection equipment may be used as a means for reducing the need for special electrical equipment when:

- combustible gas detection equipment is listed and marked both as performance tested and as suitable for use in hazardous (classified) locations,
- combustible gas detection equipment is installed in accordance with industrial practices,
- used in industrial establishments where the conditions of maintenance and supervision ensure that only qualified persons will service the installation, and
- appropriate alarms with ventilation or interlocks are provided.

FPN 1: For suggested minimum performance specifications and guidance in the selection of gas detection equipment, see ISA S12.13.01, "Performance Requirements, Combustible Gas Detectors.

FPN 2: For suggested installation, operation and maintenance guidance, see RP12.13.02. Installation, Operation, and Maintenance of Combustible Gas Detection Instruments.

FPN 3: For guidance in the installation of gas detection equipment, see ANSI/API RP 505, Recommended Practice for Classification of Electrical Installations at Petroleum Facilities Classified as Class I, Zone 0, Zone 1, or Zone 2.

SUBSTANTIATION: Equipment necessary to be placed in hazardous (classified) locations that cannot meet specific hazardous location protection techniques currently requires a purged and pressurized enclosure protection method. This is not always possible or desirable under all installation considerations. For many years gas detection equipment has been used as a method of protection in petroleum facilities in accordance with ANSI/API RP505, Recommended Practice for Classification of Electrical Installations at Petroleum Facilities Classified as Class I, Zone 0, Zone 1 or Zone 2 and within hazardous location facilities in Canada in accordance with the Canadian Electrical Code (CEC) with no reported incidents. Gas detection equipment is capable of providing indication of the presence of combustible gases prior to reaching lower explosive limits and is capable of providing alarms with ventilation or interlocks. To ensure proper gas detection equipment functionality under such critical conditions, an existing ISA standard S12.13.01, Performance Requirements, Combustible Gas Detectors, will provide guidance on gas detection equipment performance requirements and an existing ISA recommended practice RP12.13.02, Installation, Operation, and Maintenance of Combustible Gas Detection Instruments, will provide user guidance on the proper use of gas detection equipment. These documents offer an equivalent level of complexity to that of the ANSI/NFPA 496 purged and pressurized enclosure practices. In conclusion, this additional method of protection should be considered for equipment that cannot meet the proper hazardous (classified) location requirements, but is necessary to be installed in such locations.

PANEL ACTION: Accept in Principle.

Add the following new definition to 505-2:

"Combustible Gas Detection System. A protection technique utilizing stationary gas detectors in industrial establishments which under specific conditions permits the use of equipment suitable for Class I, Zone 2 locations to be used in a Class I, Zone 1 location or the use of equipment suitable for unclassified locations to be used in a Class I, Zone 2 locations."

Add the following new Paragraph (i) to 505-8: "(i) Combustible Gas Detection System. A Combustible gas detection system incorporating combustible gas detectors used in industrial establishments with restricted public access, where the conditions of maintenance and supervision ensure that only qualified persons will service the installation, is a protection technique permitted under the following conditions:

1) In a Class I, Zone 1 location that is so classified due to inadequate ventilation, electrical equipment suitable for Class I, Zone 2 locations shall be permitted.

2) In a building located in, or with an opening into, a Class I, Zone 2 location where the interior does not contain a source of flammable gas or vapor, electrical equipment for unclassified locations shall be permitted.

3) In the interior of a control panel containing instrumentation utilizing or measuring flammable liquids, gases or vapors, electrical equipment suitable for Class I, Zone 2 locations shall be permitted. Gas detection equipment shall be listed for detection of the specific gas or vapor to be encountered.

FPN: For further information, see ANSI/ISA-12.13.01, Performance Requirements, Combustible Gas Detectors.

Use of this technique for each of the applications above includes adherence to established industrial practices and requirements.

FPN No. 1: For further information, see ANSI/API RP 505, Recommended Practice for Classification of Locations for Electrical Installations at Petroleum Facilities Classified as Class I, Zone 0, Zone 1 or Zone 2.

FPN No. 2: For further information, see ISA-RP12.13.02, Installation, Operation, and Maintenance of Combustible Gas Detection Instruments."

PANEL STATEMENT: The panel agrees to applying gas detection systems in industrial establishments and selected uses. This is in keeping with long-standing practices of existing industry standards.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:

AFFIRMATIVE: 13

NEGATIVE: 1

EXPLANATION OF NEGATIVE:

COOK: See my Explanation of Negative on Comment 14-51

COMMENT ON AFFIRMATIVE:

ALEXANDER: See my affirmative comment to panel action on Comment 14-51.

GOODMAN: See my affirmative comment to the panel action on Comment 14-51.

SABAN: See my explanation of negative vote on Comment 14-154.

(Log #163)

14- 156 - (505-25): Accept

SUBMITTER: Technical Correlating Committee National Electrical Code

COMMENT ON PROPOSAL NO: 14-374

RECOMMENDATION: The Technical Correlating Committee directs the Panel to reconsider this Proposal and revise the 6 ft (1.83m) dimension in accordance with the Technical Correlating Committee's directive regarding metrication of the NEC. The issues of raceway trade size, extracts, and use of soft versus hard metrication were all studied in detail and communicated to the Panel prior to the Panel Meeting. This action will be considered by the Panel as a Public Comment.

SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.

PANEL ACTION: Accept.

See action on Comment 14-126.

PANEL STATEMENT: The panel action on Comment 14-126 will reflect the complete text of Article 505.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:

AFFIRMATIVE: 14

ARTICLE 511 — COMMERCIAL GARAGES, REPAIR AND STORAGE

(Log #164)

14- 157 - (511): Accept

Note: The Technical Correlating Committee understands that the action on this Comment is to accept Proposal 14-376 which modifies the Panel Action on Proposal 14-377.

SUBMITTER: Technical Correlating Committee National Electrical Code

COMMENT ON PROPOSAL NO: 14-376

RECOMMENDATION: It was the action of the Technical Correlating Committee that this Proposal be reconsidered by the Panel. The issues of raceway trade size, extracts, and use of soft versus hard metrication were all studied in detail and resolutions were communicated to the Panel prior to the Panel Meeting. It should be noted that all of the other Code-Making Panels accepted the metrication directive. This action will be considered by the Panel as a Public Comment.

SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:

AFFIRMATIVE: 14

(Log #165)

14- 158 - (511 through 515): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 14-376a
RECOMMENDATION: It was the action of the Technical Correlating Committee that the Panel Action on this Proposal be correlated with the Article 511 rewrite in Proposal 14-377, the Article 513 rewrite in Proposal 14-417, the Article 514 rewrite in Proposal 14-454, and the Article 515 rewrite in Proposal 14-474. This action will be considered by the Panel as a Public Comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
COMMENT ON AFFIRMATIVE:
COOK: I believe that panel action should be accept TCC direction and also should direct readers to panel action on Comment 14-160. The Zone concept should only be included in Articles 513 and 515.

(Log #1342)

14- 159 - (511 thru 515): Accept
SUBMITTER: Mike O'Meara, A.P.S.
COMMENT ON PROPOSAL NO: 14-376a
RECOMMENDATION: Revise text as follows:
I agree with the panel action to accept this proposal but feel the proposal should not incorporate the panel actions on Proposal 14-376, 14-415, 14-452, 14-473 or 14-486.
SUBSTANTIATION: By rejecting proposals 14-376, 415, 452, 473, and 486, the proposed wording in the Article 511 through 515 rewrites are not in compliance with the NFPA Manual of Style, Chapter 4.
PANEL ACTION: Accept.
PANEL STATEMENT: The metrication issues have been handled by the action on Comment 14-157.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #2179)

14- 160 - (511 and 515): Accept in Part
SUBMITTER: Donald R. Cook, Shelby County Building Inspections
COMMENT ON PROPOSAL NO: 14-376a
RECOMMENDATION: I do not believe this proposal should be accepted.
SUBSTANTIATION: See explanation of negative ballot.
PANEL ACTION: Accept in Part.
Accept the Zone concept for Articles 513 and 515. Exclude the Zone concept from Articles 511 and 514. Therefore, in Proposal 14-376a, do not accept the actions listed in Items 2 and 4.
PANEL STATEMENT: The panel has concluded that the there is insufficient justification to apply Article 505 to the occupancies covered by Articles 511 and 514. Further, the NFPA Technical Committees responsible for these occupancies have not requested that Article 505 be applied to their respective occupancies.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #699)

14- 161 - (511-2): Reject
SUBMITTER: William E. Bickner, Stillwater, MN
COMMENT ON PROPOSAL NO: 14-381
RECOMMENDATION: The entire proposal should be accepted.
SUBSTANTIATION: The primary focus of the proposed changes is to eliminate the exception to Section 511-3(b), which is ambiguous. If the intent of the exception is to apply Table 514-2 only to pits or depressions below floor level, as indicated by the panel comment, it should refer to "Pits and depressions below floor level in lubrication and service rooms," not "lubrication and repair rooms" (there is no apparent reason why the exception should not apply to the entire room). The term "service room" is undefined, and the added text clarifies the type of activities permitted, as discussed in the proposal.
PANEL ACTION: Reject.
PANEL STATEMENT: The important point of the existing exception is, "without dispensing", rather than what a "service room" might be.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #1060)

14- 162 - (511-3(a)): Reject
SUBMITTER: Lanny McMahill, Rep. IAEI SW Section
COMMENT ON PROPOSAL NO: 14-384
RECOMMENDATION: Accept the new text as proposed. Additionally, add liquid natural gas (LNG) vehicles.
SUBSTANTIATION: From a code standpoint, the hazards are the same for compressed natural gas and LNG. If LNG vehicles are not included, it would appear that they do not need to comply with the requirements.
PANEL ACTION: Reject.
PANEL STATEMENT: This is extracted text. The Committee on Automotive and Marine Service Stations has established the criterion, and the National Electrical Code Committee has not been presented sufficient substantiation for altering it. Liquefied natural gas is a separate case and is new material via the comment.
When released, LNG behaves differently than CNG and, therefore, would require different criteria for classification. The substantiation is incorrect in that the hazards are not the same for CNG and LNG.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #1539)

14- 163 - (511-3(a)): Reject
SUBMITTER: Michael J. Johnston, International Association of Electrical Inspectors
COMMENT ON PROPOSAL NO: 14-384
RECOMMENDATION: Add the following between the existing text and the exception:
"Where Compressed Natural Gas (CNG) vehicles are repaired or stored, the area within 18 in. of the ceiling shall be classified as Class I, Division 2."
Recommend adding Liquefied Natural Gas (LNG) to the original proposal that was accepted in principle.
SUBSTANTIATION: Comment to recommend accepting the new text with the addition of liquid natural gas (LNG) vehicles. From a code standpoint, the hazards are the same for compressed natural gas and LNG. If LNG vehicles are not included, it would appear that they do not need to comply with the requirements. Accepting this proposal and adding the requirements for LNG facilities would be proactive and address rising need in the field.
PANEL ACTION: Reject.
PANEL STATEMENT: This is extracted text. The Committee on Automotive and Marine Service Stations has established the criterion, and the National Electrical Code Committee has not been presented sufficient substantiation for altering it. Liquefied natural gas is a separate case and is new material via the comment.
When released, LNG behaves differently than CNG and, therefore, would require different criteria for classification. The substantiation is incorrect in that the hazards are not the same for CNG and LNG.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #700)

14- 164 - (511-3(b)): Reject
SUBMITTER: William E. Bickner, Stillwater, MN
COMMENT ON PROPOSAL NO: 14-387
RECOMMENDATION: This proposal should be accepted.
SUBSTANTIATION: Refer to substantiation for Comment on Proposal 14-381.
PANEL ACTION: Reject.
PANEL STATEMENT: No new material for substantiation has been offered.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #683)

14- 165 - (511-3(c)): Reject
SUBMITTER: William E. Bickner, Stillwater, MN
COMMENT ON PROPOSAL NO: 14-388
RECOMMENDATION: This proposal should be accepted as written.
SUBSTANTIATION: As stated by the panel, the provisions of earlier editions of the Code are not justification for the proposed change, but they are relevant to the extent that they show how provisions equivalent to those proposed were inadvertently deleted. If the effect of the deletion was recognized, the intent of the present Code must be to prohibit declassification under such conditions. The present language clearly does not recognize isolation of adjoining areas by elevation or curbs. If the panel believes that such separations are acceptable, the proposal should be accepted to clearly state that intent and eliminate continuing controversy.
PANEL ACTION: Reject.
PANEL STATEMENT: That which was proposed is presently Code section 511-3(a). To accept the proposal would create a redundant requirement.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #692)

14- 166 - (511-4): Reject
SUBMITTER: William E. Bickner, Stillwater, MN
COMMENT ON PROPOSAL NO: 14-393
RECOMMENDATION: This proposal should be accepted.
SUBSTANTIATION: Section 501-5(b)(2), Exception No. 1 applies to very few raceways in or under a concrete slab because all but the shortest runs have at least one coupling in the in- or under-floor portion of the run and are required to be sealed under the present language. Couplings or unions installed according to the Code and embedded in concrete or fill under the floor of a Division 2 location do not present significant opportunity for migration of vapors into a raceway. The proposed change would permit deletion of seals where a raceway extends unbroken through the classified area above the floor, bringing the Code into conformance with common, practical, and safe industry practice.
PANEL ACTION: Reject.
PANEL STATEMENT: Locations covered by Article 511 must also comply with requirements of Article 501, except where modified by provisions of Article 511. There is no reason to repeat parts of Article 501 in other Articles relating to Classified locations.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #2177)

14- 167 - (511-4): Reject
SUBMITTER: Donald R. Cook, Shelby County Building Inspections
COMMENT ON PROPOSAL NO: 14-394
RECOMMENDATION: Proposal should be accept or accept in principle.
SUBSTANTIATION: See explanation of negative ballot.
PANEL ACTION: Reject.
PANEL STATEMENT: The current text addresses the needs of the situation. The requirements of Article 501 for seals at boundaries applies.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
COOK: The purpose for the proposal was to provide common wording for underground or in slab wiring and associated seals in the specific occupancies. The submitter assumed that the restrictions for this wiring are based on hazardous materials entering the raceways and trying to prevent the migration of the liquids, gases or vapors to an ignition source at the end of the raceway. It seems that the hazardous materials associated with at least Articles 511-515 are very similar and that preventing this migration could be done with common wording. Since different words are used in each Article, the code language leads users to believe that gas entering a raceway under a commercial garage will react differently than gas entering a raceway under a drive at a dispensing station. I do not believe this is true and believe that common language could be used. Based on the various words shown below, and questions that are asked over and over, I believe the existing wording causes confusion and should be changed. If this set of words is a problem, some technical reason should be provided for rejecting the proposal, so that acceptable wording could be proposed.
511-4. Wiring and Equipment in Class I Locations
Within Class I locations as defined in Section 511-3, wiring and equipment shall conform to applicable provisions of Article 501. Raceways embedded in a masonry wall or buried beneath a floor shall be considered to be within the Class I location above the floor if any connections or extensions lead into or through such areas.
511-5. Sealing
Approved seals conforming to the requirements of Section 501-5 shall be provided, and Section 501-5(b)(2) shall apply to horizontal as well as vertical boundaries of the defined Class I locations.
513-4. Wiring and Equipment in Class I Locations
All wiring and equipment that is or may be installed or operated within any of the Class I locations defined in Section 513-3 shall comply with the applicable provisions of Article 501. All wiring installed in or under the hangar floor shall comply with the requirements for Class I, Division 1 locations.
513-8. Sealing
Approved seals shall be provided in accordance with Section 501-5. Sealing requirements specified in Sections 501-5(a)(4) and (b)(2) shall apply to horizontal as well as to vertical boundaries of the defined Class I locations. Raceways embedded in a concrete floor or buried beneath a floor shall be considered to be within the Class I location above the floor.
514-8. Underground Wiring
Underground wiring shall be installed in threaded rigid metal conduit or threaded steel intermediate metal conduit. Any portion of electrical wiring or equipment that is below the surface of a Class I, Division 1 or Division 2 location (as defined in Table 514-2) shall be considered to be in a Class I, Division 1 location, which shall extend at least to the point of emergence above grade. Refer to Table 300-5.
514-7. Sealing
(a) At Dispenser. An approved seal shall be provided in each conduit run entering or leaving a dispenser or any cavities or enclosures in direct communication therewith. The sealing fitting shall be the first fitting after the conduit emerges from the earth or concrete.
(b) At Boundary. Additional seals shall be provided in accordance with Section 501-5. Sections 501-5(a)(4) and (b)(2) shall apply to horizontal as well as to vertical boundaries of the defined Class I locations.
515-5. Underground Wiring
(a) Wiring Method. Underground wiring shall be installed in threaded rigid metal conduit or threaded steel intermediate metal conduit or, where buried under not less than 2 ft (610 mm) of cover, shall be permitted in rigid nonmetallic conduit or an approved cable. Where rigid nonmetallic conduit is used, threaded rigid metal conduit or threaded steel intermediate metal conduit shall be used for the last 2 ft (610 mm) of the conduit run to emergence or to the point of connection to the aboveground raceway. Where cable is used, it shall be enclosed in threaded rigid metal conduit or threaded steel intermediate metal conduit from the point of lowest buried cable level to the point of connection to the aboveground raceway.
515-6. Sealing
Sealing requirements in Sections 501-5(a)(4) and (b)(2) shall apply to horizontal as well as to vertical boundaries of the defined Class I locations. Buried raceways under defined Class I locations shall be considered to be within a Class I, Division 1 location.
516-7. Wiring and Equipment Above Class I and II Locations

(a) Wiring. All fixed wiring above the Class I and II locations shall be in metal raceways, rigid nonmetallic conduit, or electrical nonmetallic tubing, or shall be Type MI, TC, or MC cable. Cellular metal floor raceways shall be permitted only for supplying ceiling outlets or extensions to the area below the floor of a Class I or II location, but such raceways shall have no connections leading into or through the Class I or II location above the floor unless suitable seals are provided.
I do not believe that the panel has addressed the technical concerns of the proposal.

(Log #693)

14- 168 - (511-6(a)): Reject
SUBMITTER: William E. Bickner, Stillwater, MN
COMMENT ON PROPOSAL NO: 14-399
RECOMMENDATION: This proposal should be accepted.
SUBSTANTIATION: Although the panel states that the "current text correctly expresses the intent of Code-Making Panel 14," because of several previous additions to the permitted wiring methods, the language has become redundant and poorly constructed. Concise, logical ordering of the permitted methods will make this section more "user friendly."
PANEL ACTION: Reject.
PANEL STATEMENT: This would be an editorial change, but one which, if made, would likely lead some readers to believe that flexible metal conduit and liquidtight flexible metal conduit are not permitted, beginning in 2002.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #694)

14- 169 - (511-6(a)): Reject
SUBMITTER: William E. Bickner, Stillwater, MN
COMMENT ON PROPOSAL NO: 14-400
RECOMMENDATION: This proposal should be accepted, wholly, in part, or in principle.
SUBSTANTIATION: Although the panel states that the "current text correctly expresses the intent of Code-Making Panel 14," because of several previous additions to the permitted wiring methods, the language has become redundant and poorly constructed. Concise, logical ordering of the permitted methods will make this section more "user friendly." Further, it is requested that the panel address that part of the proposal that would permit surface nonmetallic raceways and nonmetallic wireways.
PANEL ACTION: Reject.
PANEL STATEMENT: This is an editorial change, but one which, if made, would automatically accept as allowable in Article 511 any raceway that is acceptable under other articles of the Code.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #696)

14- 170 - (511-6(c)): Reject
SUBMITTER: William E. Bickner, Stillwater, MN
COMMENT ON PROPOSAL NO: 14-404
RECOMMENDATION: This proposal should be accepted.
SUBSTANTIATION: The requirements of this section are no different than the general Code requirements, and need not be repeated here. It adds nothing useful to the Code and contributes to the bloat that is making the Code more difficult to us. If this section is essential to articles in this chapter, similar material should be added to Articles 514, 515 and 516. The present text is erroneous in that it requires the grounded conductor to be connected to "the 'grounded' terminal of any utilization equipment supplied." This further implies that the utilization equipment must have provisions for connection of a grounded conductor. Removing this section would not affect wiring practices, but would reduce Code clutter.
PANEL ACTION: Reject.
PANEL STATEMENT: Contrary to the submitter's substantiation, the referenced section (which is now 511-16) does contain provisions not found in Article 250.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #697)

14- 171 - (511-6(d)): Accept
SUBMITTER: William E. Bickner, Stillwater, MN
COMMENT ON PROPOSAL NO: 14-407
RECOMMENDATION: This proposal should be accepted.
SUBSTANTIATION: The heading of Section 511-6 is "Wiring in Spaces Above Class I Locations." Paragraph (d) does not establish any special requirements for receptacles in spaces above Class I locations. It addresses receptacles within Class I locations, which are covered indirectly in Section 511-4 (where any such requirement should be located) by reference to Article 501. If it is necessary to reiterate that receptacles "shall be approved for the location", that requirement should be in Section 511-4, and, in the interest of consistency, other types of equipment (such as lighting fixtures and utilization equipment) should also be covered.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #CC1402)

14- 171a - (511.7(B)(1)): Accept
SUBMITTER: CMP 14
COMMENT ON PROPOSAL NO: 14-378
RECOMMENDATION: In 511.7(B)(1), change "approved" to "identified".
SUBSTANTIATION: These changes correct errors that were made during the transcription of the rewrite of Article 511.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #2366)

14- 172 - (511-10): Reject
SUBMITTER: Monte R. Ewing, State of Wisconsin
COMMENT ON PROPOSAL NO: 14-413
RECOMMENDATION: Delete entire section.
SUBSTANTIATION: This should be a general requirement that is found in Article 210. When this section was originated it was due to electrical shocks from metal wheel car creepers cutting into lighting and tool cords. I entirely agree with the need for this GFCI requirement however, Article 511 only applies where flammable fuel is involved. There are many combustible fuel repair garages that share the same hazard for which this section was created but there is presently no requirement for GFCI protection in those garages. I submitted a proposal to Code-Making Panel 2, it is found as Proposal 2-81 on page 124 in the ROP. I believe that Code-Making Panel 14 can understand what I am pointing out here and that I am not applying dwelling application to commercial repair garages.
PANEL ACTION: Reject.
PANEL STATEMENT: Given the significant safety issues, the panel concludes the requirement must remain in Article 511, at least until such time as the GFCI requirement appears in Article 210.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #2284)

14- 173 - (511-16(b)(2)): Reject
SUBMITTER: Larry E. Fuhrman, City of Titusville
COMMENT ON PROPOSAL NO: 14-1 & 14-377
RECOMMENDATION: Revise text as follows:
(2) Approved Means. ~~Approved~~ "listed" means shall be provided for maintaining continuity of the grounding conductor between the fixed wiring system and the noncurrent-carrying metal portions of pendant luminaires (fixtures), portable lamps, and portable utilization equipment.
SUBSTANTIATION: Panel Action on approved to identified or listed should extend to this section. Listed fittings and devices for ensuring continuity of the grounding conductor are readily available. The Inspector could not field test a product to ensure fault current would be carried through unlisted or tested methods.

PANEL ACTION: Reject.
PANEL STATEMENT: A "means" cannot be listed.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

ARTICLE 513 — AIRCRAFT HANGARS

(Log #166)

14- 174 - (513): Accept
Note: The Technical Correlating Committee understands that the Panel has accepted the changes proposed by Proposal 14-415, with the modification as indicated in the Panel Action.
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 14-415
RECOMMENDATION: It was the action of the Technical Correlating Committee that this Proposal be reconsidered by the Panel. The issues of raceway trade size, extracts, and use of soft versus hard metrication were all studied in detail and resolutions were communicated to the Panel prior to the Panel Meeting. It should be noted that all of the other Code-Making Panels accepted the metrication directive. This action will be considered by the Panel as a Public Comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
The panel accepts the recommendation to reconsider. Change the wording of the sign required by 513.7(F), 513.10(B), 513.10(C)(2), 513.10(D)(1) to read:
"WARNING - KEEP 5 FT CLEAR OF AIRCRAFT ENGINES AND FUEL TANK AREAS" or
"WARNING - KEEP 1.5 METERS CLEAR OF AIRCRAFT ENGINES AND FUEL TANK AREAS."
PANEL STATEMENT: The revised sign text meets the intent of both the Technical Correlating Committee and the Technical Committee on Airport Facilities.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
COMMENT ON AFFIRMATIVE:
OMEARA: The panel action is not stated completely. It should be modified to read as follows:
"The panel accepts the recommendation to reconsider and has accepted the changes as proposed by Proposal 14-415, with the following modification: Change the wording of the sign...".

(Log #CC1401)

14- 173a - (Article 513): Accept
SUBMITTER: CMP 14
COMMENT ON PROPOSAL NO: 14-417
RECOMMENDATION: In 513.1, Fine Print Note, delete the reference to NFPA 325.
In 513.10(C)(3), change "approved" to "identified".
SUBSTANTIATION: These changes correct errors that were made during the transcription of the rewrite of Article 513.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #504)

14- 175 - (513-3): Accept
SUBMITTER: William T. Fiske, Intertek Testing Services
COMMENT ON PROPOSAL NO: 14-421
RECOMMENDATION: Panel action to accept should be upheld.
SUBSTANTIATION: The location involved with the proposed change in Division 2 and Zone 2. Zone 2 and Division 2 are virtually identical, and of comparatively low risk. Mr. Cook's comment on this proposal in the ROP is less germane to the subject than a similar comment of his on Proposal 14-348.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #2176)

14- 176 - (513-4): Reject
SUBMITTER: Donald R. Cook, Shelby County Building Inspections
COMMENT ON PROPOSAL NO: 14-427
RECOMMENDATION: Proposal should be accept or accept in principle.
SUBSTANTIATION: See explanation of negative ballot.
PANEL ACTION: Reject.
PANEL STATEMENT: The current text addresses the needs of the situation. The requirements of Article 501 for seals at boundaries applies.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
COOK: See my Explanation of Negative on Comment 14-167.

(Log #505)

14- 177 - (513-5(b)): Reject
SUBMITTER: William T. Fiske, Intertek Testing Services
COMMENT ON PROPOSAL NO: 14-429, 14-430
RECOMMENDATION: Revise as follows:
"For pendants, flexible and suitable for the type of service and ~~approved~~ listed for hard usage shall be used."
SUBSTANTIATION: Listed hard service cord is readily available. Change suggested in this comment would meet the submitter's intent.
Acceptance of this comment would change panel action from accept to accept in principle.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel concludes that "identified" is the appropriate term.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #506)

14- 178 - (513-5(c)): Reject
SUBMITTER: William T. Fiske, Intertek Testing Services
COMMENT ON PROPOSAL NO: 14-431, 14-432
RECOMMENDATION: Revise as follows:
"For portable utilization equipment and lamps, flexible cord suitable for the type of service and ~~approved~~ listed for hard usage shall be used."
SUBSTANTIATION: Listed hard service cord is readily available. Change suggested in this comment would meet the submitter's intent.
Acceptance of this comment would change panel action from accept to accept in principle.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel concludes that "identified" is the appropriate term.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #695)

14- 179 - (513-5(d)): Reject
SUBMITTER: William E. Bickner, Stillwater, MN
COMMENT ON PROPOSAL NO: 14-435
RECOMMENDATION: This proposal should be accepted.
SUBSTANTIATION: The requirements of this section are no different than the general Code requirements, and need not be repeated here. It adds nothing useful to the Code and contributes to the bloat that is making the Code more difficult to use. If this section is essential to articles in this chapter, similar material should be added to Articles 514, 515 and 516. The present text is erroneous in that it requires the grounded conductor to be connected to "the 'grounded' terminal of any utilization equipment supplied." This further implies that the utilization equipment must have provisions for connection of

a grounded conductor. Removing this section would not affect wiring practices, but would reduce Code clutter.
PANEL ACTION: Reject.
PANEL STATEMENT: Contrary to submitter's substantiation, Section 513-5(d) does contain provisions not found in Article 250.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #698)

14- 180 - (513-6(a)): Reject
SUBMITTER: William E. Bickner, Stillwater, MN
COMMENT ON PROPOSAL NO: 14-437
RECOMMENDATION: Complete proposal should be accepted.
SUBSTANTIATION: ` As the panel states, equipment that releases sparks or hot metal would not be desirable over a pit or below-grade area, but this section addresses only equipment less than 10 ft above the wings and engine enclosures of aircraft, not pits and below-grade areas. Therefore, only Section 513-3(c) is generally relevant, and (b) is relevant only if the wings or engine enclosures are less than 18 in. above the floor. The exception is unnecessary since such "cut off" areas, by definition, do not house aircraft. This section could more simply begin: "In other than Class I locations, equipment that is less than 10 ft above wings and engine enclosures....".
PANEL ACTION: Reject.
PANEL STATEMENT: The panel maintains its position as stated in the 2002 NEC ROP.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #507)

14- 181 - (513-11(c)): Reject
SUBMITTER: William T. Fiske, Intertek Testing Services
COMMENT ON PROPOSAL NO: 14-446, 14-447
RECOMMENDATION: Revise as follows:
"Flexible cords for aircraft energizers and ground support equipment shall be ~~approved~~ listed for the type of service and extra-hard usage...".
SUBSTANTIATION: Listed hard service cord is readily available. Change suggested in this comment would meet the submitter's intent.
Acceptance of this comment would change panel action from accept to accept in principle.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel concludes that "identified" is the appropriate term.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #508)

14- 182 - (513-12(b)): Reject
SUBMITTER: William T. Fiske, Intertek Testing Services
COMMENT ON PROPOSAL NO: 14-448, 14-450
RECOMMENDATION: Revise as follows:
"Flexible cords for mobile equipment shall be suitable for the type of service and ~~approved~~ listed for extra-hard usage...".
SUBSTANTIATION: Listed hard service cord is readily available. Change suggested in this comment would meet the submitter's intent.
Acceptance of this comment would change panel action from accept to accept in principle.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel concludes that "identified" is the appropriate term.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #509)

14- 183 - (513-12(b)): Reject
SUBMITTER: William T. Fiske, Intertek Testing Services
COMMENT ON PROPOSAL NO: 14-449, 14-450
RECOMMENDATION: Revise as follows:
"Attachment plugs and receptacles shall be ~~approved~~ listed for the location in which they are installed and shall provide for connection of the equipment grounding conductor."
SUBSTANTIATION: Listed plugs and receptacles are readily available, and would satisfy submitter's concerns.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel concludes that "identified" is the appropriate term.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

ARTICLE 514 — GASOLINE DISPENSING AND SERVICE STATIONS

(Log #167)

14- 184 - (514): Accept
Note: The Technical Correlating Committee understands that the action on this Comment is to accept Proposal 14-452 which modifies the Panel Action on Proposal 14-454.
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 14-452
RECOMMENDATION: It was the action of the Technical Correlating Committee that this Proposal be reconsidered by the Panel. The issues of raceway trade size, extracts, and use of soft versus hard metrication were all studied in detail and resolutions were communicated to the Panel prior to the Panel Meeting. It should be noted that all of the other Code-Making Panels accepted the metrication directive. This action will be considered by the Panel as a Public Comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #168)

14- 185 - (514): Accept
Note: The Technical Correlating Committee directs that the second paragraph of 514.1 in Proposal 14-454 be deleted. The Technical Correlating Committee advises that Article Scope statements are the responsibility of the Technical Correlating Committee and the Technical Correlating Committee accepts the Panel Action as amended.
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 14-454
RECOMMENDATION: The Technical Correlating Committee advises that Article Scope statements are the responsibility of the Technical Correlating Committee and the Technical Correlating Committee rejects the Panel Action. The second paragraph contains requirements which are not permitted in a Scope Statement. The Technical Correlating Committee directs that the Scope be only the first paragraph of the Recommendation, and directs the panel to relocate the second paragraph elsewhere in the Article. Technical Correlating Committee understands that this proposal is modified by Proposals 14-453, 14-459, 14-460, 14-462, 14-467a and 14-470. This action will be considered by the Panel as a Public Comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
Add a Fine Print Note to the definition of Motor Fuel Dispensing Facility in 514.2 of the proposed 2002 NEC to read: "FPN: Refer to Articles 510 and 511 with respect to electric wiring and equipment for other areas used as lubritoriums, service rooms,
repair rooms, offices, salesrooms, compressor rooms, and similar locations."

PANEL STATEMENT: The panel recognizes the Technical Correlating Committee's responsibility for Scope statements and has relocated the text.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #169)

14- 186 - (514-2, Table 514-3): Accept
Note: The Technical Correlating Committee directs that Section 514-2(b) of Proposal 14-460 be titled "Compressed Natural Gas, Liquefied Natural Gas, and Liquefied Petroleum Gas Areas". This section then becomes Section 514-3(b)(2) of the Article 514 rewrite (Proposal 14-454). It is further directed that Table 514-2 of Proposal 14-454 be renumbered Table 514-3(b)(1), and that Table 514.3 of Proposal 14-460 be renumbered Table 514-3(b)(2). References to the tables in the text of Proposal 14-454 shall be corrected accordingly.
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 14-460
RECOMMENDATION: The Technical Correlating Committee directs the Panel to add a Heading to 514-2(b) in accordance with the Style Manual. Staff was directed to add SI Units to the Table. This action will be considered by the Panel as Public Comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
COMMENT ON AFFIRMATIVE:
COOK: The TCC direction was to add a Heading for Section 514-2(b). The panel accepted the comment, but the heading was not included in the ballot.
• My first comment is that Section 514-2(b) of the 1999 NEC has been moved in the reorganization of Article 514 and is now Section 514-3(b).
• My recommendation would be to provide the following headings;
514.3(B) Classified Locations.
514.3(B)(1) Class I Liquids.
514.3(B)(2) Compressed Natural Gas, Liquefied Natural Gas, Liquefied Petroleum Gas.

(Log #2175)

14- 187 - (514-8): Reject
SUBMITTER: Donald R. Cook, Shelby County Building Inspections
COMMENT ON PROPOSAL NO: 14-471
RECOMMENDATION: Proposal should be accept or accept in principle.
SUBSTANTIATION: See explanation of negative ballot.
PANEL ACTION: Reject.
PANEL STATEMENT: Locations covered by Article 514 must also comply with requirements of Article 501, except where modified by provisions of Article 514. There is no reason to repeat parts of Article 501 in other articles relating to classified locations.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
COOK: See my Explanation of Negative on Comment 14-167.

(Log #2285)

14- 188 - (514-9(a)): Accept
SUBMITTER: Larry E. Fuhrman, City of Titusville
COMMENT ON PROPOSAL NO: 14-454
RECOMMENDATION: Revise text as follows:
(A) At Dispenser. An ~~approved~~ "listed" seal shall be provided in each conduit run entering or leaving a dispenser or any cavities or enclosures in direct communication therewith. The sealing fitting shall be the first fitting after the conduit emerges from the earth or concrete.
SUBSTANTIATION: Panel action has accepted the change from approved to listed for the seal off sealing compound and reducers or fitting for the seals. Listed seals are readily available and should be required here for consistence of panel action and code requirements.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

ARTICLE 515 — BULK STORAGE PLANTS

(Log #170)

14- 189 - (515): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 14-473
RECOMMENDATION: It was the action of the Technical Correlating Committee that this Proposal be reconsidered by the Panel. The issues of raceway trade size, extracts, and use of soft versus hard metrication were all studied in detail and resolutions were communicated to the Panel prior to the Panel Meeting. It should be noted that all of the other Code-Making Panels accepted the metrication directive. This action will be considered by the Panel as a Public Comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
In addition to accepting the proposed metrication changes from the task group, in the 1999 NEC Section 515-5(a), change "2 ft (610 mm)" to "600 mm (24 in.) in two places.
PANEL STATEMENT: The panel notes the additional changes to incorporate SI units.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #171)

14- 190 - (515): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 14-474
RECOMMENDATION: The Technical Correlating Committee advises that Article Scope statements are the responsibility of the Technical Correlating Committee and the Technical Correlating Committee accepts the Panel Action. It was the action of the Technical Correlating Committee that this Proposal be reconsidered and correlated with the action on Proposals 14-477, 14-478, 14-480, 14-481, 14-482, and 14-484. The Technical Correlating Committee directs NFPA staff to add the SI units to Table 515-2. This action will e considered by the Panel as a Public Comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #701)

14- 191 - (515-5(a)): Reject
SUBMITTER: William E. Bickner, Stillwater, MN
COMMENT ON PROPOSAL NO: 14-483
RECOMMENDATION: This proposal should be accepted.
SUBSTANTIATION: It is unclear what technical justification the panel expects in support of this proposal. It is self-evident that underground cable wiring methods do not necessarily have a "point of connection to the aboveground raceway," as specified in this section. There is no technical justification other than that. Cable wiring methods are not prohibited in unclassified areas of bulk plants. As stated in the proposal, the depth below finished grade and height above grade for the protective raceway are taken from Section 300-5(d).
PANEL ACTION: Reject.

PANEL STATEMENT: Section 300-5(d) covers the physical protection of wiring in unclassified areas. Section 515-5(a) applies to wiring in hazardous locations.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
COMMENT ON AFFIRMATIVE:
COOK: I do not agree with the second sentence of the panel statement, "Section 515-5(a) applies to wiring within hazardous location." This section deals with underground wiring. Area classification for Bulk Storage Plants is covered in Section 515-2 and Table 515-2. I do not see where underground spaces, other than pits or tanks, are considered classified areas. This seems correct since a classified area would require an ignitible concentration and that seems unlikely to occur underground without some cavity that included oxygen. This is part of the confusion associated with my negative ballots on comments 14-167, 176,187, and 192.

(Log #2171)

14- 192 - (515-6): Reject
SUBMITTER: Donald R. Cook, Shelby County Building Inspections
COMMENT ON PROPOSAL NO: 14-484
RECOMMENDATION: Proposal should be accept or accept in principle.
SUBSTANTIATION: See explanation of negative ballot.
PANEL ACTION: Reject.
PANEL STATEMENT: The current text addresses the needs of the situation. The requirements of Article 501 for seals at boundaries applies.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
COOK: See my Explanation of Negative on Comment 14-167.

ARTICLE 516 — SPRAY APPLICATION, DIPPING, AND COATING PROCESSES

(Log #172)

14- 193 - (516): Accept
Note: The Technical Correlating Committee understands that the action on this Comment will modify the Panel Action on Proposal 14-487.
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 14-486
RECOMMENDATION: It was the action of the Technical Correlating Committee that this Proposal be reconsidered by the Panel. The issues of raceway trade size, extracts, and use of soft versus hard metrication were all studied in detail and resolutions were communicated to the Panel prior to the Panel Meeting. It should be noted that all of the other Code-Making Panels accepted the metrication directive. This action will be considered by the Panel as a Public Comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
Revise Article 516 as follows (numbering based on 1999 NEC):
In 516-2(a)(4) of 1999 NEC, change "5 ft (1.52 m)" to "1.5 m (5 ft)" and "1 ft (305 mm)" to "300 mm (12 in)"
In 516-2(a)(5) of 1999 NEC, change "25 ft (7.62 m)" to "7.5 m (25 ft)" in two places.
In 516-2(b)(1) of 1999 NEC, change "20 ft (6.10 m)" to "6 m (20 ft)" and "10 ft (3.05 m)" to "3 m (10 ft)"
In Figure 516-2(b)(1) of 1999 NEC, change "20 ft (6100 mm)" to "6 m (20 ft)" and "10 ft (3050 mm)" to "3 m (10 ft)"
In 516-2(b)(2)(a) of 1999 NEC, change "5 ft (1525 mm)" to "1.5 m (5 ft)" and "3 ft (915 mm)" to "900 mm (3 ft)"
In Figure 516-2(b)(2) of 1999 NEC, change "3 ft R (915 mm)" to "900 mm R (3 ft)" in twelve places; "5 ft R (1525 mm)" to "1.5 m R (5 ft)" in two places; and "10 ft R (3050 mm)" to "3 m R (10 ft)" in two places.
In 516-2(b)(2)(b) of the 1999 NEC, change "10 ft (3050 mm)" to "3 m (10 ft)" and "3 ft (915 mm)" to "900 mm (3 ft)"
In 516-2(b)(3) of the 1999 NEC, change "3 ft (914 mm)" to "900 mm (3 ft)" in two places
In 516-2(b)(4) of the 1999 NEC, change "3 ft (914 mm)" to "900 mm (3 ft)"
In Figure 516-2(b)(4) of the 1999 NEC, change "3 ft R" to "900 mm R (3 ft)" in seven places.
In 516-2(b)(5) of the 1999 NEC, change "3 ft (914 mm)" to "900 mm (3 ft)"
In Figure 516-2(b)(5) of the 1999 NEC, change "3 ft (1 m)" to "900 mm (3 ft)" in six places; change "5 ft (1.5 m)" to "1.5 m (5 ft)" in six places; change "20 ft (6.1 m)" to "6 m (20 ft)" in two places.
In 516-2(b)(6) of the 1999 NEC, change "20 ft (6.1 m) to "6 m (20 ft)"
In 516-2(b)(6) Exception of the 1999 NEC, change "5 ft◊ (0.46 m◊)" to "0.46 m◊ (5 ft◊)" and "5 gal (18.9 L)" to "19 L (5 gal)"
In 516-2(c) Exception of the 1999 NEC, change "3 ft (914 mm)" to "900 mm (3 ft)"
In 516-3(d) Exception No. 2(b) of the 1999 NEC, change "18 in. (45.7 cm)" to "450 mm (18 in.)"
Make all other recommended changes as proposed in Proposal 14-486.
PANEL STATEMENT: The revised text provides more consistent use of metric units from Article 500 through 516 and consistency with CMP-8 action on conduit. CMP-14 recognizes that some changes involve extracted material, however changes were made based on Standards Council direction provided in their October 6, 2000 meeting.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #173)

14- 194 - (516): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 14-487
RECOMMENDATION: The Technical Correlating Committee advises that Article Scope statements are the responsibility of the Technical Correlating Committee and the Technical Correlating Committee accepts the Panel Action. It was the action of the Technical Correlating Committee that this Proposal be reconsidered and correlated with the action on Proposals 14-420,14-488, 14-489, 14-490, 14-491, 14-492, 14-493, 14-494, 14-495, 14-496, 14-497, 14-498, 14-499, 14-500, 14-501, 14-502, 14-503, 14-504, 14-505, 14-506, 14-507, 14-508, 14-509, 14-510, and 14-511. The Technical Correlating Committee directs the Panel to reconsider and clarify the Panel Action on this Proposal. Note references in 516-10(a), 516-10(a)(10)c, and others to sections 516-5, which is deleted in accordance with the Panel Action. The Technical Correlating Committee directs that the Action on this Proposal be rewritten to comply with the NEC Style Manual specifically with respect to 516-10. This action will be considered by the Panel as a Public Comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
In the draft of the 2002 NEC, revise Section 516.4(E) to read: "(E) Electrostatic Equipment. Electrostatic spraying or detearing equipment shall be installed and used only as provided in Section 516.10."
Also revise the last four sentences of Section 516.10(A) to read: "Where robot or programming procedures involve manual manipulation of the robot arm while spraying with the high voltage on, the provisions of Section 516.10(B) shall apply. The installation of electrostatic spraying equipment shall comply with Section 516.10(A)(1) through (10). Spray equipment shall be listed. All automatic electrostatic equipment systems shall comply with Section 516.10(A)(1) through (9)."
PANEL STATEMENT: These changes correct errors in cross references that occurred during the rewrite of Article 516.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #510)

14- 195 - (516-6(a)): Accept
SUBMITTER: William T. Fiske, Intertek Testing Services
COMMENT ON PROPOSAL NO: 14-507, 14-508
RECOMMENDATION: Panel should accept the proposal as submitted.
SUBSTANTIATION: The panel statement, "listed utilization equipment is readily available", is untrue, because it is too sweeping. Some types of utilization equipment are likely to be listed, others are very unlikely to be listed.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

ARTICLE 517 — HEALTH CARE FACILITIES

(Log #2398)

17- 13 - (517(xx)): Reject
SUBMITTER: Jan Zemplenyi, Bel Red Ambulatory Surgical Center
COMMENT ON PROPOSAL NO: 17-4
RECOMMENDATION: All facilities which provide sedation or general anesthesia shall be equipped with a back-up power mechanical generator or high-grade battery system with sufficient power and duration to assure the ability to conclude any operative procedure safely.
SUBSTANTIATION: The following is the contents of a letter I sent to Mr. Mayer Zimmerman of the Health Care Financing Administration on September 8, 2000:

It is clear to me that the amount of necessary kilowatts of back-up power depends on the size of the facility, and also on the time necessary for the completion of any procedures in progress when the black-out occurs. In our facility, we do not need large amounts of back-up power supplied for many hours in order to complete safely any of my operations. Our patient monitors are equipped with two-hour internal battery backup. Thus, in the first two hours of a blackout, we only need continuous power for the operating room lights and brief bursts of interrupted power for the electrocautery. Furthermore, the requirements are not different whether we use general or I.V. sedation anesthesia because the anesthesia machine does not use electrical power. The power system we have provides more than two hours of backup power so that I am not limited to only a two-hour duration. In my eleven years of performing office-based ambulatory surgery, I needed back-up power only once, and the Sola battery system we currently have worked out very well. We also test our battery system monthly. It functions instantaneously, and it provides us with the supply of clean current needed for our equipment.

In my recent research into the subject of backup power, I came across several battery systems including the Concorde batteries, which are used by the military and civil aviation industry for emergency power for their critical systems. Clearly, I think that my critical power requirements do not exceed those of F/A-18 or an F-117 Stealth fighter aircraft. In fact, as compared to a gasoline or diesel generator, and appropriately sized battery/inverter system provides a source of quiet, clean, reliable, and instantaneous power. Modern batteries are extremely reliable and maintenance free, whereas a generator needs to be "exercised and loaded" about once per month in order to be reliable. With a generator, there are other issues related to noise, storage and flammability of fuel. In addition, the quality of the electrical current generated can be deleterious to the electronic equipment since the waveform is not uniformly sinusoidal. In contrast, modern high-quality batteries and inverter systems provide clean sine wave, constant instantaneous current.

In summary, I feel that the requirement to retrofit my small ambulatory surgical center with a mechanical generator (prime mover) equipped with a transfer switch, is an expensive, burdensome requirement and a hardship. In my opinion, it will not add in any way to the safety of my surgical patients. I also know that, in general, certain modern battery/inverter systems can provide a superior alternative to generators, especially in instances when the total power requirements are relatively small and rather clearly defined. I strongly believe that further rational modification to the current rules iis n order, especially within view of new developments in battery power technology.

PANEL ACTION: Reject.
PANEL STATEMENT: The proposal number referenced does not deal with the subject of the submitter's recommendation. In addition there was no specific NEC reference section specified. The submitter may wish to consider Section 517-45(c)(1) which addresses power source requirements for ambulatory health care facilities. This section is extracted material from NFPA 99.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #549)

17- 14 - (517-3): Accept in Principle
Note: The Technical Correlating Committee understands that the Panel Action on Proposal 17-6a modifies this Comment.
SUBMITTER: David Eric Lees, Georgetown University Medical Center
COMMENT ON PROPOSAL NO: 17-9
RECOMMENDATION: As a practicing anesthesiologist I am unfamiliar with the term "relative analgesia" used in the subcommittee recommendation.
Delete use of word "relative."
SUBSTANTIATION: Cannot locate term "relative analgesia" in any contemporary anesthesiology text.
PANEL ACTION: Accept in Principle.
Extract the definition of "relative analgesia" from NFPA 99 and add it to 517-3 to read as follows:
"Relative Analgesia. A state of sedation and partial block of pain perception produced in a patient by the inhalation of concentrations of nitrous oxide insufficient to produce loss of consciousness (conscious sedation). [NFPA 99: 2-2]"
PANEL STATEMENT: The submitter's comment is based on the lack of definition of the term "relative analgesia". The definition for this term is contained in NFPA 99. Although the panel agrees with the submitter, NFPA 99 has jurisdiction for this term, and the NEC must correlate with the term as contained in NFPA 99.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #206)

17- 15 - (517-3-Emergency System): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 17-10
RECOMMENDATION: The Technical Correlating Committee directs the Panel to reconsider the Proposal and clarify if emergency systems in this Article are intended to modify Article 700. This action will be considered by the Panel as a Public Comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
PANEL STATEMENT: The panel accepts the recommendation of the Technical Correlating Committee to reconsider the action on Proposal 17-10, and the panel reaffirms its action. The panel's intent is that Article 700 apply only to the "life safety branch." Refer to the definition of the "life safety branch."
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #1798)

17- 16 - (517-10(b)(2)): Reject
SUBMITTER: Robert J. Clarey, Cutler-Hammer, Inc.
COMMENT ON PROPOSAL NO: 2-102, 2-103 & 2-114
RECOMMENDATION: Add a sentence to the end of paragraph 517-10(b)(2):
All branch circuits that supply 125-volt, single-phase, 15- and 20-ampere outlets installed in limited care facility bedrooms shall be protected by an arc-fault circuit interrupter(s).
SUBSTANTIATION: Proposals 2-102, 2-103, and 2-114 contain a sentence dealing with enhanced safety protection for the branch circuits of Limited Care Facility Bedrooms. The action of the Technical Correlating Committee has been to refer these proposals to Code-Making Panel 17 to be considered as a public comment. Cutler-Hammer urges acceptance of this enhanced branch circuit protection for the reasons provided in the substantiation to the proposals. In

particular, Limited Care Facility Bedrooms would then have the same AFCI protection as Dwelling Unit Bedrooms (Section 210-12). Cutler-Hammer had directed Proposal 2-103 to Code Making Panel 2 because there were no apparent individual requirements for the branch circuits protection of the Limited Care Facility bedrooms in Article 517. With redirection of the proposal(s) to Code Making Panel 17, it seems possible that the requirement could be included in 517-10 as shown. An alternative could be to include the requirement under a separate heading: H. Arc-Fault circuit Protection for Limited Care Facility Bedrooms.
PANEL ACTION: Reject.
PANEL STATEMENT: There is insufficient evidence at this time to mandate the use of arc-fault circuit interrupter(s) in limited care facilities. The use of arc-fault circuit interrupter(s) is not precluded.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
WHITE: I think Article 517 should be held to the same standard as 210-12. If it can save a life in a single family dwelling, it should do the same in a limited care facility.

(Log #2092)

17- 17 - (517-13(a) Exception No. 1): Reject
SUBMITTER: George A. Straniero, AFC Cable Systems
COMMENT ON PROPOSAL NO: 17-16
RECOMMENDATION: Accept the proposal as modified.
SUBSTANTIATION: "Metal Raceways shall not be required where Listed Types MI, MC, or AC Cables are used, provided the outer metal armor or sheath of the cable is identified as an acceptable grounding return path, or where Size No. 14, 12 or 10 AWG Type MC cable with a grounding return path consisting of combined interlocked metal armor and grounding conductor, Listed for this purpose, is used in lengths not exceeding 100 ft with fittings identified for grounding."
The modified text includes a requirement that the grounding return path, consisting of combined interlocked metal armor and grounding conductor, be Listed for this purpose. This additional requirement addresses the panel's concerns regarding the metal sheath being identified as an acceptable grounding path and will be reflected in the UL Guide information.
PANEL ACTION: Reject.
PANEL STATEMENT: The outer sheath of interlocked armor Type MC cable is not itself identified as an acceptable grounding path and therefore does not meet the conditions of Exception No. 1.
The intent is to have 2 independent grounding means: one being the outer metal armor or sheath itself, and the other being the insulated copper conductor. Each grounding path must be considered independently of the other for any length. The combination of an insulated grounding conductor and the metal sheath together is not considered to be equivalent to one of the independent means.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #1025)

17- 18 - (517-13(a) Exception No. 3): Reject
SUBMITTER: Joseph A. Ross, Ross Electrical Assessments
COMMENT ON PROPOSAL NO: 17-17
RECOMMENDATION: Delete Exception No. 3.
SUBSTANTIATION: Section 517-13(a) spells out the wiring methods for the "patient care area."
Exception No. 3 attempts to address the wiring methods "outside the patient care area."
Are not many other areas "outside the patient care areas"? Would it not be impractical to include several exceptions to cover all these other areas? There are other sections of the Code that adequately address wiring methods permitted in these other areas.
PANEL ACTION: Reject.
PANEL STATEMENT: The exception's intent is to clarify that Section 517-13(a) applies only to patient care areas. Deleting Exception No. 3 will require a second independent means for grounding of fixtures and switches outside the patient vicinity which is not the panel's intent. The exception does not address areas outside the patient care area, just outside the patient vicinity which is still within the patient care area.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #207)

10- 70 - (517-17(b) (New)): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 17-23
RECOMMENDATION: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 10 for action in Article 240. This action will be considered by the Panel as a Public Comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
The panel accepts the action of the Technical Correlating Committee to consider and take action on Proposal 17-23.
The panel action is to reject Proposal 17-23.
PANEL STATEMENT: Proposal 17-23 requests a second level of ground-fault protection for multiple occupancy buildings one or more of which is health care. Protection against ground-fault conditions is provided by the first level of ground-fault protection, if installed. The second level, as proposed, is to support service continuity. This presents additional requirements for building occupants that are non-health care occupancies. In a multiple occupancy building, containing one or more health care occupancies, the requirement of service continuity falls upon the health care occupancies. The panel suggests the submitter look for other ways within Article 517 to achieve the desired levels of service continuity, such as a UPS system.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #1653)

17- 19 - (517-30(3) Exception No. .7): Reject
SUBMITTER: Jim Silva, St. Luke's Hospital
COMMENT ON PROPOSAL NO: 17-39
RECOMMENDATION: Add the following new text:
Exception No. 7: In existing walls and partitions where receptacles, switches, etc. are to be added, flexible metal raceways and cable assemblies may be fished. The flexible metal raceway or cable assembly shall enter the partition within 8 in. of a junction box where the branch circuit is supplied by a nonflexible metal raceway.
SUBSTANTIATION: Although these wiring methods do not supply sole mechanical protection of the conductors, in a wall or partition where the flexible metal raceway or cable assembly is not accessible, the wall supplies sufficient mechanical protection from physical damage. In NFPA 70-A95 17-40a the substantiation states that within medical headwalls flexible metal raceways and cable assemblies are mechanically protected. There is little or no difference in construction of the patient headwall or an existing wall or partition. What is proposed by this exception is no different than what is industry standard for headwalls and is inspected by the authority having jurisdiction in-house inspections by qualified personnel.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel assumes that the correct proposal reference is Proposal 17-29 and the correct section reference is 517-30(c)(3).
No evidence has been presented to suggest that the wall supplies sufficient mechanical protection as stated by the submitter. There is a difference in construction of a patient headwall as compared to an existing wall or partition. A patient headwall is constructed under controlled factory conditions and the listing evaluates mechanical protection of wiring contained within the headwall.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #2322)

17- 20 - (517-30(3) Exception No. 7): Reject
SUBMITTER: Jim Silva, St. Luke's Hospital
COMMENT ON PROPOSAL NO: 17-39
RECOMMENDATION: Exception No. 7: In existing walls and partitions where receptacles, switches, etc. are to added, flexible metal raceways and cable assemblies may be fished. The flexible metal raceway or cable assembly shall enter the partition within 8 inches of a junction box where the branch circuit is supplied by a nonflexible metal raceway.
SUBSTANTIATION: Although these wiring methods do not supply sole mechanical protection of the conductors, in a wall or partition where the flexible metal raceway or cable assembly is not accessible the wall supplies sufficient mechanical protection from physical damage. In NFPA 70-A95 17-40a the substantiation states that within medical headwalls flexible metal raceways and cable assemblies are mechanically protected.
In healthcare facilities patient environments change rapidly. The need for emergency power to supply new equipment is constantly being requested. When the code change was enforced in the 1996 code cycle, it created a hardship in installing switches, outlets for power in existing conditions by forcing the channeling of walls and partitions to comply with 517-30(3). In some cases due to hygienic and infection protocols control surface metal raceways are not an option. This has resulted in increased installation costs and has forced some upgrades of the emergency system to be canceled, causing a hardship by not providing the best quality healthcare that every person deserves.
PANEL ACTION: Reject.
PANEL STATEMENT: Refer to the panel action and statement on Comment 17-19.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #CC1700)

17- 20a - (Figure 517-30(a), Figure 517-30(c)): Accept
Note: The Technical Correlating Committee directs that "FPN Figure No. 1" be changed to "FPN Figure 517-30(A)" and be located immediately following Section 517-30(A) and that "FPN Figure No. 2" be changed to "FPN Figure 517-30(C)" and be located immediately following Section 517-30(C) to comply with 2.3.1 of the NEC Style Manual
SUBMITTER: CMP 17
COMMENT ON PROPOSAL NO: 17-30a, 31e
RECOMMENDATION: The panel notes that the figure titles shown in the ROP DRAFT (preprint) are not correct. The panel reaffirm the titles as shown in the ROP. Specifically:
Figure 517-30(A) FPN Figure No. 1 (shown on DRAFT page 382) should have the title "FPN Figure No. 1. Hospital - Minimum Requirement for Transfer Switch Arrangement" as shown in Proposal 17-30a.
Figure 517-30(C) FPN Figure No. 2 (shown on DRAFT page 382) should have the title "FPN Figure No. 2. Hospital - Minimum Requirement (150 kVA or Less) for Transfer Switch Arrangement" as shown in Proposal 17-31e.
The panel notes that the figures are FPNs not part of mandatory text.
SUBSTANTIATION: The revisions are made to correct the figure titles as intended for the recommendations of Proposals 17-30a and 17-31e.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #754)

17- 21 - (517-30(b)(4)): Accept in Part
SUBMITTER: Lawrence A. Bey, Onan Corp.
COMMENT ON PROPOSAL NO: 17-31b
RECOMMENDATION: Replace ~~essential electrical system~~ with transfer switch in the third sentence only.
Delete ~~(210 kW).~~
SUBSTANTIATION: Limiting the size of the single transfer switch makes more sense than limiting the demand on the system. The reference to kW implies a power factor, which leads most to believe that it is the size of the generator set that determines if a single transfer switch is permitted. It should be permissible to use a larger generator set where the size of the single transfer switch is the limiting factor.
PANEL ACTION: Accept in Part.
The panel accepts the part of the recommendation to delete the "(120 kW)" reference after the 150 kVA value. {The panel notes that the value shown in 2002 NEC ROP "(210 kW)" was incorrect.}
The panel rejects the replacement of "essential electrical system" with "transfer switch."
PANEL STATEMENT: The panel intends that the use of a single transfer switch shall depend on the demand on the essential electrical system not the transfer switch.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #CC1701)

17- 21a - (Figure 517-41(a)): Accept
Note: The Technical Correlating Committee directs that "FPN Figure No. 1" be changed to "FPN Figure 517-41(A)" and be located immediately following Section 517-41(A) and that "FPN Figure No. 2" be changed to "FPN Figure 517-41(C)" and be located immediately following Section 517-41(C) to comply with 2.3.1 of the NEC Style Manual.
SUBMITTER: CMP 17
COMMENT ON PROPOSAL NO: 17-45b, 45f
RECOMMENDATION: The panel notes that the figure titles shown in the ROP DRAFT (preprint) are not correct. The panel reaffirm the titles as shown in the ROP. Specifically:
Figure 517-41(A) FPN Figure No. 1 (shown on DRAFT page 386) should have the title "FPN Figure No. 1. Nursing Home and Limited Health Care Facilities - Minimum Requirement for Transfer Switch Arrangement" as shown in Proposal 17-45b.
Figure 517-41(C) FPN Figure No. 2 (shown on DRAFT page 386) should have the title "FPN Figure No. 2. Nursing Home and Limited Health Care Facilities - Minimum Requirement (150 kVA or Less) for Transfer Switch Arrangement" as shown in Proposal 17-45f.
The panel notes that the figures are FPNs not part of mandatory text.
SUBSTANTIATION: The revisions are made to correct the figure titles as intended for the recommendation of Proposal 17-31e.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #1026)

17- 22 - (517-30(c)(3)): Accept in Part
Note: The Technical Correlating Committee directs that the FPN following 517.30(C)(3) be worded as follows: "See 517.13 for additional grounding requirements in patient care areas."
SUBMITTER: Joseph A. Ross, Ross Electrical Assessments
COMMENT ON PROPOSAL NO: 17-33
RECOMMENDATION: Continue to accept Proposal 17-33; but, also delete the FPN referencing Section 517-13(b) that follows Exception No. 5.
SUBSTANTIATION: The submitter of Proposal 17-33 is correct. The deleted sentence has created much controversy; but so will the FPN unless it also is deleted.
PANEL ACTION: Accept in Part.
The panel reaffirms its action on Proposal 17-33.
The panel rejects the recommendation to delete the FPN.
PANEL STATEMENT: The FPN adds an important reference for grounding clarity. The panel disagrees that the FPN creates controversy.
The panel understands that action taken on Proposal 17-15 has changed the section numbering to be referenced in the FPN. It should be 517.13(A) in the final version of the 2002 Code.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #1514)

17- 23 - (517-30(c)(3)): Hold
SUBMITTER: Joseph A. Ross, Ross Electrical Assessments
COMMENT ON PROPOSAL NO: 17-35
RECOMMENDATION: Revise Section 517-30(c)(3) as follows:
(3) Mechanical Protection of the Emergency System. The wiring of the emergency system of a hospital shall be mechanically protected by installation in nonflexible metal raceways.
Where the hospital building is above 23 m (75 ft) in height, emergency feeder circuit wiring shall be in accordance with the conditions of Section 700-9(d)(1) of this Code.
SUBSTANTIATION: It is to be noted that over the years, no other Code Making Panel has been as diligent as Code Making Panel 17 in the pursuit to provide a high-level of protection for emergency conductors. The Panel Statement specifies, "The panel has chosen to accomplish this (protection) by requiring nonflexible metallic raceway systems, MI or in encasement of concrete."
Section 700-9(d) includes additional requirements for emergency systems for buildings above 75 ft in height and provides a laundry list of occupancy classes and a hospital building is conspicuously absent. Section 700-9(d)(1) provides additional listed and other protective methods that are not included in Section 517-30(c)(3) and, therefore, are not permitted.
Code Making Panel 17 may opt for other text, other than this proposal, to include additional protective methods, but hospital buildings cannot continue through another cycle of the Code and be the only type building excluded from the occupancy classes. If anything, hospital buildings should provide a high-level of protection of emergency systems more so than any other building.
PANEL ACTION: Hold.
PANEL STATEMENT: The recommendation adds new material regarding the concept of building height that has not had public review.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #2098)

17- 24 - (517-30(c)(3)): Reject
SUBMITTER: George W. Flach, Nat'l Armored Cable Mfrs' Assn. (NACMA)
COMMENT ON PROPOSAL NO: 17-37
RECOMMENDATION: Accept the proposal.
SUBSTANTIATION: The proposal requests an exception for a safe and reasonable use of AC cable based on the additional mechanical protection provided by the cables metallic sheath. The panel statement that it does not want to expand the use of AC cable does not address the statement of problem stated by the proposal that currently it is necessary to tear open sections of existing walls to add a circuit and that the mechanical protection provided by AC cable and the wall itself will protect the wiring.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel reaffirms its action on Proposal 17-37. The panel acknowledges the difficulty involved in adding circuits and devices in existing construction. However, the panel believes that the safety benefits outweigh the difficulties involved in meeting the code requirements. Fishing Type AC cable does not provide the requisite mechanical protection and support required for the emergency system.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #1345)

17- 25 - (517-30(c)(3) Exception No. 5): Reject
SUBMITTER: Joseph A. Ross, Ross Electrical Assessments
COMMENT ON PROPOSAL NO: 17-36
RECOMMENDATION: Revise Exception No. 5 as follows:
Exception No. 5: Flexible metal raceways and cable assemblies shall be permitted to be used in listed prefabricated medical headwalls, listed office furnishings, or where necessary for flexible connection to equipment, or no longer than 3m (10 ft) where used to fish branch circuits in existing walls.
SUBSTANTIATION: The submitters of Proposals 17-36 and 17-37 have presented a real world problem. Typically, the walls of health care facilities are of concrete block and tile construction. In an existing facility, as is presently required, to retrofit a receptacle outlet is to chop open a concrete block or tile wall and lay in approximately 8 feet of "nonflexible" raceway and then repair the wall (very unsightly and impractical).
It should be permitted to fish the voids of the blocks or tile with a limited length of a flexible method, as any electrician can do and has done. A block or tile wall containing a limited length of a flexible method will more than provide the mechanical protection required for emergency systems.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel reaffirms its action on Proposal 17-36. The panel acknowledges the difficulty involved in adding circuits and devices in existing construction. However, the panel believes that the safety benefits outweigh the difficulties involved in meeting the code requirements. Fishing flexible metal raceways and cable assemblies does not provide the requisite mechanical protection and support required for the emergency system. The panel does not agree that block or tile walls will provide the necessary protection and support.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #753)

17- 26 - (517-30(d)): Reject
SUBMITTER: Lawrence A. Bey, Onan Corp.
COMMENT ON PROPOSAL NO: 17-30c
RECOMMENDATION: Reject Proposal 17-30c. Delete all of the current wording of 517-30(d) except for the second sentence of the second paragraph, so that all that remains is as follows:
(d) Capacity of Systems. The generator set(s) shall have sufficient capacity and proper rating to meet the maximum actual demand likely to be produced by the connected load of the essential electrical system(s) at any one time.
SUBSTANTIATION: While it is true that hospital emergency systems are different from emergency systems in commercial or assembly buildings, the generator sets are sized the same way based on the characteristics of the actual loads, both starting and running requirements, and the load step sequence. The big problem over the years has been oversizing of the generator sets in hospitals, such that the hospital typically does not have enough transferable load to adequately exercise the engine(s), particularly diesel engines. With oversized engine-generator sets, there are substantial costs involved to bring in dummy load banks to exercise the engine(s). This comment is intended to encourage optimized sizing, not oversizing.
The single sentence remaining from this comment would be less likely to result in oversizing, and then the requirement for generator capacity would match in both Article 517 and NFPA 99. The wording of current 517-30(d) that this comment would delete tends towards "worst case" sizing rather than optimized sizing. Generally, sizing a generator set based on feeder calculations is a short cut that will result in oversizing, because of the 125 percent factor typically applied to load currents in most all of the branches. Sizing based on connected load alone is a worst case situation, particularly where load steps are ignored. Demand factors are not used for sizing recommendations by any generator set manufacturer in the industry. Historical data may be used occasionally, but typically only where an existing generator set is being replaced, and even in that case it is best to do the calculations of actual load starting and running requirements. The current sentence on feeder sizing is redundant to requirements already existing in Articles 215 and 220.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel believes that requirements in the first paragraph of 517-30(d) are needed to establish requirements for the capacity of the essential electrical system. In addition, the first sentence of the second paragraph is needed to emphasize the requirements for feeders.
The panel believes that a set of options is needed for proper sizing of emergency generators to address the needs of the various health care applications.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #880)

17- 27 - (517-33(c), Exception): Reject
SUBMITTER: George W. Flach, New Orleans, LA
COMMENT ON PROPOSAL NO: 17-44
RECOMMENDATION: Revise as follows:
Receptacles that are supplied from the critical branch and are also connected to an uninterruptible power supply shall be identified by color, or marking or both.
SUBSTANTIATION: Would help hospital personnel identify UPS receptacles in an emergency.
PANEL ACTION: Reject.
PANEL STATEMENT: The receptacle identification requirements (which will appear as 517-30(E) in the 2002 edition of the NEC) are extracted from NFPA 99. The NEC does not preclude the marking or color identification recommended by the submitter.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #755)

17- 28 - (517-41(b)): Accept in Part
SUBMITTER: Lawrence A. Bey, Onan Corp.
COMMENT ON PROPOSAL NO: 17-45c
RECOMMENDATION: Replace ~~essential electrical system~~ with transfer switch in the third sentence only.
Delete ~~(210 kW).~~
SUBSTANTIATION: Limiting the size of the single transfer switch makes more sense than limiting the demand on the system. The reference to kW implies a power factor, which leads most to believe that it is the size of the generator set that determines if a single transfer switch is permitted. It should be permissible to use a larger generator set where the size of the single transfer switch is the limiting factor.
PANEL ACTION: Accept in Part.
The panel accepts the part of the recommendation to delete the "(120 kW)" reference after the 150 kVA value. {The panel notes that the value shown in the submitter's recommendation "(210 kW)" is incorrect.}
The panel rejects the replacement of "essential electrical system" with "transfer switch."
PANEL STATEMENT: The panel intends that the use of a single transfer switch shall depend on the demand on the essential electrical system not the transfer switch.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #CC1702)

17- 29 - (517-43): Accept
SUBMITTER: CMP 17
COMMENT ON PROPOSAL NO: 17-46b, 46d
RECOMMENDATION: Relocate the exception added by the panel action of Proposal 17-46b to follow the first paragraph of 517.43.
Delete the exception added by the panel action of Proposal 17-46d.
SUBSTANTIATION: The revised text editorially consolidates two identical exceptions into a single exception under 517.43. This change is in accordance with affirmative comment on Proposals 17-46b and 17-46d.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #CC1703)

17- 30 - (517-80):
Note: The Technical Correlating Committee directs that this Comment be reported as "Reject" because of the addition of references to entire articles. References that are for explanatory purposes shall be included in a Fine Print Note. References needed in Code text shall include the specific rule(s) being referenced.
SUBMITTER: CMP 17
COMMENT ON PROPOSAL NO: 17-51
RECOMMENDATION: Revise Section 517-80 to read as follows:
"517-80. Patient Care Areas
In patient-care areas, installations shall be in accordance with the appropriate provisions of Articles 640, 725, 760, 770, 800, 820, and 830."
The FPN is deleted as a part of this change.
SUBSTANTIATION: Based on the report of the task group assigned to review the language of 517-80, the panel has reconsidered the concerns expressed in the submitter's substantiation on Proposal 17-51. Upon further review, the panel agrees that the present wording is ambiguous and unclear, and has modified the requirements of Section 517-80 to reflect current safe installation practices. This modification eliminates the need for the FPN.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
WHITE: 17-51 asks for a clarification from Code-Making Panel 17. I think we went beyond clarification and reversed a code requirement that has not had public review.

(Log #CC1704)

17- 31 - (517-82): Accept
Note: The Technical Correlating Committee directs that the FPN following 517.82 be worded as follows: "See 517.13 for additional grounding requirements in patient care areas."
SUBMITTER: CMP 17
COMMENT ON PROPOSAL NO: 17-15
RECOMMENDATION: Renumber the FPN reference in 517-82(a) to 517-13(A).
SUBSTANTIATION: The change is needed to correlate with the renumbering of Section 517-13 that occured as a result of the panel's action on Proposal 17-15.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

ARTICLE 518 — PLACES OF ASSEMBLY

(Log #667)

15- 22 - (518): Hold
Note: The Technical Correlating Committee acknowledges the concern expressed by the submitter relative to correlating with other NFPA documents. The Technical Correlating Committee also acknowledges that the Chair of Code-Making Panel 15 will appoint a special Task Group and will also instruct the Chair to include representation from NFPA 101 and NFPA 5000 Committees on the Task Group.
SUBMITTER: James R. Quiter, Rolf Jensen & Assoc., Inc.
COMMENT ON PROPOSAL NO: 15-11
RECOMMENDATION: Revise the title of Article 518 as follows:
Article 518 - Places of Assembly Occupancies
Revise 518-1 as follows:
518-1. Scope. This article covers all buildings of portions of buildings or structures designed or intended for the assembly gathering together of 100 or more persons for deliberation, worship, entertainment, eating, drinking, amusement, awaiting transportation, or similar uses.
Revise 518-2(a) as follows:
(a) Examples. Assembly occupancies Places of assembly shall include, but not be limited …
Also, change "place of assembly" to "assembly occupancy" in 240-2, 333-4, 336-5(a), 518-3(a), 640-3(e), and 770-21 (2 locations).
SUBSTANTIATION: I serve as Chair of the NFPA Technical Correlating Committee on Safety to Life (TCC). At its September 26-27, 2000 meeting, the TCC discussed NEC Proposal 15-11 and drafted this comment. I am submitting the comment in my name, in lieu of that of the TCC, because there was not sufficient time to letter ballot the TCC prior to the October 27 comment closing date. The NFPA regulations addressing the submittal of comments to technical committees/panels outside one's own project require letter balloting by the committee that wants to submit the comment.
The current language of 518-1 is not restrictive enough in scope to accomplish its intent. The loosely defined phrase "for the ASSEMBLY of 100 or more persons" is deficient in not specifying the purpose for which the persons have assembled. Via the current wording, a space/area with 100 desks and 100 chairs in an office building would be subject to the provisions of Article 518, yet this doesn't appear to be the intent of Article 518. From the list of examples in 518-2(a),

which acknowledges via its wording that the list of examples is not all inclusive, it appears that the provisions of Article 518 are meant to apply to groups of 100 or more persons if the people have gathered together for purposes that the Life Safety Code and the model building codes refer to as constituting an assembly occupancy. It appears that Article 518 is not meant to apply to all gatherings of 100 persons or more regardless of those persons' reason for gathering.

The wording revisions proposed would accomplish two things:

1. The new wording will clarify the intent of the scope of Article 518; the current wording is unclear.

2. The new wording will create consistency in terminology among three premier documents within NFPA's arsenal of codes for the built environment - NFPA 70 NEC, NFPA 101 Life Safety Code, and NFPA 5000 (proposed) Building Code. None of these documents should attempt to function in a vacuum without consideration of the others. We owe it to our constituency to work toward consistency and avoid conflicting language.

PANEL ACTION: Hold.

PANEL STATEMENT: The panel holds this comment and Proposals 15-11 and 15-11a. The panel has reviewed its actions on Proposals 15-11 and 15-11a in light of the comments received. Resolution to these issues would require new language and possible alteration of the scope, which is not in Panel 15's purview. Therefore, the action of the panel on these comments and proposals is to "Hold for Further Study" and the language that exists in the 1999 Edition of the NEC remains. A special Task Group appointed by the Panel Chair will develop a proposal or proposals for the 2005 cycle to resolve these issues.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19

VOTE ON PANEL ACTION:

AFFIRMATIVE: 14

NEGATIVE: 4

NOT RETURNED: 1 Kalbfeld

EXPLANATION OF NEGATIVE:

AMOS: I disagree with the panel action to hold this comment for further study.

The panel has wrestled with the list of examples for as long as I have been a member of panel 15. It has been stated time after time that no list can be all-inclusive and a list will always be subjective. By establishing "assembly occupancy" in place of the existing list, we would be in conformance with other NFPA documents. Placing this comment on hold will only add three more years to the confusion.

JOHNSON: NFPA codes, especially those as closely related as NFPA 70 and NFPA 101, should not have two abstract terms having the same meaning. I do not have a strong feeling about the merit of either term but the majority of NFPA documents prefer "Assembly Occupancies." over "Places of Assembly." We do not need a task group and a three-year delay to make such a logical change.

HIRSCHLER: I oppose the action by the panel. The issue of the definition of places of assembly or of assembly occupancies, and of the associated list has been in front of the panel for several cycles (at least the three cycles I have served on the panel) and there is no justification for the panel not to act on it and "hold it for further study". Article 518 in the NEC has a unique definition of something it calls "places of assembly". There are 18 references to "Places of Assembly" in the NFPA Codes, as follows:

1. NFPA 1: 10-2.2.2* Interior finish shall be limited to that permitted in Class A places of assembly as specified in NFPA 101®, Life Safety Code®.

2. NFPA 70: Article 240 A. General - 240-2. Protection of Equipment. Equipment shall be protected against overcurrent in accordance with the article in this Code that covers the type of equipment as specified in the following list:
Places of Assembly Article 518

3. NFPA 70: 333-4. Uses Not Permitted. Type AC cable shall not be used where prohibited elsewhere in this Code, including the following:
1. In theaters and similar locations, except as provided in Article 518, Places of Assembly

4. NFPA 70: 336-5. Uses Not Permitted (a) Types NM, NMC, and NMS. Types NM, NMC, and NMS cables shall not be used in the following:
1. In any multifamily dwelling or other structure exceeding three floors above grade. For the purpose of this article, the first floor of a building shall be that floor that has 50 percent or more of the exterior wall surface area level with or above finished grade. One additional level that is the first level and not designed for human habitation and used only for vehicle parking, storage, or similar use shall be permitted.
2. As service-entrance cable
3. In commercial garages having hazardous (classified) locations as provided in Section 511-3
4. In theaters and similar locations, except as provided in Article 518, Places of Assembly

5. NFPA 70: ARTICLE 518 -- Places of Assembly
518-1. Scope. This article covers all buildings or portions of buildings or structures designed or intended for the assembly of 100 or more persons.

6. NFPA 70: 518-2. General Classifications
(a) Examples. Places of assembly shall include, but not be limited to, the following:

7. NFPA 70: 518-3. Other Articles. (a) Hazardous (Classified) Areas. Electrical installations in hazardous (classified) areas located in places of assembly shall comply with Article 500.

8. NFPA 70: 640-3. Locations and Other Articles. Circuits and equipment shall comply with (a) through (k), as applicable.
e) Places of Assembly. Equipment used in places of assembly shall comply with Article 518.

9. NFPA 70: 700-1. Scope. The provisions of this article apply to the electrical safety of the installation, operation, and maintenance of emergency systems consisting of circuits and equipment intended to supply, distribute, and control electricity for illumination or power, or both, to required facilities when the normal electrical supply or system is interrupted.
FPN No. 3: Emergency systems are generally installed in places of assembly where artificial illumination is required for safe exiting and for panic control in buildings subject to occupancy by large numbers of persons, such as hotels, theaters, sports arenas, health care facilities, and similar institutions. Emergency systems may also provide power for such functions as ventilation where essential to maintain life, fire detection and alarm systems, elevators, fire pumps, public safety communications systems, industrial processes where current interruption would produce serious life safety or health hazards, and similar functions.

10. NFPA 70: 700-21. Switch Location. All manual switches for controlling emergency circuits shall be in locations convenient to authorized persons responsible for their actuation. In places of assembly, such as theaters, a switch for controlling emergency lighting systems shall be located in the lobby or at a place conveniently accessible thereto.

11. NFPA 72: Table A-4-3.2 Average Ambient Sound Level According to Location
Places of Assembly 55 dBa

12. NFPA 102: A-9-5 Patrols or Fire Details. Because of the variety of types of places of assembly covered in this standard, no general requirement for patrols or fire watchers has been included. The committee fully recognizes the importance of this feature of fire protection, however, and believes that a system of well-trained patrols or fire watchers should be maintained in every place of assembly where fire hazards might develop.

13. NFPA 110: A-2-2.4.1. Typically, Level 1 systems are intended to automatically supply illumination or power, or both, to critical areas and equipment in the event of failure of the primary supply or in the event of danger to elements of a system intended to supply, distribute, and control power and illumination essential for safety to human life. Level 1 systems generally are installed in places of assembly where artificial illumination is required for safe exiting and for panic control in buildings subject to occupancy by large numbers of people.

14. NFPA 111: A-2-2.5.1. Typically, Level 1 systems are intended to automatically supply illumination or power, or both, to critical areas and equipment in the event of failure of the normal supply or in the event of damage to elements of a system intended to supply, distribute, and control power and illumination essential for safety to human life. Level 1 systems generally are installed in places of assembly where artificial illumination is necessary for safe exiting and for panic control in buildings subject to occupancy by large numbers of people.

15. NFPA 415: 2-1.2* Interior finish shall be limited to that permitted in Class A places of assembly as specified in NFPA 101®, Life Safety Code®.

16. NFPA 1201: A-14-5.2. In the past, most fire prevention activities were limited to a small nucleus of full-time specialists who might be civilian or uniformed personnel. ... Fire companies also should be used to perform occupancy inspections in places of assembly (e.g., nightclubs, sporting events, special events), after normal business hours, to check for overcrowding, locked or blocked exits, and other similar violations. Fire companies or personnel should not be used to "stand by" for these events.

17. NFPA 1620: 9-3 Physical Elements and Site Considerations. 9-3.1. Places of assembly may occur within other occupancies. The pre-incident planning concepts of this chapter should be utilized for these areas.

18. NFPA 1620: 9-7 Emergency Operations. 9-7.1. Consideration of life safety at places of assembly should be the major point addressed by the plan.

Out of those 18 references, 2 are incorrect, because they reference

"places of assembly from NFPA 101", and NFPA 101 does not mention "places of assembly" (numbers 1 and 15), and 9 are under the responsibility of CMP 15 (all those from the NEC). This leaves only 7 references to "places of assembly" in the entire set of NFPA codes, and all of them (as is obvious from the enumeration made) could easily refer to "assembly occupancies" instead, as they are just concepts and do not refer to a specific requirement.

The NFPA Codes have 118 references to "Assembly Occupancies" (even before the multiple references that will appear in NFPA 5000, the Building Code), including 67 in NFPA 101, 21 in NFPA 101B, 15 in NFPA 1 and even 2 in NFPA 70. It also has 98 references to "assembly occupancy", including 65 in NFPA 101, 15 in NFPA 101B, and 8 in NFPA 1. All other codes (both the new International Building Code and the traditional 3 regional model building codes) in the US reference the term "Assembly Occupancies". It is absolutely way past the time for CMP 15 to cease trying to have its own unique language and adopt a consensus language for the country. Comment 15-22 tried to do this and described correctly 7 of the 9 places where the term is referenced (it erred in calling for 770-21 when it should have stated 700-1 and 700-21, but the sense was clear). It also gave a proper description for "assembly occupancies", as taken from the Life Safety Code, NFPA 101. The discussion at the CMP meeting that NFPA 101 describes an "assembly occupancy" as having 50 people and CMP 15 wants to have restricted wiring only for places where 100 or more people are gathered is just a way of avoiding a decision. It is not uncommon in code applications for terms to have the same meaning but different thresholds in different applications; thus, CMP 15 could continue to state that an "assembly occupancy" for the NEC is a place where 100 or more people gather to conduct certain activities. The other "rationale" expressed was that there was an interest in expanding the use of a "place of assembly" to locations such as open-space offices, factories or shops: this is obviously not what is intended when anyone talks about an assembly occupancy.

This comment should have been accepted, with the correction made to the two typing errors on references.

KOVACIK: Hold is the incorrect action for this comment. The panel statement implies this is new material and it did not have the authority to revise the scope of Article 518. The panel had all of the material it needed to revise the scope and provide correlation with the panel action on 518-2 as reported in the ROP. This material was provided in the comments on voting on proposal 15-11a and the public comments submitted on 15-11 and 15-11a. The panel could have drafted a suitable scope statement for recommendation to the Technical Correlating Committee. The panel was nearly unanimous in agreeing that the list of examples in 518-2 was a source of confusion and should be deleted. The only outstanding issue appeared to be the need to clarify what is meant by "places of assembly" which the present scope statement does not with the list of examples deleted. Suitable text had been suggested, the source of which was the Appendix of NFPA 101, Life Safety Code. Unfortunately, the panel could not agree on the exact wording and after considerable discussion decided to leave 518-2 as it appears in the 1999 NEC. All of the efforts expended over the past year to write a better code for this Article were lost.

COMMENT ON AFFIRMATIVE:

KLEIN: 1. The need to coordinate with other codes was expressed repeatedly in this and other comments, as well as during the deliberations. We must be cautious that we don't take this too far - we can't be absolute - because there are different considerations from many perspectives. As pointed out during debate, different rules apply to places of assembly depending upon the capacity and type of the particular occupancy.

VANNICE: One of the historical purposes of Article 518 was to separate and better define the non-theatre assembly occupancies found in the Life Safety Code. Therefore, it might be appropriate to align Article 518 with the LSC Assembly Occupancies. We must remember, however, that Articles 520 and 525 cover some Assembly Occupancies. We should either retain the differently defined Places of Assembly or except Articles 520 and 525 from Assembly Occupancies in the NEC.

The Panel Statement to Proposal 15-11 was to provide a reference point to which we could agree or disagree. It was pointed out that the statement "assembly of 100 or more persons anywhere for any reason" was overly inclusive. A suggested solution to Section 518-2(a), which was placed on Hold, was offered as follows:

Examples: Places of assembly (assembly occupancies) are characterized by the presence or potential presence of crowds with attendant panic hazard in case of fire or other emergency. They are generally or occasionally open to the public, and the occupants, who are present voluntarily, are not ordinarily subject to discipline or control. Such buildings or structures are ordinarily occupied by able-bodied persons and are not used for sleeping purposes. Places of assembly shall include, but not limited to, the following: (List of Examples)

This added wording clarifies further what a Place of Assembly is, and is derived from draft language in proposed NFPA 5000. Comments range from saying the existing language is either too restrictive, so that it would apply to offices or factories, to not being restricting enough. The above language clarifies that, and is generally consistent with NFPA 101 and the proposed NFPA 5000.

It may or may not be desirable to keep the list of examples; however, some sort of defining paragraph other than the scope needs to be retained. Note that in the LSC the list of examples has been banished to Annex A.

(Log #1604)

15- 23 - (518): Hold

Note: See Technical Correlating Committee action on Comment 15-22.

SUBMITTER: James K. Lathrop, Koffel Assoc., Inc.

COMMENT ON PROPOSAL NO: 15-11a

RECOMMENDATION: Accept proposal as modified below:

Revise 518 to read as follows:

Article 518 - ~~Places of~~ Assembly Occupancies

Revise 518-1 as follows:

518-1 Scope. This article covers all buildings or portions of buildings or structures designed or intended for the ~~assembly~~ gathering together of 100 or more persons for such purposes as deliberation, worship, entertainment, eating, drinking, amusement, awaiting transportation, or similar purposes.

Delete 518-2(a) and renumber 518-2(b).

SUBSTANTIATION: Without the change suggested above deleting the list would be a significant change in the scope of the document with no justification. This is more than just deleting a list. It is changing the total scope of the Article. Without the list, the Code will be worse, not better. However, by properly defining an assembly use, as is defined in the Life Safety Code and all the model building codes and in the proposed NFPA 5000, deleting the list will not be as problematic.

Without the suggested revision the Panel is now saying that this article applies to factories, open plan office buildings, open dormitory prisons and military barracks, stores, open plan schools, and large warehouses and distribution facilities. Where is the justification for this significant increase in scope?

If one follows the history of the NEC since 1975, when Article 518 first went into the code, it has never been substantiated that "Place of Assembly" in the NEC is any different than "Place of Assembly" in the Life Safety Code or the model building codes. Although the other codes eventually modernized the term to "assembly occupancies" the basic definition was the same. When I was Chief Life Safety Engineer for NFPA, I often discussed this article with the NEC staff due to the fact that NEC used 100 vs. the Life Safety Code 50 people. We repeatedly came to the same conclusion that was not a conflict because the NEC was just using a larger number for wiring purposes (similar to the 100 the Life Safety Code used for panic/fire exit hardware.) It was never discussed that the NEC meant something totally different from the Life Safety Code.

Quoting from the scope of Article 518 in the 1975 NEC: "This article covers all buildings or that part of a building or structure designed or intended for use by 100 or more persons for assembly purposes, such as dining, meeting, entertainment, lectures, bowling, worship, dancing or exhibition, and includes museums, gymnasiums, armories, group rooms, mortuaries, skating rinks, pool rooms, places of awaiting transportation, places for deliberation (court rooms), places for sporting events, and similar purposes." It does not say any place you gather together 100 or more people. The intent has always been to apply to the gathering together of 100 or more people for assembly purposes.

As pointed out by the Panel the list is just that a list. Is not all inclusive. However, every use on the list is an assembly use. How does the Panel now say that non-assembly uses will be included? Where is the justification to extend this beyond the uses that all model codes include in the assembly category?

In summary, the Panel is trying to significantly increase the scope of the article through the deletion of a list. Although deleting lists is usually a good idea, the base definition must be proper. As is remaining in the NEC, the base requirement without the list is not adequate and has not been justified by the Panel.

PANEL ACTION: Hold.

PANEL STATEMENT: The panel holds this comment and Proposals 15-11 and 15-11a. The panel has reviewed its actions on Proposals 15-11 and 15-11a in light of the comments received. Resolution to these issues would require new language and possible alteration of the

scope, which is not in Panel 15's purview. Therefore, the action of the panel on these comments and proposals is to "Hold for Further Study" and the language that exists in the 1999 Edition of the NEC remains. A special Task Group appointed by the Panel Chair will develop a proposal or proposals for the 2005 cycle to resolve these issues.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NEGATIVE: 4
NOT RETURNED: 1 Kalbfeld
EXPLANATION OF NEGATIVE:
AMOS: I disagree with the panel action. This comment should have been Accepted in Principle by accepting the "Assembly Occupancies" in the title.
HIRSCHLER: I oppose the action by the panel. This comment should have been accepted in principle and referred to action on accepted comment 15-22. See my comments on 15-22.
JOHNSON: See my Explanation of Negative Vote on Comment 15-22.
KOVACIK: See my Explanation of Negative Vote on Comment 15-22.
COMMENT ON AFFIRMATIVE:
KLEIN: See my Comment on Affirmative on Comment 15-22.
VANNICE: See my Comment on Affirmative on Comment 15-22.

(Log #1835)

15- 24 - (518): Hold
Note: See Technical Correlating Committee action on Comment 15-22.
SUBMITTER: Patricia Horton, Elaine Thompson, Allied Tube & Conduit
COMMENT ON PROPOSAL NO: 15-11
RECOMMENDATION: Continue to reject this proposal.
SUBSTANTIATION: Rejection of this proposal is right in line with the Code-Making Panel 15 interpretation of the intent of Article 518 over the years. The Panel has been especially astute in recognizing that the NEC charge is to deal with electrical issues, including ALL hazards arising from the use of electricity. The NFPA Board of Directors acknowledged years ago that those hazards include fire hazards. The Panel has long included the increased risks that exist where over 100 persons are intended to be present. In the interest of aiding in their continued assessment of the nonmetallic wiring methods that are not permitted by Article 518, comments on Article 336 and Article 331, as well as back-up documents are forwarded as part of this comment and comment on 15-11a. Also included is a comment to Proposal 7-145 developed by the NFPA 3-story Task Group as the basic response to proposed expanded use of NM Cable. These documents should be helpful to Code-Making Panel 15 in their continuing review of this issue.
Note: Supporting Material is available for review at NFPA Headquarters.
PANEL ACTION: Hold.
PANEL STATEMENT: The panel holds this comment and Proposals 15-11 and 15-11a. The panel has reviewed its actions on Proposals 15-11 and 15-11a in light of the comments received. Resolution to these issues would require new language and possible alteration of the scope, which is not in Panel 15's purview. Therefore, the action of the panel on these comments and proposals is to "Hold for Further Study" and the language that exists in the 1999 Edition of the NEC remains. A special Task Group appointed by the Panel Chair will develop a proposal or proposals for the 2005 cycle to resolve these issues.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15
NEGATIVE: 3
NOT RETURNED: 1 Kalbfeld
EXPLANATION OF NEGATIVE:
JOHNSON: See my Explanation of Negative Vote on Comment 15-22.
HIRSCHLER: I oppose the action by the panel. This comment should have been accepted in principle and referred to action on accepted comment 15-22. See my comments on 15-22.
KOVACIK: See my Explanation of Negative Vote on Comment 15-22.
COMMENT ON AFFIRMATIVE:
KLEIN: See my Comment on Affirmative on Comment 15-22.
VANNICE: See last paragraph of panel statement to Proposal 15-11. This concept is amplified in a letter from NFPA's Mr. Cote included in the documents given us. He states: "the scope clearly states that it (CMP) shall have primary responsibility for preparing documents on minimizing the risk of electrical shock and as a potential ignition source of fires and explosions."
Historically, Article 518 was created to deal with issues including the fact that wiring methods in Places of Public Assembly are often subjected to more adverse conditions than normal, and that the gathering together of larger groups of people warrant additional safety factors. The concern isn't just to get people out of the building safely, but to reduce the likelihood of having them need to get out. This is especially true of people assembled voluntarily and not ordinarily subject to discipline or control.
The Panel toured the Phoenix Civic Plaza Convention Center. There we learned that a walk-through is conducted with each new client. The purpose of this walk-through is so that when the client receives a bill for all the damage to the facility, they will understand and pay it. After an exhibition, typically there is one to two days of required repair work to the electrical system, mechanical system, walls, etc. due to damage by fork lifts, carts, and crates, etc. We also saw that the ceiling has only one surface with conduits exposed to the workers on the top side.
I have been watching the construction of some offices. The contractor applied plywood with a nail gun. Approximately 10 percent of the nails missed the stud (and its metal plate) and entered the wall cavity grazing the NM cable. This observation increased concerns with respect to walls that are heavily "used" such as museums. Museum walls are an example of such use. Pictures and sculpture are hung and re-hung, often not with picture hooks, but with toggle bolts and lag screws. These walls are screwed, nailed and drilled into blindly with regularity, up to the point of requiring the surface to be replaced. Spaces that are likely to be reconfigured or are used for multiple purposes require additional safety factors.

(Log #1838)

15- 25 - (518(b) and (c)): Reject
SUBMITTER: Patricia Horton, Elaine Thompson, Allied Tube & Conduit
COMMENT ON PROPOSAL NO: 15-17
RECOMMENDATION: See comment on Proposal 15-16. This is a duplicate of that proposal.
SUBSTANTIATION: See comment on Proposal 15-16.
Note: Supporting Material is available for review at NFPA Headquarters.
PANEL ACTION: Reject.
PANEL STATEMENT: Refer to the panel action and statement on Comment 15-39 and Proposals 15-16 and 15-17.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16
NEGATIVE: 1
ABSTENTION: 1
NOT RETURNED: 1 Kalbfeld
EXPLANATION OF NEGATIVE:
JOHNSON: See my Explanation of Negative Vote on Comment 15-22.
EXPLANATION OF ABSTENTION:
BOYER: There is no consensus within the NEMA organization on this issue.

(Log #1603)

15- 26 - (518-1, 518-2(a)): Hold
Note: See Technical Correlating Committee action on Comment 15-22.
SUBMITTER: James K. Lathrop, Koffel Assoc., Inc.
COMMENT ON PROPOSAL NO: 15-11
RECOMMENDATION: Accept proposal as originally submitted.
SUBSTANTIATION: The panel statement is without technical justification and inconsistent with other NFPA documents. It states "They are buildings or portions of buildings or structures designed or intended for the assembly of 100 or more persons anywhere for any reason, except where modified elsewhere by the NEC." Is the panel now saying that factories, open plan office buildings, open dormitory prisons and military barracks, stores, open plan schools, and large warehouses and distribution facilities are now Places of Assembly? If so, where is the justification for this significant increase in scope.
If one follows the history of the NEC since 1975, when Article 518 first went into the code, it has never been substantiated that "Place of

Assembly" in the NEC is any different than "Place of Assembly" in the Life Safety Code or the model building codes. Although the other codes eventually modernized the term to "assembly occupancies" the basic definition was the same. When I was Chief Life Safety Engineer for NFPA, I often discussed this article with the NEC staff due to the fact that the NEC used 100 vs the Life Safety Code 50 people. We repeatedly came to the same conclusion that this was not a conflict because the NEC was just using a larger number for wiring purposes (similar to the 100 the Life Safety Code uses for panic/fire exit hardware.) It was never discussed that the NEC meant something totally different from the Life Safety Code.

Quoting from the scope of Article 518 in the 1975 NEC: "This article covers all buildings or that part of a building or structure designed or intended for use by 100 or more persons for assembly purposes, such as dining, meeting, entertainment, lectures, bowling, worship, dancing or exhibition, and includes museums, gymnasiums, armories, group rooms, mortuaries, skating rinks, pool rooms, places of awaiting transportation, places for deliberation (court rooms), places for sporting events, and similar purposes." It does not say any place you gather together 100 or more people. The intent has always been to apply to the gathering together of 100 or more people for assembly purposes.

By the way, a building defined by NFPA in its glossary of terms as: "Building: Any structure used or intended for supporting or sheltering any use or occupancy." Therefore an open platform is a building since it is a structure that is supporting a use or occupancy. However, this is not a significant issue and if the panel wishes to accept in principle but retain "building or structure" there is no objection. That is not a justification for rejecting the whole proposal.

As pointed out by the Panel the list is just that a list. Is not all inclusive. However, every use on the list is an assembly use. How does the panel now say that non-assembly uses will be included? Where is the justification to extend this beyond the uses that all model codes include in the assembly category.

In the last four paragraphs of the Panel statement the panel lays out a very good reason for the elimination of Article 518. The Panel does an excellent job of explaining that the requirements are based on the number of people and not the electricity. Why does the gathering together of 100 people, regardless of the reason, make electricity, or the wiring system behave any differently? The Panel clearly lays it out; "Possible electrical induced hazards include".

Fire - no different based on the number of people - the wiring methods and the electricity do not behave differently.

Smoke - is a different type of smoke given off due to the number of people?

Toxicity - why is this different, is the toxicity different if a wiring method burns in a hospital or a school verses an assembly use?

Structural Integrity - Is the Panel saying that structural integrity is more important in an assembly use than in a high rise?

Burns, shocks, explosions, blinding flashes, and electrocutions - this is totally independent of the number of people. Where does the fire record show this to be different based on the building containing an assembly use?

In summary, the Panel is trying to significantly increase the scope of the article through its Panel statement. The Panel must provide significant justification for such action. Since the Panel statement can be considered part of the developmental record, the statement must be withdrawn regardless of action on this comment.

PANEL ACTION: Hold.

PANEL STATEMENT: The panel holds this comment and Proposals 15-11 and 15-11a. The panel has reviewed its actions on Proposals 15-11 and 15-11a in light of the comments received. Resolution to these issues would require new language and possible alteration of the scope, which is not in Panel 15's purview. Therefore, the action of the panel on these comments and proposals is to "Hold for Further Study" and the language that exists in the 1999 Edition of the NEC remains. A special Task Group appointed by the Panel Chair will develop a proposal or proposals for the 2005 cycle to resolve these issues.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19

VOTE ON PANEL ACTION:

AFFIRMATIVE: 15
NEGATIVE: 3
NOT RETURNED: 1 Kalbfeld

EXPLANATION OF NEGATIVE:

JOHNSON: See my Explanation of Negative Vote on Comment 15-22.

HIRSCHLER: I oppose the action by the panel. This comment should have been accepted in principle and referred to action on accepted in principle comment 15-29. See my comments on 15-29 and 15-22.

KOVACIK: See my Explanation of Negative Vote on Comment 15-22.

COMMENT ON AFFIRMATIVE:

KLEIN: See my Comment on Affirmative on Comment 15-22.

VANNICE: See my Comment on Affirmative on Comment 15-22.

(Log #1908)

15- 27 - (518-1 and 518-2(a)): Hold

Note: See Technical Correlating Committee action on Comment 15-22.

SUBMITTER: Michael I. Callanan, International Brotherhood of Electrical Workers

COMMENT ON PROPOSAL NO: 15-11

RECOMMENDATION: Continue to reject this proposal.

SUBSTANTIATION: The Panel statement is correct "The NEC does define Places of Assembly". The scope in section 518-1 and the examples listed in 518-2 provide the user with the necessary information for proper application of Article 518.

This comment represents the official position of the International Brotherhood of Electrical Workers Codes & Standards Committee.

PANEL ACTION: Hold.

PANEL STATEMENT: The panel holds this comment and Proposals 15-11 and 15-11a. The panel has reviewed its actions on Proposals 15-11 and 15-11a in light of the comments received. Resolution to these issues would require new language and possible alteration of the scope, which is not in Panel 15's purview. Therefore, the action of the panel on these comments and proposals is to "Hold for Further Study" and the language that exists in the 1999 Edition of the NEC remains. A special Task Group appointed by the Panel Chair will develop a proposal or proposals for the 2005 cycle to resolve these issues.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19

VOTE ON PANEL ACTION:

AFFIRMATIVE: 15
NEGATIVE: 3
NOT RETURNED: 1 Kalbfeld

EXPLANATION OF NEGATIVE:

HIRSCHLER: I oppose the action by the panel. This comment should have been rejected and referred to action on accepted in principle comment 15-29. See my comments on 15-29 and 15-22.

JOHNSON: See my Explanation of Negative Vote on Comment 15-22.

KOVACIK: See my Explanation of Negative Vote on Comment 15-22.

(Log #176)

15- 28 - (518-2): Accept

SUBMITTER: Technical Correlating Committee National Electrical Code

COMMENT ON PROPOSAL NO: 15-11a

RECOMMENDATION: It was the action of the Technical Correlating Committee that further consideration be given to the comments expressed in the voting. This action will be considered by the panel as a public comment.

SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.

PANEL ACTION: Accept.

PANEL STATEMENT: Refer to the panel action and statement on Comments 15-22, 23, 24, 26, 27, 29, 30.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19

VOTE ON PANEL ACTION:

AFFIRMATIVE: 16
NEGATIVE: 2
NOT RETURNED: 1 Kalbfeld

EXPLANATION OF NEGATIVE:

HIRSCHLER: I oppose the action by the panel. This comment should have been accepted and referred to action on accepted in principle comment 15-29. See my comments on 15-29 and 15-22.

JOHNSON: See my Explanation of Negative Vote on Comment 15-22.

(Log #1836)

15- 29 - (518-2): Hold

Note: See Technical Correlating Committee action on Comment 15-22.

SUBMITTER: Patricia Horton, Elaine Thompson, Allied Tube & Conduit

COMMENT ON PROPOSAL NO: 15-11(a)

RECOMMENDATION: Accept this proposal in principle, but add back a charging paragraph as noted by Mr. Vannice in his comment, and as noted by the Technical Correlating Committee. New paragraph to read as follows:

(a) Places of Assembly. Places of assembly shall include all buildings or portions of buildings or structures designed or intended to be occupied by 100 or more persons at any given time.

Leave "Multiple Occupancies (b), and Theatrical Areas (c)," as contained in the 1999 NEC.

SUBSTANTIATION: The decision to delete this list will clarify the long expressed intent of Code-Making Panel 15. Section (a) has always clearly stated the list is examples only, and not all inclusive. The reasoning contained in the Panel statement for 15-11 certainly provided their overall thinking. Documentation in support of our comments on 15-11, 15-11a, 15-16, 15-17, and 15-18 has been provided as a package to the Code-Making Panel as overall information on the nonmetallic wiring methods that are regulated in Article 518. This is provided for the record and further edification of the Panel. For detailed information readers of the ROC are referred to comments on Proposal 7-145.

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

PANEL ACTION: Hold.

PANEL STATEMENT: The panel holds this comment and Proposals 15-11 and 15-11a. The panel has reviewed its actions on Proposals 15-11 and 15-11a in light of the comments received. Resolution to these issues would require new language and possible alteration of the scope, which is not in Panel 15's purview. Therefore, the action of the panel on these comments and proposals is to "Hold for Further Study" and the language that exists in the 1999 Edition of the NEC remains. A special Task Group appointed by the Panel Chair will develop a proposal or proposals for the 2005 cycle to resolve these issues.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19

VOTE ON PANEL ACTION:

AFFIRMATIVE: 15

NEGATIVE: 3

NOT RETURNED: 1 Kalbfeld

EXPLANATION OF NEGATIVE:

HIRSCHLER: I oppose the action by the panel. This comment should have been accepted in principle and proposal 15-11a continued to be accepted. This would have been the logical thing to do. The list contained in Article 518 is a list of arbitrary examples that is not all-inclusive, and was never intended to be all-inclusive, and its use causes great difficulties to people trying to decide where Article 518 applies. The list is as follows:

(a) Examples. Places of assembly shall include, but not be limited to, the following:

Armories	Courtrooms
Assembly halls	Dance halls
Auditoriums	Dining facilities
Auditoriums within	Exhibition halls
Business establishments	Gymnasiums
Mercantile establishments	Mortuary chapels
Other occupancies	Multipurpose rooms
Schools	Museums
Bowling lanes	Places of awaiting transportation
Church chapels	Pool rooms
Club rooms	Restaurants
Conference rooms	Skating rinks

Does this mean that a cathedral, or even an auditorium within a cathedral, doesn't count? they probably do count. What about a lunch room within a factory? What about a library? What about a court room? The list of potential places excluded is probably larger than the list of places included in the list. There is no justification for including this list, which has been a headache (and a growing one as the cycles have gone on). The list should have remained deleted, as the panel correctly did on Proposal 15-11a.

If the panel wished to add a charging paragraph instead of the list it could have used the definition as incorporated in comment 15-22, namely:

(a) Assembly occupancies: assembly occupancies shall include buildings or portions of buildings or structures designed or intended for the gathering together of 100 or more persons for deliberation, worship, entertainment, eating, drinking, amusement, awaiting transportation or similar uses."

See also my comment on comment 15-22.

JOHNSON: See my Explanation of Negative Vote on Comment 15-22.

KOVACIK: See my Explanation of Negative Vote on Comment 15-22.

(Log #1909)

15- 30 - (518-2): Hold

Note: See Technical Correlating Committee action on Comment 15-22.

SUBMITTER: Michael I. Callanan, International Brotherhood of Electrical Workers

COMMENT ON PROPOSAL NO: 15-11a

RECOMMENDATION: Reject this proposal.

SUBSTANTIATION: Deleting the list of examples will not help the user of this code. In fact the user of this code will be confused by this action. Removal of the examples listed will decrease the usability of Article 518.

The text in 518-2a clearly states "Places of assembly shall include, but not be limited to, the following:" informing the user that the list of examples is not all-inclusive.

This comment represents the official position of the International Brotherhood of Electrical Workers Codes & Standards Committee.

PANEL ACTION: Hold.

PANEL STATEMENT: The panel holds this comment and Proposals 15-11 and 15-11a. The panel has reviewed its actions on Proposals 15-11 and 15-11a in light of the comments received. Resolution to these issues would require new language and possible alteration of the scope, which is not in Panel 15's purview. Therefore, the action of the panel on these comments and proposals is to "Hold for Further Study" and the language that exists in the 1999 Edition of the NEC remains. A special Task Group appointed by the Panel Chair will develop a proposal or proposals for the 2005 cycle to resolve these issues.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19

VOTE ON PANEL ACTION:

AFFIRMATIVE: 16

NEGATIVE: 2

NOT RETURNED: 1 Kalbfeld

EXPLANATION OF NEGATIVE:

HIRSCHLER: I oppose the action by the panel. This comment should have been rejected and referred to action on accepted in principle comment 15-29. See my comments on 15-29 and 15-22.

KOVACIK: See my Explanation of Negative Vote on Comment 15-22.

(Log #2097)

15- 31 - (518-4(a)): Accept

SUBMITTER: George W. Flach, Nat'l Armored Cable Mfrs' Assn. (NACMA)

COMMENT ON PROPOSAL NO: 15-15

RECOMMENDATION: Reject the proposal.

SUBSTANTIATION: This proposal will permit a nonmetallic raceway in places of assembly without any substantiation for deviating from the present requirement for encasing nonmetallic raceways beneath 2 inches of concrete.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19

VOTE ON PANEL ACTION:

AFFIRMATIVE: 16

NEGATIVE: 1

ABSTENTION: 1

NOT RETURNED: 1 Kalbfeld

EXPLANATION OF NEGATIVE:

HIRSCHLER: I oppose the action by the panel. This comment should have been rejected and referred to action on accept, or accept in part of comment 15-33. See my comments on 15-33.

EXPLANATION OF ABSTENTION:

FLACH: My classification is "independent expert."

(Log #177)

15- 32 - (518-4(a), Exception): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 15-15
RECOMMENDATION: It was the action of the Technical Correlating Committee that further consideration be given to the comments expressed in the voting. This action will be considered by the panel as a public comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
PANEL STATEMENT: Refer to the panel action and statement on Comment 15-33.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17
NEGATIVE: 1
NOT RETURNED: 1 Kalbfeld
EXPLANATION OF NEGATIVE:
HIRSCHLER: I oppose the action by the panel. This comment should have referred to action on accept, or accept in part of comment 15-33. See my comments on 15-33.

(Log #803)

15- 33 - (518-4(a), Exception): Reject
SUBMITTER: David H. Kendall, Carlon
COMMENT ON PROPOSAL NO: 15-15
RECOMMENDATION: This proposal should continue to be accepted.
SUBSTANTIATION: The proposal does not in away change the existing requirements for ENT per Section 518-4 where it states for nonmetallic raceways that it shall be encased in not less than 2 in. of concrete. Optical Fiber/Communication Raceways are made from the same materials used on the insulation of the Optical Fiber Cabling. The raceways are required to meet the same fire characteristics as the cable for both smoke and/or flame spread in a plenum or a riser. Only plenum rated cables are allowed to be used in a plenum rated raceway, etc. See Section 770-53.
At no time are these raceways permitted to have electrical conductors installed inside them. Optical Fiber/Communication Raceways are used strictly for cable management for Optical Fiber/Communication cables. These cables can be installed in the same application without the use of either metal or nonmetallic raceways.
PANEL ACTION: Reject.
PANEL STATEMENT: With the rejection of this comment, the panel notes that this action also rejects Proposal 15-15.
The last paragraph of the substantiation is false. Sections 770-5(c) and -52 specifically refer to optical fiber cables which are conductive but not designed for carrying electrical current and composite, which include current carrying electrical conductors (required to be classified in accordance with the type of electrical conductor). While an initial installation may not include either of these types, there is no way to guarantee that they wouldn't be added in the future. Therefore, the type of raceway allowed must be compatible with any of the types of optical cable which may be installed.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17
NEGATIVE: 1
NOT RETURNED: 1 Kalbfeld
EXPLANATION OF NEGATIVE:
HIRSCHLER: I oppose the action by the panel. This comment should have been accepted or accepted in part. Section 518-4(a) permits, by exception, fixed wiring methods listed for
a. Audio signal processing, amplification, and reproduction equipment, by Article 640
b. Communications circuits, by Article 800
c. Class 2 and Class 3 remote-control and signaling circuits, by Article 725
d. Fire alarm circuits, by Article 760
The rejection of optical fiber cables and raceways, listed by Article 770, based on the flimsy excuse that such raceways contain nonmetallic raceways (as stated in the substantiation in accepted comment 15-31) or that they may contain electrical conductors (as stated in the panel statement for rejected comment 15-33) is representative of an ingrained prejudice by panel members. The action ignores the fact that it was pointed out repeatedly to the panel that, for consistency' sake: (a) wiring methods per articles 640, 800, 725 and 760 (all permitted) also contain electrical conductors, (b) the panel could have accepted only those optical fiber cables that contain no electrical conductors, (c) the panel could have accepted only those optical fiber cables that are not associated with non metallic raceways and (d) the panel could have restricted the use of optical fiber cables to those meeting plenum cable requirements (which would then have to meet much better fire performance requirements than the other wiring methods). During the panel deliberations I made a motion that the comment be accepted in part in principle by restricting the acceptance to those optical fiber systems listed by Article 770 and which do not contain electrical conductors, do not contain nonmetallic raceways and are listed for use in plenums; there was no second to the motion. The fact that the panel was unwilling to consider any of those alternatives clearly indicates either a lack of understanding of wiring methods or a prejudice against plastic materials.

(Log #1566)

15- 34 - (518-4(a), Exception): Accept
SUBMITTER: Steven R. Terry, Production Arts Lighting Inc.
COMMENT ON PROPOSAL NO: 15-15
RECOMMENDATION: The reference to optical fiber cables and Article 770 should be deleted - the proposal should be rejected.
SUBSTANTIATION: The proposal suggests that the use of certain nonmetallic raceways is acceptable for fiber optic installation in places of public assembly. The placement of the proposal in 518-4(a) allows the use of a nonmetallic wiring method without any restriction. The allowance of other nonmetallic methods in Places of Assembly is covered in Section 518-4(c), which limits the use of such methods to spaces with a finish rating. The Code Panel has previously ruled on numerous occasions that the introduction of nonmetallic wiring methods into Article 518 venues without a finish rating for protection is not acceptable. This proposal should be rejected, for all the reasons that the panel has rejected such nonmetallic wiring methods in the past for use in places of public assembly without a finish rating.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17
NEGATIVE: 1
NOT RETURNED: 1 Kalbfeld
EXPLANATION OF NEGATIVE:
HIRSCHLER: I oppose the action by the panel. This comment should have been rejected and referred to action on accept, or accept in part of comment 15-33. See my comments on 15-33.

(Log #2288)

15- 35 - (518-4(a), Exception): Accept
SUBMITTER: Christopher R. Pharo, Marlton, NJ
COMMENT ON PROPOSAL NO: 15-15
RECOMMENDATION: I would urge the panel to reject this proposal.
SUBSTANTIATION: As the panel has suggested, acceptance of this proposal would allow a nonmetallic raceway to be used in Places of Assembly. The general rule is very specific in stating what is required and what is accepted. The exceptions reaffirm the approved wiring methods.
Optical fiber cables and raceways can be used in metal raceways - already, why list it? This will only cause confusion.
I believe the acceptance of this proposal undermines the stringent requirements of Article 518.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17
NEGATIVE: 1
NOT RETURNED: 1 Kalbfeld
EXPLANATION OF NEGATIVE:
HIRSCHLER: I oppose the action by the panel. This comment should have been rejected and referred to action on accept, or accept in part of comment 15-33. See my comments on 15-33.

(Log #881)

15- 36 - (518-4(a), Exception (e)): Reject
SUBMITTER: George W. Flach, New Orleans, LA
COMMENT ON PROPOSAL NO: 15-15
RECOMMENDATION: Revise part (e) to read:
"Optical fiber cables in metal raceways or Type MC cable."
SUBSTANTIATION: Exported nonmetallic raceways should not be permitted in places of assembly.
PANEL ACTION: Reject.
PANEL STATEMENT: Section 518-4 already defines the wiring methods allowed, including those for fiber optic cable.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19
VOTE ON PANEL ACTION:
AFFIRMATIVE: 18
NOT RETURNED: 1 Kalbfeld

(Log #1826)

15- 37 - (518-4(b) & (c)): Reject
SUBMITTER: Marshall A. Klein, Marshall A. Klein & Assoc., Inc.
COMMENT ON PROPOSAL NO: 15-17
RECOMMENDATION: Accept original proposal.
SUBSTANTIATION: (Please note that this is the identical issue covered under ROP Code Proposal 15-34-(522-5(a) and (c)) (Log #3246)).

We would like to address the Panel's Statements for rejection. (Panel's Statements are italicized, our responses are not).

"The fire hazard assessment presented does not address a realistic heat input into the NM cable.

Our comments: The Sullivan Report, on page 9, Section 1.4.2 noted that the heat input for the Cone Calorimeter Test for both ENT and the NM Cable was $5kW/m^2$. The original "Fire Hazard Analysis; The Use of ENMT" that was submitted with the 1987 NEC TCR Code Proposal 8-49 (including the 1987 NEC TCD 8-32 and 8-32A) to remove the three story limit for ENMT used the same heat input of $5kW/m^2$. This was noted on the original submitted report on Part B, Section 1.0 first paragraph. Both these reports were submitted to Panel 15 as part of the substantiation for this Code Proposal. Why would this heat input be adequate for ENT's approval, but NOT for NM Cable? Seems like a double standard? The heat input from both reports was used only to determine when ENT and NM Cable start to decompose (which is at 347°F). This information was input into the fire model so the fire model knew when to terminate its evaluation of the performance of the wiring methods within the ceiling and wall spaces. When the fire model reached the decomposition temperature of the PVC material (ENT and NM Cable), the fire modeling could terminate. In fact, the Sullivan Fire Modeling actually used a much lower termination temperature to provide very conservative results (error on the side of safety). Instead of using 347°F, Sullivan used the maximum electrical rating of the conductors, 194°F, as the termination point for the fire modeling. Sullivan had a safety factor of 153°F under the actual decomposition temperature of the ENT and NM Cable. Therefore, this part of the Panel's Statement is irrelevant to the acceptance of this code proposal.

"NM cable is made of plasticized PVC and not rigid PVC, it is not required to be highly fire retarded and would ignite under conditions of fairly low heat input generating a significant amount of heat and potentially spreading the flame beyond the area of origin. Electrical nonmetallic tubing and rigid nonmetallic conduit are made of rigid PVC, which will not ignite unless an intense heat source is applied and continues to be imposed on the raceway and that is why they are permitted in this section."

Our comments: The Code Calorimeter Tests show the plasticized PVC as well as rigid PVC will decompose at the same temperature, which is logical, since they are both plastics. Electrical wiring methods in concealed spaces, based on NFPA Fire Data submitted to Panel 7, are not a major source of flame spread in properly firestopped and draftstopped spaces. Both the NEC and the Model Building Codes provide stringent firestopping/draftstopping requirements to be followed for installing electrical wiring through walls and floor spaces. The 15 minute finish rating was imposed on ENT back in 1985 addressing the concern for fires outside the concealed spaces that cover the wiring system, not for the concern with a fire within the concealed space. Such a fire within the concealed space is a very rare occurrence based on actual fire data.

"Support documentation addresses flammability and toxicity issues as they relate to survivability. However, another issue is protection of the conductors so they don't become the source of ignition."

Our comments: Nonmetallic-sheathed cable does not present an ignition source problem. It has been well documented in recent years that nonmetallic-sheathed cable does not present an ignition source problem. NFPA 921, "Guide for Fire and Explosion Investigation" makes it clear that electrical conductors, including nonmetallic-sheathed cable, are not common sources of ignition. Fire data supports this conclusion. See NFPA 921-98, Sections 14-11.4, 14-11.5, A-14-11.4, and Appendix B on referenced publications.

"Section 336-6(b) doesn't allow for this - it states "The cable shall be protected from physical damage where necessary..." - this proposal would negate that requirement. The thermal barrier required for ENT and RNMC does not necessarily provide this physical protection."

Our comments: Section 336-6 "Exposed Work", provide the requirements for the use of NM Cable when used outside of walls and ceilings. That's why it is entitled "Exposed "Work". This code proposal would not negate Section 336-6(b). Section 336-6(b) was never intended to be applicable, and has never been applied, to NM Cable installed inside concealed spaces. If this code proposal is accepted, all the other installation requirements under Article 336, Part B, "Installation" would still be applicable to NM Cable installed under this code proposal.

In summation, the Panel's Statement contains comments of questionable technical merit when compared to the technical substantiation provided with the original code proposal. We would hope the Panel revisits this issue and accepts this code proposal based on its technical merits.
PANEL ACTION: Reject.
PANEL STATEMENT: Type NM cable does not equal or exceed the fire safety of wiring methods already allowed. The information provided in the comments of 2002 NEC ROP 7-145, page 486 more than document enough reasons to not allow the usage of Type NM cable is places of public assembly.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17
ABSTENTION: 1
NOT RETURNED: 1 Kalbfeld
COMMENT ON AFFIRMATIVE:
KLEIN: 1. The commentor refers to 333-6 "Exposed Work" for when NM Cable is used outside of walls and ceilings. In many of these "518" venues, there is no wiring system that could be considered as not exposed - being behind a wall or a ceiling does not constitute non-exposure. In the tour many of the panel members took of the Phoenix Civic Plaza (a large Convention Center adjacent to the panel meetings), the conduit on the "back side" of a ceiling in one of the exhibit halls we toured was exposed with 15 ft clear to the building structure. This space was a working area containing numerous catwalks for access to control areas and mounting of specialty lumniaires (lighting fixtures).
VANNICE: See my Comment on Affirmative on Comment 15-24.
It appears that in Article 336, Code-Making Panel 7 rejected all attempts to expand the use of NM cable. They must have concerns that we should be aware of.
EXPLANATION OF ABSTENTION:
BOYER: See my Explanation of Abstention on Comment 15-25.

(Log #1827)

15- 38 - (518-4(b) and (c)): Reject
SUBMITTER: Marshall A. Klein, Marshall A. Klein & Assoc., Inc.
COMMENT ON PROPOSAL NO: 15-17
RECOMMENDATION: Revise text as follows:
518-4 Wiring Methods
(a) (No changes)
(b) Nonrated Types of Construction. Nonmetallic-sheathed cable, Type AC cable, electrical nonmetallic tubing, and rigid non-metallic conduit shall be permitted to be installed in those buildings or portions thereof that are not required to be of a fire-rated type of construction classification by the applicable building code.
FPN: Types of non ~~F~~fire-rate construction classifications are described ~~in the fire resistive classification used~~ in building codes.
SUBSTANTIATION: (Please note that this is the identical issue covered under ROP Code Proposal 15-34-(522-5(a) and (c)) (Log #3246).

Based on the Panel Statement on our original code proposal, we have submitted two separate comments to address our concern on how this Section of Code reads in the existing Code vs. how this restriction is unwarranted for NM Cable.

As additional information for this Panel to consider when reviewing this comment, the NEC NM Task Group at its August 27-30, 200o, meeting confirmed with UL's representative on the Task Group, Mr. Tom Guida, that electrical wiring installed within a fire-rated wall or ceiling does not have any impact on the integrity of the fire rating of the wall or ceiling (Enclosure 4 of the August 2000 Meeting Minutes Question #11 and Answer). As also noted in the minutes of this Task

Group, under Item 00-8-4C, "Review of UL Information", Chairman Trainer had a phone conversation with Mr. Walke of UL that confirmed Mr. Guida's answer on this issue.

This code comment follows-up on the vague and ambiguous wording of 518-4(b). The Panel did not answer our questions on the original intent of 518-4(b) which were:

1. Is the intent of this section to prohibit the use of wiring methods listed in 518-4(b) in buildings that are of "fire rated" construction type classifications such a 5A (One Hour Protected Wood Frame), 3A (Protected Ordinary), 2A/2B (Protected Noncombustible), or 1A/1B (Fire Resistive) under the Model Building Codes?
2. Is the intent of this section to allow the use of wiring methods listed in 518-4(b) in buildings that are of "non-fire rated" construction type classifications such as 5B (Unprotected Wood Frame), 3B (Unprotected Ordinary), or 2C (Unprotected Noncombustible)?
3. Is the intent of this section to allow the use of wiring methods listed in 518-4(b) in nonfire rated walls of buildings that are of "fire rated" construction type classifications such as 5A (One Hour Protected Wood Frame), 3A (Protected Ordinary), 2A/2B (Protected Noncombustible), or 1A/1B (Fire Resistive) under the Model Building Codes?
4. Is the intent of this section to prohibit the use of wiring methods listed in 518-4(b) in fire rated walls in buildings that are of "non-fire rated" construction type classifications such as 5B (Unprotected Wood Frame), 3B (Unprotected Ordinary), or 2C (Unprotected Noncombustible)?

Questions #1 and #2 relate to the wiring methods allowed or prohibited for a building, whereas questions #3 and #4 relate to wiring methods in individual walls in a building. By sprinklering a building, the building's wall ratings can be reduced from one hour down to "0" fire rating. Such sprinkler allowances are permitted in all types of building construction types, regardless of fire rated or non-fire rated building construction types.

We noted in my substantiation of our original code proposal that the Electrical Code Handbook's commentary on page 672 is even more confusing trying to explain this bizarre restriction where one side of a storage room can use one type of wiring, but the other side of the storage room adjoining the corridor cannot. If the Figure 518-2 on page 672 was in a sprinklered building of a fire rated construction type classification, all the double lined walls shown as fire rated walls would be permitted to be non-fire rated walls. Therefore, does the building's overall construction type classification govern the application of Section 518-4(a), or does the wiring method only depend on the fire rating of the building element assembly (wall, floor, column, etc.) the wires are located in?

If the application of Section 518-4(b) is intended to apply to non-fire rated types of construction, then I could have the "lesser fire resistant" wiring in non-fire rated walls, and the "better fire resistant" wiring in the fire rated walls. From a fire protection/life safety standpoint, would this be "backwards"? Therefore, the only logical application of Section 518-4(b) would be in buildings of non-fire rated type of construction.

In summary, if the Panel still insists on limiting the use of the wiring methods in Section 518-4(b), such limitation only makes sense when it is related to the construction classification of the building as a whole, not to fire rated building elements in an otherwise non-fire rated construction classification type of building. If the Panel agrees with this understanding of the intent and application of this section of the Code, the revised wording will accomplish this in a clear and unambiguous manner.

PANEL ACTION: Reject.

PANEL STATEMENT: The existing wording clearly identifies the intent of CMP-15. Some of the assertions on building classification and derating by using sprinklers are not accurate. Some building classifications that require sprinklers are not allowed to be derated because of the occupancy.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19

VOTE ON PANEL ACTION:

AFFIRMATIVE: 18

NOT RETURNED: 1 Kalbfeld

COMMENT ON AFFIRMATIVE:

HIRSCHLER: I am concerned that the panel did not seem to appreciate that there is a lack of clarity that was identified by the submitter. I agree with the panel action, but I feel that some change in wording is probably required, and would have hoped for some guidance in the panel statement.

VANNICE: See my Comment on Affirmative on Comment 15-37.

(Log #1837)

15- 39 - (518-4(b) and (c)): Reject

SUBMITTER: Patricia Horton, Elaine Thompson, Allied Tube & Conduit

COMMENT ON PROPOSAL NO: 15-16

RECOMMENDATION: Accept this proposal in part by deleting 518-4(b) as suggested by the proponent. Do not accept the other proposed changes.

SUBSTANTIATION: The proponent has raised sufficient questions to warrant deletion of this section until the next code cycle would permit development of text that responds to these questions. Many changes have occurred in the International Building Code that have not necessarily been correlated with the intent of Article 518. Fire ratings of assemblies have been lowered in exchange for sprinklers. Often these sprinkler systems are permitted to be other than a full NFPA 13 system, and would not require concealed spaces to have sprinklers. As clarified by the Code-Making Panel in Proposal 11-a, if the area or building is designed or intended to be occupied by 100 or more persons the safer wiring methods need to be employed. For buildings and structures that do not meet the 100 person criteria, Articles 336, 331, 333 and 347 will regulate the use of NM cable and ENT. It is also important to note that buildings are frequently built outside of the jurisdictional limits of a building code and only later annexed into the jurisdiction. The wiring method will already be in place. Electrical wiring can be a source of ignition and is primarily located in concealed spaces. The section proposed to be deleted could have a safety impact where the NEC is used and a Building Code is not. The Beverly Hills Supper Club is a perfect example of the hazard that could occur if hundreds of people were gathered in such a building with overhead spaces loaded with NM cable. This section is not needed. Comments to 7-145 by the 3-story Task Group, and comments by others, detail why N/M cable is not equivalent to currently permitted wiring methods. In the interest of space, readers of the ROC are referred to these comments. The comments and back-up documentation have been supplied to CMP 15. The Panel's attention is called particularly to the fire characteristics contained in the documentation, and the concern for fires originating in concealed spaces where NM cable can be a source of ignition with delayed detection.

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

PANEL ACTION: Reject.

PANEL STATEMENT: There is no justification for eliminating Section 518-4(b) which are acceptable wiring methods for this article. Proposal 15-16 remains rejected.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19

VOTE ON PANEL ACTION:

AFFIRMATIVE: 17

ABSTENTION: 1

NOT RETURNED: 1 Kalbfeld

EXPLANATION OF ABSTENTION:

BOYER: See my Explanation of Abstention on Comment 15-25.

(Log #178)

15- 40 - (518-4(c)): Accept

SUBMITTER: Technical Correlating Committee National Electrical Code

COMMENT ON PROPOSAL NO: 15-18

RECOMMENDATION: It was the action of the Technical Correlating Committee that further consideration be given to the comments expressed in the voting. This action will be considered by the panel as a public comment.

SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.

PANEL ACTION: Accept.

PANEL STATEMENT: Reject the proposal. The substantiation does not provide technical merit or data to expand the uses already permitted. Refer to the panel statement in Proposal 15-41.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19

VOTE ON PANEL ACTION:

AFFIRMATIVE: 15

NEGATIVE: 3

NOT RETURNED: 1 Kalbfeld

EXPLANATION OF NEGATIVE:

AMOS: I'm voting against the panel action on this proposal. The Technical Correlating Committee obviously recognized the validity of the negative comments and asked the panel to reconsider the action to reject proposal 15-18. The panel accepted the Technical Correlating Committee recommendation but failed to overturn their original rejection. The panel statement said in part, "the substantiation does not provide technical merit". However, the panel did not provide any substantiation of its own for not accepting the original proposal. There have been countless examples provided by Dr. Hirschler both in his negative comment and at the panel meeting, sighting a number of statistics showing the long history of its safe use. Nonmetallic tubing and rigid nonmetallic conduit is already allowed in a myriad of locations that meet the same criteria as the submitter suggests. There are no statistical reasons for not allowing this product and the panel, does not provide any technical data to support not expanding its use".

HIRSCHLER: I oppose the action by the panel. This comment should have referred to action on accept of comment 15-41. I will reproduce my own comments on proposal 15-18, which the Technical Correlating Committee demanded should be further considered (together with those by the other dissenters: Peter Amos and Michael Glenn).

Marcelo Hirschler comment on opposition to panel action on rejecting proposal 15-18: "No evidence exists of fire fatalities resulting from the use of electrical nonmetallic tubing (ENT) or rigid nonmetallic conduit (RNMC) protected by a wall with a 15 min finish rating. None of these wiring methods are new, they both have a long history of safe use: PVC conduits were introduced in the early 1960's and RNMC was first approved for use in the NEC in 1968, while ENT was first approved in the NEC in 1984.

Furthermore, the panel was already informed in previous cycles that (a) electrical cables installed within ENT can continue to function, when the ENT is installed in code-compliant fashion, even after a fire in the place of assembly has reached flashover; (b) ENT meets the physical property requirements of NEMA and UL for listing for this application, in terms of crushing resistance, impact resistance and tensile and (c) both ENT and RNMC have been safely used for 9 years in the Reedy Creek Improvement District {by now a longer period}. It has also been shown earlier that the use of nonmetallic raceways (electrical nonmetallic tubing (ENT) and rigid nonmetallic conduit (RNMC)) in the occupancies allowed by the code, with the protection required by the code, does not introduce any significant additional hazard to the occupants, or hinder escape in any way. In all the occupancies mentioned in the code there is extra protection, in terms of means of egress, already provided by the model building codes.

Moreover, the fire load (as represented by the combustible materials and products in the room) in places of assembly includes seating for the attendance (which is intended for 100 or more persons). Thus, it is likely that at least 5,000 pounds (100 times a 50 pound seat) of combustible material, of high flammability (since there are no mandatory requirements of fire performance of seating), is present in the assembly room. The fire resulting from ignition of this mass of combustibles vastly exceeds the potential contribution of a few pounds of non metallic conduit installed behind a half inch gypsum board wall.

The standard material used in ENT and in RNMC is unplasticized poly(vinyl chloride) (unplasticized PVC), which is of very low combustibility. In fact, unplasticized PVC will only burn when subjected to intense heat or flame and will cease burning as soon as the source of heat or flame is withdrawn from its vicinity. In terms of fire hazard, the key question is: "How big is the fire?" The answer is given by the maximum heat release rate. A burning object will spread a fire to nearby products only if it gives off enough heat to ignite them. Moreover, the heat has to be released fast enough not to be dissipated or lost while traveling through the cold air surrounding anything not on fire. The rate of heat release has been shown to be much more important than either ease of ignition, smoke toxicity or flame spread in controlling the time available for potential victims of a fire to escape. The maximum rate of heat released by unplasticized PVC when it burns is smaller than that of almost any nonmetallic material, and is indistinguishable from the heat released by the ignition source itself in many cases. The addition of PVC rigid nonmetallic conduit and electrical nonmetallic conduit in concealed spaces does not add any significant fire hazard to such spaces, due to the excellent fire performance of PVC and the good history of safe use of the product.

It is informative to compare the rate of heat release of unplasticized PVC (material used to make electrical nonmetallic tubing or rigid nonmetallic conduit) with that of the polyurethane foam typically used as the resilient material in an auditorium seat (when considering equal areas):

Product	Conduit PVC	Chair Polyurethane Foam
Incident Heat Flux: 20 kW/m^2		
Peak rate of heat release	50-100 kW/m^2	250-300 kW/m^2
Incident Heat Flux: 40 kW/m^2		
Peak rate of heat release	120-180 kW/m^2	700-750 kW/m^2
Weight of Products	0.1 - 0.2 pounds per foot of raceway	50-100 pounds per seat

This proposal should have been approved, or at least approved in part if the panel believes that there is a specific hazard associated with one or more of the additional uses proposed. The panel statement is inadequate: the panel should have justified why each individual additional occupancy recommended for permitted use of ENMT and RMC is inappropriate for such use. For example it is unclear what additional hazard is associated with university classrooms that is not inherent on other meeting rooms."

The proposal recommended adding a number of applications for use of nonmetallic raceways: club rooms, college classrooms, university classrooms, courtrooms, drinking establishments, mortuary chapels, museums, passenger stations, terminals of air, surface, underground and marine public transportation facilities, libraries and places of religious worship. The proposal had an extensive technical substantiation, and additional information was presented to the panel in this and earlier cycles. The panel rejected the proposal with the simple statement: "The substantiation does not provide technical merit or data to expand the uses already permitted." The panel statement for the Technical Correlating Committee comment says "the substantiation does not provide technical merit or data to expand the uses already permitted". However, in none of the cases does the panel address any of the individual occupancies for which the proposal is asking for an expanded use of nonmetallic raceway. If the panel was concerned, as stated during the discussion, about lack of fire safety in one or more of the occupancies suggested, it should have addressed the specific occupancy involved. If the panel was concerned, as also stated during the discussion, about the physical or mechanical integrity of the wiring methods, it should have stated that. Instead the panel exhibited, once more, either lack of understanding or lack of willingness to understand "new" technologies, even if they have long histories of safe use. See also my comments on comment 15-41.

JOHNSON: I agree with the reasoning expressed in the voting on the original proposal. An unprejudiced study of the material supplied, and there were dozens of pages of it, shows that all things considered the record shows no loss of life because electrical nonmetallic tubing (ENT) or rigid nonmetallic conduit (RNMC) was used. Failures occur because the insulation on wire inside the conduit fails, not because the conduit fails. Nonmetallic conduit does not burn or melt readily. Indeed, since it is an insulator of heat, the insulation inside the conduit may hold up longer in a fire and breakdown of the insulation between the conductor and conduit cannot cause a failure. No other testing is needed.

(Log #1601)

15- 41 - (518-4(c)): Reject

SUBMITTER: James K. Lathrop, Koffel Assoc., Inc.

COMMENT ON PROPOSAL NO: 15-18

RECOMMENDATION: Accept proposal as originally submitted.

SUBSTANTIATION: The panel has not provided adequate justification to reject the proposal. NFPA regulations mandate that any rejection must include a panel statement that address the issues provided in the submitter's original substantiation. The failure of the panel to do this makes it difficult to rebut the panel's reasons since no technical reasons for the rejection were provided.

As stated in the original proposal, there is no justification to prohibit the use of electrical nonmetallic tubing and rigid nonmetallic conduit in the additional uses lists. The NFPA 101, Life Safety Code that is charged with the protection of life against fire in buildings does not establish any different requirements amongst these types of assembly occupancies. In fact, the scope of the Technical Correlating Committee on Safety to Life establishes that Committee as the Committee to have primary responsibility for documents on the protection of human life from fire and other circumstances capable of producing similar consequences. The Technical Committee on Assembly Occupancies and Membrane Structures is established as the

Committee having primary responsibility for documents on protection of human life from fire and other circumstances capable of producing similar consequences in assembly occupancies. Due to the fact that the Life Safety Code does not have different requirements for the uses listed, the NEC should justify the differences based on electrical safety. It has not done so. Recognizing that the NEC is also usually used with a building code, it should be noted that the International Building Code (IBC) developed by all three model building code organizations in the United States breaks assembly occupancies into five groups, A-1 through A-5. Of those five groups the current list n 518-4(c) involves two, A-2 and A-3. Since the IBC does not establish different requirements within a use category and uses in both A-2 and A-3 are currently allowed by the NEC, it makes no sense not to allow the additional uses specified. Similarly, the new NFPA 5000 will use occupancies based on NFPA 101. It will make no sense for the NEC to be out of sync with both NFPA 5000 and NFPA 101 as well as the IBC.

None of the additional uses present any hazard to life due to electrical installations greater than those already on the list do. Not adding these to the list in 518-4(c) actually extends the prohibition without substantiation.

Without any historical or research data to validate their action, the panel has consistently rejected logical expansion of the list of uses where ENT and RNMC are permitted for assembly occupancies. ENT and RNMC are permitted wiring methods in high-rise buildings; residential occupancies, including board and care facilities; health care facilities; and detention and correctional occupancies. Clearly if they can be used in these occupancies, many of which are defend in place occupancies, fire, smoke, and toxicity is not an issue. In these occupancies the fire history has been improving over the last several years. Since the mid-1980's the fire history in these occupancies, where ENT and RNMC are permitted, has improved consistently with other occupancies. Graphs (copies provided) based on NFPA data reflecting fire history for fixed wiring fires in occupancies were ENT and RNMC have been permitted for several years and occupancies where it has not. "Libraries, Museums, and Court Room Buildings." "Passenger Terminals," and "Theaters and Studios" represent that group where ENT has not been permitted in rated construction. There is noting in this data that can be used to condemn the use of ENT or RNMC. In most of the cases the numbers are so low that even one fire often skews the data. It should be noted that the dollar loss data is not adjusted for inflation and therefore small increases are actually decreases if one compensates for inflation. There is nothing in this data that supports the prohibition of ENT or RNMC even in uses that are not addressed by the proposal this comment supports.

ENT and RNMC have been used for decades with and without the 15-minute finish rating. In today's very litigious society if there were any injuries or deaths or serious fires in which ENT played a role, the manufacturer would be quickly aware of it. Carlon is not aware of any such cases. There is no justification, by analysis, by data, by litigation or by case law for the prohibitions that the panel keeps insisting upon.

A review of previous panel substantiations for not permitting ENT or RNMC in similar applications has not revealed any technical rational for the prohibition. The rejection of Proposal 15-29 during the last code cycle was based on a substantiation that lacked any technical merit. Electrical wiring methods do not behave differently because they are in assembly occupancy. Most other occupancies can have many more than 100 people in them and ENT or RNMC is permitted. The Life Safety Code and the model building codes address the problems of people being unfamiliar with their surroundings, which is a key element in assembly occupancies. There is no valid reason to prohibit ENT or RNMC in the proposed listed uses.

We also bring the Panel's attention to the negative ballot comments by Mr. Amos, Mr. Glenn and Mr. Hirshler. We incorporate those comments by reference and therefore request the panel address the technical points presented in these ballot comments.

Note: Supporting material available for review upon request at NFPA headquarters.

PANEL ACTION: Reject.

PANEL STATEMENT: The technical merits have not been shown to be equal to or greater than the existing wiring methods. The statistics and lack of supporting source data for the graphs provided did not provide a compelling reason to change the original panel action on the proposal. Specifically, there are no percentages shown as to the ratios of plastic wiring methods versus metallic wiring methods. In addition, no statistics were provided for current wiring methods in places of assembly. Refer to the panel statement of Proposal 15-11.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19

VOTE ON PANEL ACTION:

AFFIRMATIVE: 14
NEGATIVE: 3
ABSTENTION: 1
NOT RETURNED: 1 Kalbfeld

EXPLANATION OF NEGATIVE:

GLENN: I am voting against the panel action to reject the original Proposal 15-18 as well as Comment 15-41. As stated in my comment against the panel action to reject 15-18 Log #3228 during the ROP stage, the panel's original statement that the substantiation does not provide technical merit or data to expand the use of ENT and RNMC to these other venues does not follow good reason. The submitter's original substantiation of the NFPA Annual Fire Loss Report showed that in the locations where ENT and RNMC are now used that there has been a decrease not an increase in fires. For the applications of this article, these materials would require a covering of 2 inches of concrete or location behind a fire rated wall. Furthermore, ENT and RNMC are listed for these types of applications. During the comment stage, the submitter supplied 27 pages of graphs documenting the statistics of the number of fires and injuries supporting the successful record of ENT and RNMC from 1980 through 1997. The submitter has more than substantiated and documented that this material is as good as the cable now allowed. The panel statement "the technical merits have not been shown to be equal to or greater than the existing wiring methods." is incorrect. All of the substantiation more than documented that this material is equal to MI cable. It appears to me that the panel keeps thinking that everything has to be equal to rigid conduit and this is not the case. If this material is not allowed, then some of the materials now permitted should be eliminated as well. I see no good reason for rejecting neither the original proposal nor the supporting documentation submitted during the comment cycle.

HIRSCHLER: I oppose the action by the panel. This comment should have been accepted.

The panel statement incredibly says that the statistics and lack of supporting source for the graphs "did not provide a compelling reason to change the original action". For the information of the readers: the submitter presented 28 graphs "based on NFPA data" (as stated in the substantiation, meaning that they were generated by the NFPA department of statistics). The graphs presented data on fire losses caused by fixed wiring fires. The information addressed number of fires, number of fire deaths, number of fire injuries, and amount of dollar losses in seven types of occupancies: office buildings, hotels and motels, apartments, theaters and studios, passenger terminals, eating and drinking establishments, and libraries, museums, and court room buildings. In each case, data was presented for "protected construction" and for "unprotected construction".

The following Table shows just the fire death data, but 4 such tables could have been constructed with the data provided. The data clearly indicates that fire losses caused by ignition of fixed wiring are minimal, and that there is no statistical significant difference between the various occupancies, some of which permit the use of nonmetallic raceways and some of which do not.

INSERT TABLE HERE Landscaped Table of Fire Fatality Fire Data from NFPA **See Table on following page.**

Table of Fire Fatality Data from NFPA Caused by Fixed Wiring Fires in Various Occupancies

Year	Fixed Wiring Fires # Fire Deaths Protected Construct-ion Office Buildings.	Fixed Wiring Fires # Fire Deaths Unprotected Construction Office Buildings.	Fixed Wiring Fires # Fire Deaths Protected Construct-ion Hotels and Motels.	Fixed Wiring Fires # Fire Deaths Unprotected Construction Hotels and Motels.	Fixed Wiring Fires # Fire Deaths Protected Construct-ion Apartments	Fixed Wiring Fires # Fire Deaths Unprotected Construction Apartments	Fixed Wiring Fires # Fire Deaths Protected Construct-ion Theaters and Studios	Fixed Wiring Fires # Fire Deaths Unprotected Construction Theaters and Studios.	Fixed Wiring Fires # Fire Deaths Protected Construct-ion Passenger Terminals	Fixed Wiring Fires # Fire Deaths Unprotecte d Constructio n Passenger Terminals.	Fixed Wiring Fires # Fire Deaths Protected Construct-ion Eating and Drinking Establish-ments	Fixed Wiring Fires # Fire Deaths Unprotected Construction Eating and Drinking Establish-ments	Fixed Wiring Fires # Fire Deaths Protected Construct-ion Libraries, Museums and Court Room Buildings..	Fixed Wiring Fires # Fire Deaths Unprotected Construction Libraries, Museums and Court Room Buildings
1980	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1981	0	0	0	0	12	24	0	0	0	0	0	4	0	0
1982	0	0	0	0	0	23	0	0	0	0	0	0	0	0
1983	0	0	0	0	8	8	0	0	0	0	0	0	0	0
1984	0	0	0	0	7	0	0	0	0	0	0	0	0	0
1985	0	0	0	0	8	27	0	0	0	0	0	0	0	0
1986	0	0	0	0	3	10	0	0	0	0	0	0	0	0
1987	0	0	0	0	0	13	0	0	0	0	0	0	0	2
1988	0	0	0	0	13	9	0	0	0	0	0	0	0	0
1989	0	0	0	0	7	9	0	0	0	0	0	0	0	0
1990	0	0	0	0	9	11	0	0	0	0	0	0	0	0
1991	0	0	0	0	0	3	0	0	0	0	0	0	0	0
1992	0	0	0	0	0	6	0	0	0	0	0	0	0	0
1993	0	0	0	0	3	0	0	0	0	0	0	0	0	0
1994	0	0	0	0	4	8	0	0	0	0	1	0	0	0
1995	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1996	0	0	0	0	3	4	0	0	0	0	0	0	0	0
1997	0	0	0	0	9	0	0	0	0	0	0	0	0	0

The panel statement also, again incredibly, states that "no statistics were provided for current wiring methods in places of assembly" when clearly theaters and studios, passenger terminals, eating and drinking establishments, and libraries, museums, and court room buildings are all places of assembly, according to Article 518.

Once more, the panel refused to address any of the individual occupancies requested. See also my comments on comment 15-40.

JOHNSON: See my Explanation of Negative Vote on Comment 15-40.

COMMENT ON AFFIRMATIVE:

KLEIN: 1. There are numerous problems with the Commentor's substantiation that are not addressed by the Panel statement, some of which were discussed during the Panel's deliberations, some of which were not.

2. In one part of the commentor's substantiation, he states that: "...ENT and RNMC are permitted wiring methods in...health care facilities;...". This is not an accurate statement, and in fact is misleading. Such methods are permitted in some areas of health care facilities, such as corridors and offices. But in Patient Care Areas, which is just about everywhere else, metal conduit or raceways are required, and a separate (isolated) ground is also required (517-13). Exceptions are allowed, but do not include allowing ENT or RNMC.

3. Part of the substantiation refers to a set of graphs. These graphs "based on NFPA data reflecting fire history for fixed wiring fires" are unclear in several ways. First, there was no backup material provided for the data. None of it can be correlated to the data in the NFPA "Fire Loss in the U.S. 1999" report or associated with any of the other reports available through NFPA's Web Site (except possibly a customized report which we have not been presented). The graphs titled: "Fixed Wiring Fires" are unclear as to the source of ignition. Is the title as stated because the fire started in the wiring or because the fire involved the fixed wiring?

4. The graphs refer to "Unprotected Construction" and "Protected Construction" but does not define these terms. In view of the topic (518-4) being addressed, these terms probably refer to fire rated or non-fire rated construction. However, if this is not the case, we have another area where the data presented may not be pertinent, or properly address the situation. Also, the graphs are presented on different scales, so a quick review may be misleading. Are we dealing with absolute numbers , or "per capita" data.

5. Examining the graphs, it appears the commentor's argument fails for expanded use of ENT or RNMC as it is clear that theaters and studios, where only metal conduit is allowed, fare much better than other spaces, in particular with respect to injury or death. How can such an examination support the use of non-metallic conduit in theaters and studios, as there can be no data to support the case? Examining the graphs on the basis of fire rated or non-fire rated construction does appear to show that fire rated construction is actually more prone to fire in most cases, which is somewhat counter-intuitive. Also, if construction type is the criteria, how do we know what portion of the occupancies where both types of conduit are allowed is metal conduit or nonmetallic conduit? There are at least four variables, but only two are presented.

6. What also isn't reported is the cause of death or injury. Is the cause fire related or due to electrical shock? Did a person die because they were shocked, but couldn't get out and ultimately succumbed to fire and smoke? Part of the Code's purpose is the "practical safeguarding of persons and property from hazards arising from the use of electricity." One of these hazards is electrical shock. Fire and toxicity are also hazards, which the panel cannot ignore. The commentor would have us only address electrical shock (but does not address this himself) and does not worry about these other issues.

7. The commentor (and other proponents) most often address the issue of toxicity with respect to nonmetallic conduit. One often stated example is that the toxicity of such materials should not be an issue because the content of theater seats is much more toxic than nonmetallic conduit. However, it is unlikely that an electrical fire will start in a seat, but it can start in the conduit. What they have failed to address is the shock hazard. The data presented in the proposal phase of this cycle and the comment phase of the previous cycle tried to show that the mechanical strength of certain nonmetallic conduits is greater than metal conduit. Failure of the conduits was identified by a short in the wiring. However, the wiring method used in the nonmetallic conduit - twisting the conductors to ensure the grounding conductor is involved and a short occurs with a failure - does not reflect a real world installation. So, in the cases, where a nonmetallic conduit does fail even at a higher level of mechanical damage than the corresponding metal conduit, there is a very low probability that there will be a short to the grounding conductor which in turn would activate the overcurrent protection and thus eliminate the shock hazard and the risk of ignition within the nonmetallic conduit. With metal conduit, there is a very high probability that a fault will result in a short to ground and overcurrent protection activation.

8. A real world example: An exhibit in a lobby of a theater or convention center with large objects hung on a wall for display. A nail gun or a toggle bolt is used, the stud is missed, and the conduit and a hot conductor are penetrated. In the case of metal conduit, the hot conductor is shorted to ground via the nail or toggle bolt and the metal conduit. For nonmetallic conduit, unless the grounding conductor is also penetrated, the nail or toggle bolt is electrically hot, presenting a shock hazard outside the wall (no matter its rating). Depending on the involvement of other conductors, a "roasting short" could be initiated which could lead to fire.

KRAMER: In proposal 15-18 it was claimed "there is no justification to prohibit the use of electrical nonmetallic tubing and rigid nonmetallic conduit in the additional uses lists." It is also repeated in this comment. Currently, club rooms, college and university classrooms, courtrooms, drinking establishments, mortuary chapels, museums, passenger stations and terminals of air, surface, underground, and marine public transportation facilities and libraries are not part of 518-4(c) and as such, justification is not needed to leave the code unchanged.

Part of the substantiation refers to the use of RNMC and ENT in health care facilities, but in some uses, metallic raceway or type MI are exclusively required.

The fact that ENT and RNMC are allowed in health care, detention and correction facilities, which are 'defend in place' occupancies, is not germane to places of assemblies, many of which have large transient populations who are not familiar with the lay-out of the facility. The ratio of staff (guard, nurse, waiter) to client (inmate, patient, customer) is also much higher in the non-places of assembly.

There are also some unique characteristics in some of the proposed additional occupancies. Some of them may be quite large with electrical panels located several hundred feet apart. In these instances, conduit runs of over 100 feet could be installed. As the distance to the panel with the circuit protective device in it increases, the impedance of a circuit in a fault condition becomes critical. It has been shown (A. P. S. Meliopoulos, et al., Performance Evaluation of Steel-Conduit-Enclosed Power Systems, IEEE trans. Ind. Applicat., Vol. 35, No. 3, May/June 1999, pp 515-523) that in a metallic conduit system (due to the saturation of the steel conduit), the length of the circuit can be longer and still allow operation of the protective devices than an installation using a nonmetallic conduit with the same sized wires.

LANNI: Article 518 NEC exists because of the history of large losses of life in places of assembly. This is due to panic and mob-like reactions of people in crowded spaces. Since its inception the NEC committees over the years have chosen metal raceways in order to provide maximum integrity to the permanent wiring systems of Article 518. As metal raceways have been the standard, newer methods have been compared to them in an effort not to diminish safety in any way. When comparing plastic raceways to metal raceways (as they relate to mechanical strength, flammability, toxicity, smoke production, and other performance issues), it has been observed that the metal raceways are superior. Consideration has always been given to the overall characteristics of the raceways instead of one particular aspect or property. Anyone who has burned or cut PVC conduit knows how it smells and smokes or how easily it shears.

Although the plastic raceways are relatively safe, it is impossible to judge what exact level of safety is allowable in the sensitive area of places of assembly. NFPA relies on the broad experience of its committees and the professional organizations that they represent to judge the merits of the proposed changes to the code. The committee has been cautious and has decided on the side of safety. The result has been the consistent rejection of PVC plastic as a safe as, or safer method of raceway.

PVC performs well in corrosive atmospheres and will outperform metal raceways in that specific application.

VANNICE: See my Comment on Affirmative on Comment 15-24.

It is important to know what information has been left out as it is to know what information is included. Since the information presented is in support of a specific change in the Code, it does not contain a balanced analysis of both sides of the issue. I asked for details as to how the presented information was collected and received no viable answer. I have since reviewed the "1999 US Fire Loss" in the Sept./Oct. 2000 NFPA Journal including the statement at the end "Where we get our information". Knowing that the presented information was extracted directly from such articles in the manner described would have been more compelling. The actual source of the data should have been provided so that conditions and assumptions could be evaluated.

The supporting documentation indicates deaths and injuries due to fires. It does not indicate deaths and injuries due to non-fire electrical causes.

In one part of the commentor's substantiation he states that :

"...ENT and RNMC are permitted wiring methods in...health care facilities;...". This is not an accurate statement, and in fact is misleading. Such methods are permitted in some areas of health care facilities, such as corridors and offices. But in Patient Care Areas, which is just about everywhere else, metal raceways are required, and a separate (isolated) ground is also required (517-13). Exceptions are allowed, but do not include allowing ENT or RNMC. Generalizations tend to cover up important details.
EXPLANATION OF ABSTENTION:
BOYER: See my Explanation of Abstention on Comment 15-25.

(Log #1602)

15- 42 - (518-4(c)): Reject
SUBMITTER: James K. Lathrop, Koffel Assoc., Inc.
COMMENT ON PROPOSAL NO: 15-18
RECOMMENDATION: Revise 518-4(c) to read as follows:
(c) Spaces with Finish Rating. Electrical nonmetallic tubing and rigid nonmetallic conduit shall ~~be permitted to~~ not be installed in armories, exhibition halls, and gymnasiums, ~~conference and meeting rooms in hotels or motels, dining facilities, restaurants, and church chapels,~~. In other locations, it shall be permitted where
(1) The electrical nonmetallic tubing or rigid nonmetallic conduit is installed concealed within walls, floors, and ceilings where the walls, floors, and ceilings provide a thermal barrier of material that has at least a 15-minute finish rating as identified in listings of fire-rated assemblies.
(2) The electrical nonmetallic tubing or rigid nonmetallic conduit is installed above suspended ceilings where the suspended ceilings provide a thermal barrier of material that has at least a 15-minute finish rating as identified in listings of fire-rated assemblies.
Electrical nonmetallic tubing and rigid nonmetallic conduit are not recognized for use in other space used for environmental air in accordance with Section 300-22(c).
FPN: A finish rating is established for assemblies containing combustible (wood) supports. The finish rating is defined as the time at which wood stud or wood joist reaches an average temperature rise of 121°C (250°F) or an individual temperature rise of 163°C (325°F) as measured on the plane of the wood nearest the fire. A finish rating is not intended to represent a rating for a membrane ceiling.
SUBSTANTIATION: The panel continues to not provide adequate justification for the restrictions on ENT and RNMC in Article 518 above and beyond the general restrictions of the NEC. At the Panel ROP meeting it was suggested that the list should include where ENT and RNMC should not be used rather than where it can be used. The purpose of this comment is to incorporate that suggestion. Since the panel has been unable to develop a technical substantiation for the reason for the existing restrictions, we have included in the list those areas mentioned in the past as areas where the product could be exposed to physical damage. Although we may not concur with the restrictions, we believe the proposed list to be an attempt to reflect those areas mentioned at the ROP meeting and in prior discussions.
With this comment we include the supporting statement and data in our comment to 518-4(c) including the substantiation's for the negative ballot and request that the panel address the technical issues.
PANEL ACTION: Reject.
PANEL STATEMENT: There has been no substantiation or documentation shown to expand the use of ENT and RNMC into the additional occupancies. Based on physical considerations, armories, exhibition halls and gymnasiums are not the only venues that are inappropriate for these wiring methods.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15
NEGATIVE: 2
ABSTENTION: 1
NOT RETURNED: 1 Kalbfeld
EXPLANATION OF NEGATIVE:
GLENN: See my explanation of negative vote on Comment 15-41.
HIRSCHLER: I oppose the action by the panel. This comment should have been accepted. See also my comments on 15-40 and 15-41.
COMMENT ON AFFIRMATIVE:
KLEIN: See my Comment on Affirmative on Comment 15-41.
VANNICE: See my Comment on Affirmative on Comment 15-24.
Museums, places of religious worship which are often modified to do religious pageants and presentations, and drinking establishments that contain such performance areas as dance floors should be afforded additional protection.
EXPLANATION OF ABSTENTION:
BOYER: See my Explanation of Abstention on Comment 15-25.

(Log #1839)

15- 43 - (518-4(c)): Accept
SUBMITTER: Patricia Horton, Elaine Thompson, Allied Tube & Conduit
COMMENT ON PROPOSAL NO: 15-18
RECOMMENDATION: Continue to reject this proposal.
SUBSTANTIATION: Acceptance of this proposal will be in conflict with the clarification the Panel has provided in Proposals 15-11 and 15-11a. If the building, or portion of the building, will not be occupied by 100 or more persons, Article 518 will not apply and installation practices will be governed by Article 331. This correlates with the referenced proposals. It is too late this cycle, but this section needs to be removed entirely in the next NEC cycle. Documentation on ENT has been provided to the Panel. Readers of the ROC are referred to comment on Proposal 8-65 for further information.
Note: Supporting material available for review upon request at NFPA headquarters.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15
NEGATIVE: 2
ABSTENTION: 1
NOT RETURNED: 1 Kalbfeld
EXPLANATION OF NEGATIVE:
GLENN: I am voting against the panel action to accept this proposal See my explanation of negative vote on Comment 15-41.
HIRSCHLER: I oppose the action by the panel. This comment should have been rejected and referred to accepted comment 15-41. See also my comments on 15-40 and 15-41.
COMMENT ON AFFIRMATIVE:
KOVAVIK: Although I am voting to support the panel action, I do not agree with the submitter's comment in the substantiation that this section needs to be removed entirely from the NEC.
EXPLANATION OF ABSTENTION:
BOYER: See my Explanation of Abstention on Comment 15-25.

(Log #1681)

15- 44 - (518-6 (New)): Reject
SUBMITTER: Gersil N. Kay, Conservation Lighting International Ltd.
COMMENT ON PROPOSAL NO: N/A
RECOMMENDATION: All emergency lighting in public places of assembly, including retail establishments, museums, offices, hospitality, high rise residences, schools and factories should be placed at the baseboard where it can be seen in smoke-filled interiors.
SUBSTANTIATION: In 1996, I sent two additions to the National Electric Code. At that time they were not included. They are more important now than ever.
PANEL ACTION: Reject.
PANEL STATEMENT: The proposed new text has not had a chance for public review and comment.
The proposed concept of emergency lighting location is not within the scope of the National Electrical Code.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19
VOTE ON PANEL ACTION:
AFFIRMATIVE: 18
NOT RETURNED: 1 Kalbfeld

ARTICLE 520 — THEATERS, AUDIENCE AREAS OF MOTION PICTURE AND TELEVISION STUDIOS, AND SIMILAR LOCATIONS

(Log #537)

15- 45 - (520 Title): Reject
SUBMITTER: Paul Petit, American Insulated Wire Corp.
COMMENT ON PROPOSAL NO: 15-20
RECOMMENDATION: "Performance Areas" should be deleted from the proposed text.
SUBSTANTIATION: Performance Areas mentioned in the proposal are normally outdoor performance areas which should be correctly covered by Article 525, which requires that the flexible cords and cables, when used outdoors, shall be listed for wet locations. Article 520 allows cables to be used outdoors, but does not mandate that they be listed for wet locations, (which it should). In that sense, Article 520 is not more stringent than Article 525. Unless this proposal is changed to mandate "wet locations cables", when these performance

areas (or other) are located outdoors, this proposal should correctly be rejected.
PANEL ACTION: Reject.
PANEL STATEMENT: The new verbiage is appropriate for the title.
Several proposals were made and accepted making it clear that theatrical type venues were managed and operated and used equipment differently than carnival type venues. This delineation affects much more equipment than just the cable . Article 400 already requires cable suitable for use and location. In Article 520 venues there are uses of cable "outdoors" which are not subject to sunlight and standing water. In Article 525 venues the cables are frequently subject to standing water, and are used day after day.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17
NEGATIVE: 1
NOT RETURNED: 1 Kalbfeld
EXPLANATION OF NEGATIVE:
HIRSCHLER: I oppose the action by the panel. This comment should have been accepted in principle, with the following action, namely adding to 520-5 (a) a statement that "when used outdoors, flexible cords and cables shall also be listed for wet locations and be sunlight resistant". This is an example of a case where the panel chose not to consider safety issues. Clearly, when performances are held outdoors, inclement weather is a distinct possibility, and cables should be required to be suitable for use in wet locations or under intense sunlight.
COMMENT ON AFFIRMATIVE:
KLEIN: Performance areas are not normally outdoors. Article 400-3 requires all flexible cords and cables to be suitable for the conditions of use.

(Log #536)

15- 46 - (520-1): Reject
SUBMITTER: Paul Petit, American Insulated Wire Corp.
COMMENT ON PROPOSAL NO: 15-21
RECOMMENDATION: Proposed new wording "indoor or outdoor" should read "indoor" only. "or outdoor" should be deleted from the text.
SUBSTANTIATION: Article 520 allows for cables to be used outdoors but does not mandate that they be listed for wet locations. All cables used outdoors are subjected to wet locations, and should be covered under Article 525, which has such a provision. Until Article 520 mandates a wet location requirement for outdoor used cords, the "outdoor" reference should remain deleted from the text.
PANEL ACTION: Reject.
PANEL STATEMENT: Article 520 venues that are wet locations or that are subject to sunlight are already required to use wet location and sunlight resistant cable by Sections 400-3 and 110-11.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17
NEGATIVE: 1
NOT RETURNED: 1 Kalbfeld
EXPLANATION OF NEGATIVE:
HIRSCHLER: I oppose the action by the panel. This comment should have been accepted in principle, with the recommendation I made in my comment on 15-45.

(Log #533)

15- 47 - (520-2): Reject
SUBMITTER: Paul Petit, American Insulated Wire Corp.
COMMENT ON PROPOSAL NO: 15-22
RECOMMENDATION: Proposed new wording "indoors or outdoors" in the performance area definition should read "indoor" only
"or outdoors" should be deleted from the text.
SUBSTANTIATION: Article 520 allows for cables to be used outdoors but does not mandate that they be listed for wet locations. All cables used outdoors are subjected to wet locations, and should be covered under Article 525, which has such a provision. Until Article 520 mandates a wet location requirement for outdoor used cords, the "outdoors" reference should remain deleted from the text.
PANEL ACTION: Reject.
PANEL STATEMENT: Article 520 venues that are wet locations or that are subject to sunlight are already required to use wet location and sunlight resistant cable by Sections 400-3 and 110-11.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17
NEGATIVE: 1
NOT RETURNED: 1 Kalbfeld
EXPLANATION OF NEGATIVE:
HIRSCHLER: I oppose the action by the panel. This comment should have been accepted in principle, with the recommendation I made in my comment on 15-45.

(Log #1828)

15- 48 - (520-5(a) & (c)): Reject
SUBMITTER: Marshall A. Klein, Marshall A. Klein & Assoc., Inc.
COMMENT ON PROPOSAL NO: 15-34
RECOMMENDATION: Revise text as follows:
~~522~~ 520-5 Wiring Methods
(a) & (b) (No changes)
(c) Nonrated Types of Construction. Nonmetallic-sheathed cable, Type AC cable, electrical nonmetallic tubing, and rigid non-metallic conduit shall be permitted to be installed in those buildings or portions thereof that are not required to be of a fire-rated type of construction classification by the applicable building code.
FPN: Types of nonfire-rated construction classifications are described in buildings codes.
SUBSTANTIATION: (Please note that this the identical issue covered under ROP Code Proposal 15-17-(518-4(b) and (c)) (Log #4098).
Based on the Panel Statement on our original code proposal, we have submitted two separate comments to address our concern on how this Section of Code reads in the existing Code vs. how this restriction is unwarranted for NM Cable.
As additional information for this Panel to consider when reviewing this comment, the NEC NM Task Group at its August 27-30, 200o, meeting confirmed with UL's representative on the Task Group, Mr. Tom Guida, that electrical wiring installed within a fire-rated wall or ceiling does not have any impact on the integrity of the fire rating of the wall or ceiling (Enclosure 4 of the August 2000 Meeting Minutes Question #11 and Answer). As also noted in the minutes of this Task Group, under Item 00-8-4C, "Review of UL Information", Chairman Trainer had a phone conversation with Mr. Walke of UL that confirmed Mr. Guida's answer on this issue.
This code comment follows-up on the vague and ambiguous wording of 520-5(c). The Panel did not answer our questions on the original intent of 520-5(c) which were:
1. Is the intent of this section to prohibit the use of wiring methods listed in 520-5(c) in buildings that are of "fire rated" construction type classifications such as 5A (One Hour Protected Wood Frame), 3A (Protected Ordinary), 2A/2B (Protected Noncombustible), or 1A/1B (Fire Resistive) under the Model Building Codes?
2. Is the intent of this section to allow the use of wiring methods listed in 520-5(c) in buildings that are of "non-fire rated" construction type classifications such as 5B (Unprotected Wood Frame), 3B (Unprotected Ordinary), or 2C (Unprotected Noncombustible)?
3. Is the intent of this section to allow the use of wiring methods listed in 520-5(c) in nonfire rated walls of buildings that are of "fire rated" construction type classifications such as 5A (One Hour Protected Wood Frame), 3A (Protected Ordinary), 2A/2B (Protected Noncombustible), or 1A/1B (Fire Resistive) under the Model Building Codes?
4. Is the intent of this section to prohibit the use of wiring methods listed in 520-5(c) in fire rated walls in buildings that are of "non-fire rated" construction type classifications such as 5B (Unprotected Wood Frame), 3B (Unprotected Ordinary), or 2C (Unprotected Noncombustible)?
Questions #1 and #2 relate to the wiring methods allowed or prohibited for a building, whereas questions #3 and #4 relate to wiring methods in individual walls in a building. By sprinklering a building, the building's wall ratings can be reduced from one hour down to "0" fire rating. Such sprinkler allowances are permitted in all types of building construction types, regardless of fire rated or non-fire rated building construction types.
We noted in my substantiation of our original code proposal that the Electrical Code Handbook's commentary on page 672 is even more confusing trying to explain this bizarre restriction where one side of a storage room can use one type of wiring, but the other side of the storage room adjoining the corridor cannot. If the Figure 518-2 on page 672 was in a sprinklered building of a fire rated construction type classification, all the double lined walls shown as fire rated walls would be permitted to be non-fire rated walls. Therefore, does the building's overall construction type classification govern the

application of Section 520-5(c), or does the wiring method only depend on the fire rating of the building element assembly (wall, floor, column, etc.) the wires are located in?

If the application of Section 520-5(c) is intended to apply to non-fire rated types of construction, then I could have the "lesser fire resistant" wiring in non-fire rated walls, and the "better fire resistant" wiring in the fire rated walls. From a fire protection/life safety standpoint, would this be "backwards"? Therefore, the only logical application of Section 520-5(c) would be in buildings of non-fire rated type of construction.

In summary, if the Panel still insists on limiting the use of the wiring methods in Section 520-5(c), such limitation only makes sense when it is related to the construction classification of the building as a whole, not to fire rated building elements in an otherwise non-fire rated construction classification type of building. If the Panel agrees with this understanding of the intent and application of this section of the Code, the revised wording will accomplish this in a clear and unambiguous manner.

PANEL ACTION: Reject.

PANEL STATEMENT: Refer to panel action and statement on Comment 15-38.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19

VOTE ON PANEL ACTION:

AFFIRMATIVE: 18

NOT RETURNED: 1 Kalbfeld

COMMENT ON AFFIRMATIVE:

HIRSCHLER: See my Comment on Affirmative on comment 15-38.

VANNICE: See my Comment on Affirmative on Comment 15-38.

(Log #1829)

15- 49 - (520-5(a) & (c)): Reject

SUBMITTER: Marshall A. Klein, Marshall A. Klein & Assoc., Inc.

COMMENT ON PROPOSAL NO: 15-34

RECOMMENDATION: Accept the original proposal.

SUBSTANTIATION: (Please not that this is the identical issue covered under ROP Code Proposal 15-17-(518-4(b) and (c)) (Log #4098).

We would like to address the Panel's Statements for rejection. (Panel's Statements are italicized, our responses are not).

Panel Statement on this Proposal - 15-34 was: *Refer to panel action and statement on Proposal 15-17."* Panel Statement on Proposal 15-17: *The fire hazard assessment presented does not address a realistic heat input into the NM cable.""*

Our comments: The Sullivan Report, on page 9, Section 1.4.2 noted that the heat input for the Cone Calorimeter Test for both ENT and the NM Cable was $5kW/m^2$. The original "Fire Hazard Analysis; The Use of ENMT" that was submitted with the 1987 NEC TCR Code Proposal 8-49 (including the 1987 NEC TCD 8-32 and 8-32A) to remove the three story limit for ENMT used the same heat input of $5kW/m^2$. This was noted on the original submitted report on Part B, Section 1.0 first paragraph. Both these reports were submitted to Panel 15 as part of the substantiation for this Code Proposal. Why would this heat input be adequate for ENT's approval, but NOT for NM Cable? Seems like a double standard? The heat input from both reports was used only to determine when ENT and NM Cable start to decompose (which is at 347°F). This information was input into the fire model so the fire model knew when to terminate its evaluation of the performance of the wiring methods within the ceiling and wall spaces. When the fire model reached the decomposition temperature of the PVC material (ENT and NM Cable), the fire modeling could terminate. In fact, the Sullivan Fire Modeling actually used a much lower termination temperature to provide very conservative results (error on the side of safety). Instead of using 347°F, Sullivan used the maximum electrical rating of the conductors, 194°F, as the termination point for the fire modeling. Sullivan had a safety factor of 153°F under the actual decomposition temperature of the ENT and NM Cable. Therefore, this part of the Panel's Statement is irrelevant to the acceptance of this code proposal.

"*NM cable is made of plasticized PVC and not rigid PVC, it is not required to be highly fire retarded and would ignite under conditions of fairly low heat input generating a significant amount of heat and potentially spreading the flame beyond the area of origin. Electrical nonmetallic tubing and rigid nonmetallic conduit are made of rigid PVC, which will not ignite unless an intense heat source is applied and continues to be imposed on the raceway and that is why they are permitted in this section.""*

Our comments: The Code Calorimeter Tests show the plasticized PVC as well as rigid PVC will decompose at the same temperature, which is logical, since they are both plastics. Electrical wiring methods in concealed spaces, based on NFPA Fire Data submitted to Panel 7, are not a major source of flame spread in properly firestopped and draftstopped spaces. Both the NEC and the Model Building Codes provide stringent firestopping/draftstopping requirements to be followed for installing electrical wiring through walls and floor spaces. The 15 minute finish rating was imposed on ENT back in 1985 addressing the concern for fires outside the concealed spaces that cover the wiring system, not for the concern with a fire within the concealed space. Such a fire within the concealed space is a very rare occurrence based on actual fire data.

"*Support documentation addresses flammability and toxicity issues as they relate to survivability. However, another issue is protection of the conductors so they don't become the source of ignition."*

Our comments: Nonmetallic-sheathed cable does not present an ignition source problem. It has been well documented in recent years that nonmetallic-sheathed cable does not present an ignition source problem. NFPA 921, "Guide for Fire and Explosion Investigation" makes it clear that electrical conductors, including nonmetallic-sheathed cable, are not common sources of ignition. Fire data supports this conclusion. See NFPA 921-98, Sections 14-11.4, 14-11.5, A-14-11.4, and Appendix B on referenced publications.

"*Section 336-6(b) doesn't allow for this - it states "The cable shall be protected from physical damage where necessary..." - this proposal would negate that requirement. The thermal barrier required for ENT and RNMC does not necessarily provide this physical protection.""*

Our comments: Section 336-6 "Exposed Work", provides the requirements for the use of NM Cable when used outside of walls and ceilings. That's why it is entitled "Exposed "Work". This code proposal would not negate Section 336-6(b). Section 336-6(b) was never intended to be applicable, and has never been applied, to NM Cable installed inside concealed spaces. If this code proposal is accepted, all the other installation requirements under Article 336, Part B, "Installation" would still be applicable to NM Cable installed under this code proposal.

In summation, the Panel's Statement contains comments of questionable technical merit when compared to the technical substantiation provided with the original code proposal. We would hope the Panel revisits this issue and accepts this code proposal based on its technical merits.

PANEL ACTION: Reject.

PANEL STATEMENT: Refer to panel action and statement on Comment 15-37.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19

VOTE ON PANEL ACTION:

AFFIRMATIVE: 18

NOT RETURNED: 1 Kalbfeld

COMMENT ON AFFIRMATIVE:

KLEIN: See my Comment on Affirmative on Comment 15-37.

VANNICE: See my Comment on Affirmative on Comment 15-37.

(Log #2095)

15- 50 - (520-5(a)(2)): Accept

SUBMITTER: George W. Flach, Nat'l Armored Cable Mfrs' Assn. (NACMA)

COMMENT ON PROPOSAL NO: 15-24

RECOMMENDATION: Continue to accept the proposal.

SUBSTANTIATION: Dr. Hirschler's "explanation of negative" comment for this proposal requested substantiation concerning the physical integrity and fire safety characteristics of Type AC as compared to the currently permitted Type MC cable.

The physical integrity of Type AC cable is equal to that of MC cable. The thickness of the outer metallic sheath of Type AC cable required by Underwriters Laboratories is 25 mils. The thickness of the outer metallic sheath of Type MC cable is permitted to be less than 25 mils.

Both AC cable and MC cable comply with the UL 1685 Vertical Tray and Smoke Release requirements and in accordance with their respective UL standards may be marked for use in cable trays and may be marked "-LS" signifying "Limited Smoke".

The physical integrity and fire safety characteristics of Type AC are equal to the currently permitted Type MC cable.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19

VOTE ON PANEL ACTION:

AFFIRMATIVE: 16

NEGATIVE: 1

ABSTENTION: 1

NOT RETURNED: 1 Kalbfeld

EXPLANATION OF NEGATIVE:

HIRSCHLER: I oppose the action by the panel. This comment should have been rejected. As I have stated in my comment on the accepted proposal (which the Technical Correlating Committee considered to be worthy of further consideration as a public comment

when made on Proposal 15-66): "There has been no substantiation introduced to show that AC cable exhibits the physical integrity that this panel has always required for wiring methods used in theaters. Moreover, AC cable has not been shown to have the same fire safety characteristics of MI cable or MC cable, because of the insulated conductors, which do not have to meet sufficient fire safety requirements." It should be noted that article 333, to which armored cable is listed, says the uses permitted are those "where not subject to physical damage" because of its "flexible metal enclosure". Moreover, the insulated conductors can be ones made of THHN, THW, THHW, TW, UF, etc., per Table 310-13, none of which exhibit very high fire performance (if any). The fire performance exhibited by armored cable is simply based on the fact that it is enclosed by metal, but the burning of the insulated conductors (if the enclosure were pierced or damaged) would be fairly substantial. This is clearly an example of differential treatment applied to "armored cable" as opposed to "nonmetallic raceway", which exhibits better flame spread / heat release performance and equivalent mechanical strength.
EXPLANATION OF ABSTENTION:
FLACH: My classification is "independent expert."

(Log #179)

15- 51 - (520-53(h)(2)): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 15-29
RECOMMENDATION: It was the action of the Technical Correlating Committee directs that this Proposal be reconsidered and correlated with the action on Proposal 5-9. This action will be considered by the Panel as a Public Comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
PANEL STATEMENT: Refer to the panel action on Comment 15-54. The FPN was not added for the applications of Sections 520-53(h)(2) because the ungrounded conductors in portable feeder cables were not commonly manufactured or identified in gray and the addition of the FPN may add confusion.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19
VOTE ON PANEL ACTION:
AFFIRMATIVE: 18
NOT RETURNED: 1 Kalbfeld

(Log #180)

15- 52 - (520-53(h)(2)): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 15-30
RECOMMENDATION: It was the action of the Technical Correlating Committee directs that this Proposal be reconsidered and correlated with the action on Proposal 5-9. This action will be considered by the Panel as a Public Comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
PANEL STATEMENT: Refer to the panel actions and statement on Comments 15-51 and 15-54.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19
VOTE ON PANEL ACTION:
AFFIRMATIVE: 18
NOT RETURNED: 1 Kalbfeld

(Log #1978)

15- 53 - (520-53(h)(2)): Accept
SUBMITTER: Charles Mello, Milwaukie, OR
COMMENT ON PROPOSAL NO: 15-30
RECOMMENDATION: Revise the text to delete only the word "natural" in one location and leave the word "gray" in.
SUBSTANTIATION: The panel action presently does not correlate with the actions of Panel 5 for proposals 5-9, and 15 similar proposals all referenced back to the panel action on proposal 5-9. In addition it does not correlate with the Panel 6 actions on proposals 6-35, 6-36, 6-192, 6-193, 6-194, 6-196 and 6-197. Panel 7 action on proposals 7-280 and 7-281 also now would not correlate with this action. After several cycles and a lot of deliberations, CMP 5 has made the decision to delete the word "natural" and now establish gray colored conductors as grounded conductors. The panel actions by CMP 6 and CMP 7 follow that same line. To ensure consistency, the action originally made by Panel 15 needs to be reversed and the action suggested above applied.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19
VOTE ON PANEL ACTION:
AFFIRMATIVE: 18
NOT RETURNED: 1 Kalbfeld

(Log #1979)

15- 54 - (520-53(h)(2)): Accept
SUBMITTER: Charles Mello, Milwaukie, OR
COMMENT ON PROPOSAL NO: 15-29
RECOMMENDATION: Revise the text to delete only the word "natural" in one location and leave the word "gray" in.
SUBSTANTIATION: The panel action presently does not correlate with the actions of Panel 5 for proposals 5-9, and 15 similar proposals all referenced back to the panel action on proposal 5-9. In addition it does not correlate with the Panel 6 actions on proposals 6-35, 6-36, 6-192, 6-193, 6-194, 6-196 and 6-197. Panel 7 action on proposals 7-280 and 7-281 also now would not correlate with this action. After several cycles and a lot of deliberations, CMP 5 has made the decision to delete the word "natural" and now establish gray colored conductors as grounded conductors. The panel actions by CMP 6 and CMP 7 follow that same line. To ensure consistency, the action originally made by Panel 15 needs to be reversed and the action suggested above applied.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19
VOTE ON PANEL ACTION:
AFFIRMATIVE: 18
NOT RETURNED: 1 Kalbfeld

(Log #1446)

15- 55 - (520-53(h)(5)): Accept
Note: The Technical Correlating Committee understands that the words “in walls” following “through holes” in the first sentence of the Recommendation be retained since the Recommendation in the Comment did not specifically indicate deletion of these words.
SUBMITTER: Kenneth E. Vannice, Rep. U.S. Insitute for Theatre Technology Engineering Commission
COMMENT ON PROPOSAL NO: 15-31
RECOMMENDATION: The Proposal should have been accepted in principal. Revise wording to read:
(5) Supply Conductors Not Reduced in ~~Ampacity~~ Size. Supply conductors not reduced in ~~ampacity~~ size under the provisions of Section 520-53(h)(3) or Section 520-53(h)(4)shall be permitted to pass through holes specifically designed for the purpose. If penetration is through the fire-resistant-rated wall, it shall be in accordance with Section 300-21.
SUBSTANTIATION: The proposer is correct that the existing wording does to make sense. What is a "supply conductor not reduced in ampacity"? The revised wording would clarify this.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19
VOTE ON PANEL ACTION:
AFFIRMATIVE: 18
NOT RETURNED: 1 Kalbfeld

ARTICLE 525 — CARNIVALS, CIRCUSES, FAIRS, AND SIMILAR EVENTS

(Log #534)

15- 56 - (525-1): Reject
SUBMITTER: Paul Petit, American Insulated Wire Corp.
COMMENT ON PROPOSAL NO: 15-39
RECOMMENDATION: Revise as follows:
"Traveling Attractions" should not be deleted from the proposed text.

SUBSTANTIATION: "Traveling Attractions" mentioned in the text can be outdoor performance areas which should be correctly covered by Article 525, which requires that the flexible cords and cables, when used outdoors, shall be listed for wet locations. Article 520 allows cables to be used outdoors, but does not mandate that they be listed for wet locations, (which it should). Unless Article 520 is changed to mandate "wet locations cables", when these traveling attractions (or other) are located outdoors, this proposal should correctly be rejected.
PANEL ACTION: Reject.
PANEL STATEMENT: The term "traveling attractions" is too general and can be applicable to either Article 520 or 525.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17
NEGATIVE: 1
NOT RETURNED: 1 Kalbfeld
EXPLANATION OF NEGATIVE:
HIRSCHLER: I oppose the action by the panel. This comment should have been accepted in principle, with the recommendation I made in my comment on 15-45.

(Log #535)

15- 57 - (525-1): Reject
SUBMITTER: Paul Petit, American Insulated Wire Corp.
COMMENT ON PROPOSAL NO: 15-38
RECOMMENDATION: The word "exhibitions" should not be deleted from the text.
SUBSTANTIATION: The reference to "exhibitions" being already covered by Article 518 is erroneous, as Article 518 specifically references exhibition halls. "Exhibitions" can be outdoors exhibitions, not necessarily in halls. Article 518 only references that the wiring comply with Article 520, and Article 520 makes no provisions for wet locations. When this wiring is exposed to water outdoors, the word "exhibitions" should properly remain in the text.
PANEL ACTION: Reject.
PANEL STATEMENT: The term does not specifically identify the functions applicable to Article 525.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17
NEGATIVE: 1
NOT RETURNED: 1 Kalbfeld
EXPLANATION OF NEGATIVE:
HIRSCHLER: I oppose the action by the panel. This comment should have been accepted in principle, with the recommendation I made in my comment on 15-45.

(Log #181)

15- 58 - (525-13(f)): Accept
Note: The Technical Correlating Committee understands that as a result of the Panel Action on Proposal 15-37, the Section will be numbered 525.20(G).
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 15-47
RECOMMENDATION: It was the action of the Technical Correlating Committee that further consideration be given to the comments expressed in the voting. This action will be considered by the panel as a public comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
Revise action on Proposal 15-47 so 525-13(f) reads:
Protection. Flexible cords or cables accessible to the public shall be arranged to minimize the tripping hazard and shall be permitted to be covered with nonconductive matting, provided that the matting does not constitute a greater tripping hazard than the uncovered cables. It shall be permitted to bury cables. The requirements of 300.5 shall not apply.
PANEL STATEMENT: Due to the panel's action on proposal 15-37, this becomes 525.20(G)
Field circumstances will determine the most viable option. There is no need to remove nonconductive matting. It will be difficult to enforce "shallow". **NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE:** 19
VOTE ON PANEL ACTION:
AFFIRMATIVE: 18
NOT RETURNED: 1 Kalbfeld

(Log #182)

15- 59 - (525-18):
Note: The Technical Correlating Committee directs that Proposal 15-50a and Comment 15-59 be reported as "Hold" so that the panel can address the reference to the NEMA configurations in the mandatory text.
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 15-50a
RECOMMENDATION: The Technical Correlating Committee directs that the Action on this Proposal be rewritten to comply with the NEC Style Manual. This action will be considered by the Panel as a Public Comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
Revise the panel action of Proposal 15-50a to read as follows:
"525.18 Ground-Fault Circuit-Interrupter (GFCI) Protection.
(A) GFCI Protection Required.
(1) General-Use 15- and 20-Ampere, 125-volt Receptacles. Those 125-Volt, single-phase , 15- and 20-ampere NEMA configuration 5-15 and 5-20 receptacles that are either used during disassembly and reassembly or that are readily accessible to the general public shall have listed ground-fault circuit-interrupter (GFCI) protection.
(2) Other Applicable Sections. Receptacles which require GFCI protection under other sections shall include those addressed in the following sections:
(1) 551.40(C)
(2) 551.41(C)
(3) 680.6
(4) 680.43(A)
(5) 680.44
(6) 680.51(A)
(7) 680.56(A)
(8) 680.57(B)
(B) GFCI Protection Not Required.
(1) Egress Lighting. Egress lighting shall not be connected to the load side of terminals of a ground-fault circuit-interrupter receptacle. Branch circuits which supply egress lighting shall not be protected by a GFCI circuit breaker.
(2) Other Receptacles. Receptacle other than NEMA 5-15 or 5-20 which only facilitate quick and safe disconnecting and reconnecting of electrical equipment shall be permitted to have GFCI protection."
PANEL STATEMENT: The panel understands that Section 525-18 will now become Section 525.23. The text has been revised to comply with the Manual of Style.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19
VOTE ON PANEL ACTION:
AFFIRMATIVE: 18
NOT RETURNED: 1 Kalbfeld

(Log #183)

15- 60 - (525-19 (New)): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 15-50b
RECOMMENDATION: The Technical Correlating Committee directs that the Action on this Proposal be rewritten to comply with the NEC Style Manual. This action will be considered by the Panel as a Public Comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
Revise the recommendation of Proposal 15-50b to read as follows:
"525-19 Grounding Conductor Continuity Assurance.
The continuity of the grounding conductor system used to reduce electrical shock hazards as required by 210-7(c) , 250-114, 250-138, 305-4(d) shall be verified each time that portable electrical equipment is connected."

PANEL STATEMENT: The panel understands that new 525-19 will become 525.32. The text has been revised to comply with the Manual of Style.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19
VOTE ON PANEL ACTION:
AFFIRMATIVE: 18
NOT RETURNED: 1 Kalbfeld

(Log #2244)

15- 61 - (525-23 (New)): Reject
SUBMITTER: Tom Dunn, San Jose, CA
COMMENT ON PROPOSAL NO: 15-57
RECOMMENDATION: This proposal should be accepted.
SUBSTANTIATION: 1) Following is panel 5's statement to proposal 5-128, "PANEL STATEMENT: If supplying portable wiring, then 250-34 applies. If there is a need for a special occupancy, then it should be placed within that special occupancy article."

2) Panel 16 accepted proposal 16-2, which will add 640-3(1), which will read as follows: "… Grounding of portable and vehicle-mounted generators shall be in accordance with Section 250-34."

Panels 5 and 16 clearly state that generators supplying portable wiring do not require a grounding electrode. Also, that this should be included in article 525.

525 specifically covers portable wiring. This needs to be addressed in 525 to clarify that 250-34 applies to generators used for carnival power.

The restriction in 250-34, that reads: "The generator supplies only equipment mounted on the generator or cord- and plug-connected equipment through receptacles mounted on the generator, or both, and …", should not apply to carnival generators. What difference does it make, pertaining to the grounding electrode, if the distribution wires are connected to the generator through receptacles or some other method? Also, this restriction has never been understood by any authorities having jurisdiction who I have talked with.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel reaffirms the reason for rejection as stated in the panel statement for Proposal 15-57.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17
NEGATIVE: 1
NOT RETURNED: 1 Kalbfeld
EXPLANATION OF NEGATIVE:
DUNN: Comment 15-61 should have been; Accepted in Principle - in part.

The panel statement should have been: The panel accepts the following wording which satisfies the submitter's intent.

525-23. Grounding Electrode. The frame of a portable generator shall not be required to be grounded and shall be permitted to serve as the grounding electrode for a portable wiring system supplied by the generator under the following conditions:
(a) The output of the generator is not higher than 250 volts, and
(b) No voltage(s) higher than 250 Volts is (are) distributed.
Due to the panel's action on proposal 15-37, this becomes 525-33.

Substantiation: The Panel's statement in rejecting this comment (15-61), does not address the submitter's substantiation that Panels 5 and 16 have indicated that 525 should include a provision about the grounding of portable generators.

Admittedly, the submitter should have proposed some text. In fact, at the Panel meeting, it appeared that the Panel was going to vote against the motion to accept, and move to accept in principle - in part, including the text above. However, the panel quickly moved to reject the comment (15-61), merely restating the Panel's statement for rejecting the original proposal (15-57).

The Panel's statement in rejecting the original proposal (15-57) contains a reason for having a grounding electrode that is undesirable and some inappropriate references to Section 250. Following is a breakdown of the Panel's Statement into its three sentences with comments about each sentence.

The first sentence reads: "The purpose of the a grounding electrode is the primary reference point in creating a grounded system." My substantiation for voting negative to the Panel's rejection of the original proposal (15-57) portrayed a situation where disconnecting the "grounding electrode" was necessary to prevent the ponies from being electrocuted. This was to show why having carnival generators referenced to ground is undesirable.

The second sentence reads, "The requirements for grounding of generators are addressed in 250-30 and 250-34." However, 250-30 pertains to the grounding of separately derived systems. Article 100 defines a separately derived system as, "A premises wiring system whose power is derived from…". 525 addresses portable wiring, 525 does not address premises wiring. Therefore, 250-30 does not apply.

Referencing 250-34, as suggested in the second sentence of the panel's statement, will cause confusion because 250-34 mandates the following condition, "(1) The generator supplies only equipment mounted on the generator or cord- and plug-connected equipment through receptacles mounted on the generator, or both…". Trying to comply with this condition would not be possible for a carnival.

The third sentence in the panel's statement is: "System grounding requirements are addressed in 250-20. 250-20 defines which alternating-current circuits and systems shall be grounded. There are four systems listed - (a), (b), (c), and (d), and none of these apply to 525 for the following reasons:

"(a) Alternating-Current Circuits of Less than 50 Volts." which does not apply because the generator output will be 120/208 volts.

"(b) Alternating-Current Systems of 50 Volts to 1000 Volts. Alternating-current systems of 50 volts to 1000 volts that supply premises wiring and premises wiring systems…", 525 addresses portable wiring, 525 does address not premises wiring. Therefore, (b) doesn't apply.

"(c) Alternating-Current Systems of 1 kV and Over.", which will not apply because of the voltage restrictions included in the proposed text.

"(d) Separately Derived Systems.", which does not apply for the same reason that 250-30 is not applicable"

To summarize: The panel's statement contains references that are not applicable to Section 525. The panel's statement has not substantiated their disagreement with the submitter's substantiation. The panel will have ignored both the direction of Panel 5, and the precedent of Panel 16 by rejecting this comment.

(Log #184)

15- 62 - (525-40): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 15-60
RECOMMENDATION: The Technical Correlating Committee directs that the Action on this Proposal be rewritten to comply with the NEC Style Manual. This action will be considered by the Panel as a Public Comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
PANEL STATEMENT: Panel has modified the panel action of Proposal 15-50a to comply with the Manual of Style. The panel notes that the panel action on Proposal 15-60 was to reject.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19
VOTE ON PANEL ACTION:
AFFIRMATIVE: 18
NOT RETURNED: 1 Kalbfeld

ARTICLE 530 — MOTION PICTURE AND TELEVISION STUDIOS AND SIMILAR LOCATIONS

(Log #1447)

15- 63 - (530-8(a)): Accept in Principle
SUBMITTER: Kenneth E. Vannice, Rep. U.S. Insitute for Theatre Technology Engineering Commission
COMMENT ON PROPOSAL NO: 15-72
RECOMMENDATION: Revise new section 647-8(a) as follows:
(a) Disconnecting Means. All lighting equipment luminaires and associated control equipment, if provided, shall have a disconnecting means that simultaneously opens all ungrounded conductors~~, and~~ that shall be located within sight of the luminaire or be capable of being locked in the open position.
SUBSTANTIATION: The concern surrounding a disconnecting means for lighting fixtures relates to the safe re-lamping of a luminaire on a branch circuit where both sides of the circuit are 60v above ground. As written and modified by the Panel, the proposal calls for the disconnect being "within sight". Within sight of what? This needs to be clarified so that personnel changing a lamp can either see the switch or be assured that it is locked off. In addition, "lighting equipment" is too vague and needs to be tightened to specify luminaires and control equipment. Also editorially, the current word "and" refers back to the lighting equipment, not the disconnect. The word "that" is more correct.

PANEL ACTION: Accept in Principle.
Revise 647.8(a) of the panel action of Proposal 15-72 as follows:
A) Disconnecting Means. All luminaires (lighting fixtures) connected to separately derived systems operating at 60 volts to ground, and associated control equipment, if provided, shall have a disconnecting means that simultaneously opens all ungrounded conductors. The disconnecting means shall be located within sight of the luminaire (lighting fixture) or be capable of being locked in the open position.
PANEL STATEMENT: The revised text more clearly expresses the requirement and meets the intent of the submitter.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19
VOTE ON PANEL ACTION:
AFFIRMATIVE: 18
NOT RETURNED: 1 Kalbfeld

(Log #1508)

15- 64 - (530-10): Reject
SUBMITTER: Richard D. Thompson, Thompson Associates
COMMENT ON PROPOSAL NO: 15-65
RECOMMENDATION: Reverse the decision of the technical panel and accept this proposal based on the following substantiation.
SUBSTANTIATION: This proposal was submitted to both Code Making Panel 15 responsible for Article 530, Motion Picture and Television Studios and Similar Locations, as well as to Code Making Panel 2 for inclusion into Table 220-3(a). [Reference Log 1886, 2-264]. Code Making Panel 2 rejected this proposal on the basis that Table 220-3(a) applies only to general lighting loads. The panel questioned whether or not the set lighting load of a motion picture or television soundstage is a general lighting load.
In light of that Committee Statement, it can be interpreted as a non-general lighting load. It is a specific electrical lighting load for the set lighting. Using Code Making Panel 2's interpretation, the general lighting load for a TV or film soundstage would be the work lights, as they provide general illumination to the space.
Code Making Panel 15 however, in their panel Statement, stated, "The production lighting load calculation parameters are more appropriately placed in Article 220."
Since these two panels have taken opposite opinions as to where best to locate this proposal, we ask the Technical Correlating Committee and Code Making Panel 15 to incorporate this requirement into Article 530, using the original substantiation which accompanied this proposal.
PANEL ACTION: Reject.
PANEL STATEMENT: A motion picture and television lighting load can range from a few kilowatts to a few megawatts. These loads are normally supplied by augmenting the existing building service which must serve all or none of the lighting load according to the owners desires.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19
VOTE ON PANEL ACTION:
AFFIRMATIVE: 18
NOT RETURNED: 1 Kalbfeld

(Log #185)

15- 65 - (530-11): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 15-66
RECOMMENDATION: It was the action of the Technical Correlating Committee that further consideration be given to the comments expressed in the voting. This action will be considered by the panel as a public comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
PANEL STATEMENT: Refer to the panel action on Comment 15-66. The panel reaffirms its action on Proposal 15-66.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17
NEGATIVE: 1
NOT RETURNED: 1 Kalbfeld
EXPLANATION OF NEGATIVE:
HIRSCHLER: I oppose the action by the panel. This comment should have referred to action on reject of comment 15-66. See comments on 15-50.

(Log #2096)

15- 66 - (530-11): Accept
SUBMITTER: George W. Flach, Nat'l Armored Cable Mfrs' Assn. (NACMA)
COMMENT ON PROPOSAL NO: 15-66
RECOMMENDATION: Continue to accept the proposal.
SUBSTANTIATION: Dr. Hirschler's "explanation of negative" comment for this proposal requested substantiation concerning the physical integrity and fire safety characteristics of Type AC as compared to the currently permitted Type MC cable.
The physical integrity of Type AC cable is equal to that of MC cable. The thickness of the outer metallic sheath of Type AC cable required by Underwriters Laboratories is 25 mils. The thickness of the outer metallic sheath of Type MC cable is permitted to be less than 25 mils.
Both AC cable and MC cable comply with the UL 1685 Vertical Tray and Smoke Release requirements and in accordance with their respective UL standards may be marked for use in cable trays and may be marked "-LS" signifying "Limited Smoke".
The physical integrity and fire safety characteristics of Type AC are equal to the currently permitted Type MC cable.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16
NEGATIVE: 1
ABSTENTION: 1
NOT RETURNED: 1 Kalbfeld
EXPLANATION OF NEGATIVE:
HIRSCHLER: I oppose the action by the panel. This comment should have been rejected. See comments on 15-50.
EXPLANATION OF ABSTENTION:
FLACH: My classification is "independent expert."

(Log #186)

15- 67 - (530 Part G): Accept
Note: The Technical Correlating Committee advises that placement of articles is the responsibility of the Technical Correlating Committee and the Technical Correlating Committee agrees with the relocation of 530 Part G to new Article 647.
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 15-72
RECOMMENDATION: The Technical Correlating Committee advises that Article Scope statements are the responsibility of the Technical Correlating Committee and the Technical Correlating Committee rejects the Panel Action.
The Technical Correlating Committee directs that the Scope be revised to read as follows: "This article covers the installation and wiring of separately derived systems operating at 120 volts line-to-line and 60 volts to ground for sensitive electronic equipment." The Technical Correlating Committee directs the Panel to place the limitation to commercial and industrial occupancies elsewhere in the article.
This action will be considered by the Panel as a Public Comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
Revise 647.1 and 647.3 to read as follows:
"647.1. Scope. This article covers the installation and wiring of separately derived systems operating at 120 volts line-to-line and 60 volts to ground for sensitive electronic equipment."
"647.3. General. Use of a separately derived 120-volt single-phase 3-wire system with 60 volts on each of two ungrounded conductors to a grounded neutral conductor shall be permitted for the purpose of reducing objectionable noise in sensitive electronic equipment locations provided that the following conditions apply:
(1) The system is installed only in commercial or industrial occupancies.
(2) The system's use is restricted to areas under close supervision by qualified personnel.
(3) All of the requirements in 647.4 through 647.8 are met."

PANEL STATEMENT: This change accomplishes the direction of the Technical Correlating Committee and maintains the intent of limiting the use of this article to commercial and industrial occupancies.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19
VOTE ON PANEL ACTION:
AFFIRMATIVE: 18
NOT RETURNED: 1 Kalbfeld

(Log #1449)

15- 68 - (530 Part G): Accept in Principle
SUBMITTER: Kenneth E. Vannice, Rep. U.S. Insitute for Theatre Technology Engineering Commission
COMMENT ON PROPOSAL NO: 15-72
RECOMMENDATION: Insure that in responding to the Technical Correlating Committee's public comment to remove from the Scope the limitation on application of this article in commercial and industrial occupancies and place it elsewhere in the article, it does not get deleted!
SUBSTANTIATION: For safety, it is important that this Article only be used in commercial and industrial occupancies, and that limitation must be crystal-clear to the reader.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: The intent of the submitter has been met by the panel action on Comment 15-67.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19
VOTE ON PANEL ACTION:
AFFIRMATIVE: 18
NOT RETURNED: 1 Kalbfeld

ARTICLE 547 — AGRICULTURAL BUILDINGS

(Log #212)

19- 7 - (547-2): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 19-11
RECOMMENDATION: The Technical Correlating Committee directs that the Panel clarify the Panel Action on this Proposal regarding the renumbering of the sections, combining existing 547-2 with another section, or deleting 547-2. The Technical Correlating Committee directs the Panel to correlate the action on this Proposal with the actions on Proposals 19-21 and 19-28. This action will be considered by the Panel as a Public Comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
PANEL STATEMENT: Refer to Comment 19-10.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 8
VOTE ON PANEL ACTION:
AFFIRMATIVE: 8

(Log #566)

19- 8 - (547-2): Accept
SUBMITTER: Robert A. McCullough, Ocean County Construction Insp. Dept., NJ
COMMENT ON PROPOSAL NO: 19-21
RECOMMENDATION: Revise text in panel action as follows:
Distribution Point. An electrical supply point from which service drops, service laterals, feeders, or branch circuits to agricultural buildings, associated farm dwelling(s), and associated buildings under single management are supplied. ~~The service Point described in Article 100 is typically at the distribution point.~~
FPN No.1 Distribution Points are also known as the Center Yard Pole, Yard Pole, or the Common Distribution Point.
FPN No. 2. The service Point as defined in Article 100 is typically at the Distribution Point.
SUBSTANTIATION: Editorial. See comment submitted for Proposal 19-11.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 8
VOTE ON PANEL ACTION:
AFFIRMATIVE: 8

(Log #567)

19- 9 - (547-2): Accept in Principle
SUBMITTER: Robert A. McCullough, Ocean County Construction Insp. Dept., NJ
COMMENT ON PROPOSAL NO: 19-28
RECOMMENDATION: Proposal should be accepted in principle and modified as follows:
Equipotential Plane. An area accessible to livestock where a wire mesh or other conductive elements are embedded in concrete or earth, are bonded to all metal structures and fixed nonelectrical equipment that may become energized, and are connected to the electrical grounding system to prevent a difference in voltage from developing within the plane. ~~For this article, livestock does not include poultry.~~
SUBSTANTIATION: See comment and substantiation for Proposal 19-11 for textual changes. Acceptance of that comment makes renumbering of subsequent sections unnecessary.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Refer to Comments 19-10 and 19-37.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 8
VOTE ON PANEL ACTION:
AFFIRMATIVE: 8

(Log #572)

19- 10 - (547-2): Accept in Principle
SUBMITTER: Robert A. McCullough, Ocean County Construction Insp. Dept., NJ
COMMENT ON PROPOSAL NO: 19-11
RECOMMENDATION: Revise 547-2 as follows:
547-2. ~~Other Articles.~~ Definitions. ~~For agricultural buildings not having conditions as specified in Section 547-1, the electrical installations shall be made in accordance with the applicable articles in this code.~~
Distribution Point. An electrical supply point from which service drops, service laterals, feeders, or branch circuits to agricultural buildings, associated farm dwelling(s), and associated buildings under single management are supplied.
FPN No. 1: Distribution Points are also known as the Center Yard Pole, Meter Pole, or the Common Distribution Point.
FPN No. 2: The Service Point as defined in Article 100 is typically at the Distribution Point.
Equipotential Plane. An area accessible to livestock where a wire mesh or other conductive elements are embedded in concrete or earth, are bonded to all metal structures and fixed nonelectrical equipment that may become energized, and are connected to the electrical grounding system to prevent a difference in voltage from developing within the plane.
SUBSTANTIATION: Acceptance of this comment will complete the action contemplated by the panel with regard to Proposals 19-11, 19-21, and 19-28. This was to create a new Section 547-2 which contains the definitions of the two terms unique to Article 547. The existing text of 547-2 is deleted as it is not needed.
If a building does not have the conditions specified in the scope of this article, it is not necessary to comply with the specific rules in Article 547. The general rules of the code would apply. This comment further modifies the panel's action on Proposal 19-21 by removing from the definition, the last sentence and inserting it as new FPN No. 2. This text is explanatory and not germane to the definition. Additionally, this comment modifies Proposal 19-28 in two ways. First, the words "or earth" are added after the word "concrete". The panel's action of Proposal 19-26a introduces a requirement for an equipotential plane in certain dirt surface areas. Without the words "or earth" in the definition, it would be required to embed the conductive elements in concrete even though the surface area is dirt. I do not believe this was the panel's intent. Second, the last sentence in the definition of an equipotential plane is deleted. A companion proposal will suggest adding that sentence to 547-9. I believe that the panel's intent was only to exempt poultry buildings or areas from the equipotential plane requirements. The language used, "For this article livestock does not include poultry", could be construed as exempting poultry buildings or areas from all the requirements of Article 547 in total. This is not the case. The panel I believe, only intended to exempt these areas from the requirements of an equipotential plane.
PANEL ACTION: Accept in Principle.
Revise 547-2 as follows:
547-2. ~~Other Articles.~~ Definitions. ~~For agricultural buildings not having conditions as specified in Section 547-1, the electrical installations shall be made in accordance with the applicable articles~~

~~in this code.~~
Distribution Point. An electrical supply point from which service drops, service laterals, feeders, or branch circuits to agricultural buildings, associated farm dwelling(s), and associated buildings under single management are supplied.
FPN No. 1: Distribution Points are also known as the Center Yard Pole, Meter Pole, or the Common Distribution Point.
FPN No. 2: The Service Point as defined in Article 100 is typically at the Distribution Point.
Equipotential Plane. An area where wire mesh or other conductive elements are embedded in or placed under concrete, bonded to all metal structures and fixed nonelectrical equipment that may become energized, and connected to the electrical grounding system to prevent a difference in voltage from developing within the plane.
PANEL STATEMENT: Accepted with editorial revisions.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 8
VOTE ON PANEL ACTION:
AFFIRMATIVE: 8

(Log #CC1901)

19- 10a - (547-4): Accept
Note: The Technical Correlating Committee understands that the panel action is to revise 547-4(c) only.
SUBMITTER: CMP 19
COMMENT ON PROPOSAL NO: 19-16
RECOMMENDATION: Revise 547-4 to read:
547-4(c). Equipment Enclosures, Boxes, Conduit Bodies, and Fittings.
(1) Excessive Dust. Equipment enclosures, boxes, conduit bodies, and fittings installed in areas of buildings where excessive dust may be present shall be designed to minimize the entrance of dust and shall have no openings (such as holes for attachment screws) through which dust could enter the enclosure.
(2) Damp or Wet Locations. In damp or wet locations, equipment enclosures, boxes, conduit bodies, and fittings shall be placed or equipped so as to prevent moisture from entering or accumulating within the enclosure, box , conduit body, or fitting. In wet locations, including normally dry or damp locations where surfaces are periodically washed or sprayed with water, boxes, conduit bodies, and fittings shall be listed for use in wet locations, and equipment enclosures shall be weatherproof.
(3) Corrosive Atmosphere. Where wet dust, excessive moisture, corrosive gases or vapors, or other corrosive conditions may be present, equipment enclosures, boxes, conduit bodies, and fittings shall have corrosion resistance properties suitable for the conditions.
FPN No. 1: See Table 430-91 for appropriate enclosure type designations.
FPN No. 2: Aluminum and magnetic ferrous materials may corrode in agricultural environments.
SUBSTANTIATION: Based on several comments, the Panel reviewed its action on proposal 19-16 and accepts the proposal with the deletion of the first sentence which is redundant.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 8
VOTE ON PANEL ACTION:
AFFIRMATIVE: 8

(Log #213)

19- 11 - (547-4(a)): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 19-14
RECOMMENDATION: It was the action of the Technical Correlating Committee that this Proposal be reconsidered and correlated with the action on Proposal 7-12. This action will be considered by the Panel as a Public Comment. The Technical Correlating Committee understands that the action on this Proposal further modifies the action on Proposal 19-13.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
PANEL STATEMENT: Refer to panel action on Comment 19-13.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 8
VOTE ON PANEL ACTION:
AFFIRMATIVE: 8

(Log #570)

19- 12 - (547-4(a)): Reject
SUBMITTER: Robert A. McCullough, Ocean County Construction Insp. Dept., NJ
COMMENT ON PROPOSAL NO: 19-14
RECOMMENDATION: Continue to accept the proposal.
SUBSTANTIATION: The original substantiation stated that open wiring on insulators is not suitable in the INTERIOR (emphasis added) of modern agricultural buildings. The panel believed that to be true and felt that for the locations described in 547-1(a), it was more appropriate to require a higher degree of protection for the wiring methods rather than installing single, insulated conductors.
Additional restrictions placed on the interior installations by Article 547 can cause confusion when attempting to apply the provisions of Article 320 since the rules in 547 modify or amend those in 320. 320-3 permits the use of open wiring on insulators where subject to corrosive vapors. Article 547 does not. The fact that CMP 7 rejected the companion proposal does not pose a conflict as open wiring on insulators could still be used at an agricultural establishment as the service or feeder conductors where run outside, or in areas that do not fall within the scope of Article 547. I believe the term "establishment" as stated in 320-3 can be used to indicate the use permitted on the property in general and Article 547 further restricts this wiring method for the particular areas within its scope. I believe that CMP 7 was correct in its rejection as there was no substantiation to remove the permitted use everywhere at an agricultural establishment. I also believe that CMP 19 was correct in accepting the proposal to remove the permission as a wiring method within the particular areas under the scope of Article 547.
PANEL ACTION: Reject.
PANEL STATEMENT: Refer to Panel Action on Comment 19-13.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 8
VOTE ON PANEL ACTION:
AFFIRMATIVE: 8

(Log #1020)

19- 13 - (547-4(a)): Accept in Principle
SUBMITTER: James K. Hinrichs, State of Washington, Department of Labor & Industries
COMMENT ON PROPOSAL NO: 19-14
RECOMMENDATION: Replace the proposed Section 547(a) with the following:
547-4. Wiring Methods.
(a) Wiring Systems. Type UF, NMC, copper SE cables, rigid nonmetallic conduit, liquidtight flexible nonmetallic conduit, or other cables or raceways suitable for the location, with approved termination fittings, shall be the wiring method employed. Article 320 and Article 502 wiring methods shall be permitted for areas described in Section 547-1(a).
FPN: See Sections 300-7 and 347-9 for installation of raceway systems exposed to widely different temperatures.
SUBSTANTIATION: Article 320 - Open Wiring on Insulators is a recognized wiring method of the 1999 edition of the National Electrical Code and continues to be recognized. This wiring method has been used for decades and if properly installed constitutes a safe wring method. To eliminate this wiring method from Article 547 would cause confusion within the electrical industry, and be unnecessarily costly to the end use customer. There would be numerous electrical installations of this type within agricultural buildings that would not be able to be upgraded or repaired using this wiring method if this code change occurs. There does not appear to be any documentation to substantiate removal of this wiring method from Section 547-4(a)
PANEL ACTION: Accept in Principle.
Replace the proposed Section 547(a) with the following:
547-4. Wiring Methods.
(a) Wiring Systems. Type UF, NMC, copper SE cables, jacketed Type MC cable, rigid nonmetallic conduit, liquidtight flexible nonmetallic conduit, or other cables or raceways suitable for the location, with approved termination fittings, shall be the wiring method employed. Article 320 and Article 502 wiring methods shall be permitted for areas described in Section 547-1(a).
FPN: See Sections 300-7 and 347-9 for installation of raceway systems exposed to widely different temperatures.
PANEL STATEMENT: The comment is accepted and a revision made in Proposal 19-13 is added. This reverses Panel action on Proposal 19-14.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 8
VOTE ON PANEL ACTION:
AFFIRMATIVE: 8

(Log #1440)

19- 14 - (547-4(a)): Reject
SUBMITTER: Barry Bauman, Alliante Energy/Rep. American Society of Agricultural Engineers
COMMENT ON PROPOSAL NO: 19-14
RECOMMENDATION: 19-14 should be accepted as proposed.
SUBSTANTIATION: The clip on luminaries used in NEC 320 agricultural installations do not conform to NEC 547.8. Consequently, these installations do not conform to the NEC. Due to their loss experience, insurance companies will either not insure buildings wired with Open Wiring On Insulators or they will impose a much higher rate.
A similar comment is to be submitted for Proposal 7-12.
PANEL ACTION: Reject.
PANEL STATEMENT: Refer to Panel Action on Comment 19-13.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 8
VOTE ON PANEL ACTION:
AFFIRMATIVE: 8

(Log #690)

19- 15 - (547-4(c)): Accept in Principle
SUBMITTER: William E. Bickner, Stillwater, MN
COMMENT ON PROPOSAL NO: 19-16
RECOMMENDATION: The panel revisions to the proposed changes should be reviewed to address the concerns stated below.
SUBSTANTIATION: The term "dustproof" should not be used. A proposal has been accepted to delete that term from Article 100. UL and NEMA standards address "dusttight" equipment, but the term "dustproof" is not generally used in reference to enclosures and boxes. "Dusttight" implies a more stringent construction than does the proposed language. The proposed changes would permit "weatherproof" enclosures, as provided for wet locations according to Section 373-2(a). To require "watertight" enclosures would be more restrictive and preclude the use of enclosures such a NEMA 4.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Refer to Comment 19-15a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 8
VOTE ON PANEL ACTION:
AFFIRMATIVE: 8
COMMENT ON AFFIRMATIVE:
BAUMAN: Should refer to Comment 19-10a. There is no 19-10a.
LAROCCA: The Panel Statement should read: "Refer to Comment 19-10a" rather than 19-15a. It appears that the panel comment originally identified as 19-15a was renumbered as 19-10a to fit into the sequence of comments.
MCCULLOUGH: In the panel statement, change the referenced comment number to 19-10a. Coment 19-15a was the number used during the panel meeting and was subsequently changed after the statement was written.

(Log #2109)

19- 16 - (547-4(c)): Accept in Principle
SUBMITTER: Truman C. Surbrook, Michigan State University
COMMENT ON PROPOSAL NO: 19-16
RECOMMENDATION: Agree with Panel's action to Accept in Principle, but disagree with Panel's action to change "weatherproof" to "watertight" in 547-4(c)(2). Change watertight back to weatherproof.
SUBSTANTIATION: This issue was discussed in the past, and watertight was changed to weatherproof to solve a problem of water accumulating inside enclosures and causing malfunctions. Junction and device boxes and enclosures in the 1984 NEC were required to be watertight, but changed to weatherproof in the 1987 NEC. Other enclosures were always required to only be weatherproof even in the 1984 NEC. It is not possible to prevent water vapor from entering enclosures, but it is difficult to get it out once it accumulates. Watertight enclosures do not breathe to equalize vapor pressure. Changes in temperature will cause condensation inside enclosures that frequently contain electronic equipment. Condensation on electronic components and circuit boards will cause malfunctions. These enclosures generally installed in wet locations must be permitted to breathe. Please do not make a step back by changing weatherproof to watertight.
The Panel did not provide any data that would justify this change from weatherproof to watertight. Please do not create a problem by making this change. For controllers, switches, circuit breakers, and fuses, the enclosure has been weatherproof as far back as the 1978 NEC which is the oldest Code I had available.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Refer to Comment 19-10a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 8
VOTE ON PANEL ACTION:
AFFIRMATIVE: 8
COMMENT ON AFFIRMATIVE:
BAUMAN: Should refer to Comment 19-10a. There is no 19-15a.
LAROCCA: See my Comment on Affirmative for Comment 19-15.
MCCULLOUGH: In the panel statement, change the referenced comment number to 19-10a. Coment 19-15a was the number used during the panel meeting and was subsequently changed after the statement was written.

(Log #1706)

19- 17 - (547-4(c)(2)): Accept in Principle
SUBMITTER: Douglas Fak, Interlochen, MI
COMMENT ON PROPOSAL NO: 19-16
RECOMMENDATION: Agree with action to Accept in Principle in Part, but in 547-4(c)(2) change the word "watertight" in the Code Panels action to "Weatherproof".
SUBSTANTIATION: The Code Panel incorrectly changed the word weatherproof to watertight. In 547-5(a), the Code requires that enclosures be weatherproof, not watertight. The original proposal used weatherproof, not watertight. The Code Panel gave no justification for this change. Mr. McNeive voted negative for similar reasons.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Refer to Comment 19-10a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 8
VOTE ON PANEL ACTION:
AFFIRMATIVE: 8
COMMENT ON AFFIRMATIVE:
BAUMAN: Should refer to Comment 19-10a. There is no 19-15a.
LAROCCA: See my Comment on Affirmative for Comment 19-15.
MCCULLOUGH: In the panel statement, change the referenced comment number to 19-10a. Coment 19-15a was the number used during the panel meeting and was subsequently changed after the statement was written.

(Log #2237)

19- 18 - (547-4(c)(2)): Accept in Principle
SUBMITTER: Thomas J. Garvey, Milwaukee, WI
COMMENT ON PROPOSAL NO: 19-16
RECOMMENDATION: Revise the first sentence of (2) to read:
In damp or wet locations, equipment enclosures, boxes, conduit bodies, and fittings, shall be placed or equipped so as to prevent moisture from ~~entering or~~ accumulating within the enclosure,...
SUBSTANTIATION: As expressed in the submitter's substantiation, the intent of this section is to prevent accumulation of moisture. There is no practical way to prevent moisture from entering the enclosure. Conduits and cables do not block out the ambient air. The free movement of air will ensure that condensation will occur at some point in time. Equipment can continue to function safely as long as excess moisture is allowed to drain.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Refer to Comment 19-10a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 8
VOTE ON PANEL ACTION:
AFFIRMATIVE: 8
COMMENT ON AFFIRMATIVE:
BAUMAN: Should refer to Comment 19-10a. There is no 19-15a.
LAROCCA: See my Comment on Affirmative for Comment 19-15.
MCCULLOUGH: In the panel statement, change the referenced comment number to 19-10a. Coment 19-15a was the number used during the panel meeting and was subsequently changed after the statement was written.

(Log #2302)

19- 19 - (547-5): Accept in Principle
SUBMITTER: Robert J. Flick, Alliant Energy
COMMENT ON PROPOSAL NO: 19-16
RECOMMENDATION: Revise as follows:
"... In wet locations, including normally dry or damp locations where surfaces are periodically washed or sprayed with water, boxes, conduit

bodies, and fittings shall be listed for use in wet locations and equipment enclosures shall be ~~watertight~~ weatherproof."
SUBSTANTIATION: An environment with very high humidity will have condensation. Condensation can occur both inside and outside of enclosures. It is very important to prevent moisture from entering an enclosure, but more important to provide a means of preventing water from accumulating within the enclosure through a breather or drain plug.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Refer to Comment 19-10a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 8
VOTE ON PANEL ACTION:
AFFIRMATIVE: 8
COMMENT ON AFFIRMATIVE:
BAUMAN: Should refer to Comment 19-10a. There is no 19-15a.
LAROCCA: See my Comment on Affirmative for Comment 19-15.
MCCULLOUGH: In the panel statement, change the referenced comment number to 19-10a. Comment 19-15a was the number used during the panel meeting and was subsequently changed after the statement was written.

(Log #214)

19- 20 - (547-8): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 19-18a
RECOMMENDATION: It was the action of the Technical Correlating Committee that further consideration be given to the affirmative comments expressed in the voting. This action will be considered by the panel as a public comment. The Technical Correlating Committee directs that the Action on this Proposal be rewritten to comply with the NEC Style Manual regarding references to entire articles.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
PANEL STATEMENT: Refer to Comment 19-19a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 8
VOTE ON PANEL ACTION:
AFFIRMATIVE: 8
COMMENT ON AFFIRMATIVE:
LAROCCA: The Panel Statement should read: "Refer to Comment 19-19a" rather than 19-23a. It appears that the panel comment originally identified as 19-23a was renumbered as 19-19a to fit into the sequence of comments.
MCCULLOUGH: In the panel statement, change the referenced comment number to 19-19a. Comment 19-23a was the number used during the panel meeting and was subsequently changed after the statement was written.

(Log #1021)

19- 21 - (547-8): Reject
SUBMITTER: James K. Hinrichs, State of Washington, Department of Labor & Industries
COMMENT ON PROPOSAL NO: 19-18a
RECOMMENDATION: The following language needs to be deleted from the proposal submitted by Code Making Panel 19:
Article 547-8(a)(2) Series Disconnects. Where the serving utility provides a disconnecting means as part of their service requirements and this disconnecting means is determined to meet the requirements of this section, an additional disconnecting means shall not be required.
And then change (3) to (2); change (4) to (3); change (5) to (4); change (6) to (5).
SUBSTANTIATION: The language in the above mentioned portion of the Code Making Panel 19 proposal would not be enforceable by the authority having jurisdiction and would create misunderstandings and confusion for the electrical installer and the consumer because in most cases the authority having jurisdiction is not allowed to inspect upstream from the Service Point. Furthermore Section 90-2(b)(5) of the 1999 NEC would preclude this section becoming part of the NEC.
PANEL ACTION: Reject.
PANEL STATEMENT: Refer to action on Comment 19-19a which addresses the submitter's concerns.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 8
VOTE ON PANEL ACTION:
AFFIRMATIVE: 8
COMMENT ON AFFIRMATIVE:
LAROCCA: See my Comment on Affirmative on Comment 19-20.
MCCULLOUGH: In the panel statement, change the referenced comment number to 19-19a. Comment 19-23a was the number used during the panel meeting and was subsequently changed after the statement was written.

(Log #1263)

19- 22 - (547-8): Reject
SUBMITTER: David A. Kerr, Jr., Friendsville, PA
COMMENT ON PROPOSAL NO: 19-18a
RECOMMENDATION: Accept in principle.
SUBSTANTIATION: This looks like a big improvement in readability. I'm not sure there is any need to require disconnect at meter pole. Article 230 permits service conductors to go from a house to a garage, although I think this should be restricted to big buildings with fire pumps, or other real needs. The utility can and will cut the transformer. Mr. SImmons doesn't seem to think a same size EGC is necessary. Only purged and pressurized will keep barn air out of equipment. It's the Jersey shore times ten. Connections need Noalox. AA8000 wire seems fine when terminals die.
PANEL ACTION: Reject.
PANEL STATEMENT: No specific proposal is made as required by 4-4.5 (c) of the NFPA Regulations Governing Committee Projects.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 8
VOTE ON PANEL ACTION:
AFFIRMATIVE: 8

(Log #1790)

19- 23 - (547-8): Reject
SUBMITTER: Alan Manche, Square D Co.
COMMENT ON PROPOSAL NO: 19-18a
RECOMMENDATION: The panel should reconsider and reject this proposal returning to the 1999 NEC wording.
SUBSTANTIATION: These revisions introduce more problems than it solves. 547-8(A) in this proposal permits the disconnect at the distribution point to be classified as the service disconnect. It further permits the disconnect to be supplied by the utility or to be customer owned at the distribution point. 547-8(A)(4) states that the disconnect to be exempt from overload protection. It is not clear how short-circuit protection is addressed at the distribution point.
Depending on the interpretation of this section, a safety concern exists for the unprotected conductors and switch at the distribution point if overcurrent protection is not required. Although a utility owned, pole mounted switch may be appropriately designed for a short circuit condition, a significant concern rests with a customer owned enclosed switch that is not protected from short circuit conditions. The present wording may be interpreted to permit the use of an unfused switch at the distribution point without any overcurrent protection immediately adjacent. Unfused switches are permitted to be marked Suitable for Use as Service Equipment because of the requirement in 230-91 requiring the overcurrent protection to be an integral part of the service disconnect or immediately adjacent. The overcurrent device is protecting that switch. Permitting an unfused switch at the distribution point and the overcurrent protection to be located at the building establishes a significant safety hazard when the switch is called upon to carry short circuit current, the switch is no longer protected.
If a switch is installed at the distribution point without overcurrent protection either integral or immediately adjacent there to. A possible fault on the conductors (possibly long length of conductors) would expose the switch to extremely high fault currents resulting in the possible concerns. The 1999 language clearly addresses this issue that the disconnect be SUSE.
PANEL ACTION: Reject.
PANEL STATEMENT: Refer to Comment 19-19a where the panel has revised the section and addresses the submitter's concerns.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 8
VOTE ON PANEL ACTION:
AFFIRMATIVE: 8
COMMENT ON AFFIRMATIVE:
BAUMAN: Should refer to Comment 19-19a. There is no 19-23a.
LAROCCA: See my Comment on Affirmative on Comment 19-20.
MCCULLOUGH: In the panel statement, change the referenced comment number to 19-19a. Comment 19-23a was the number used during the panel meeting and was subsequently changed after the statement was written.

(Log #CC1902)

19- 19a - (547-8): Accept
SUBMITTER: CMP 19
COMMENT ON PROPOSAL NO: 19-18a
RECOMMENDATION: Revise 547-8 to read:
547-8. Electrical Supply to Buildings or Structures from a Distribution Point
(A). Site Isolating Device. A disconnecting means shall be installed at the distribution point where two or more agricultural buildings, structures, associated farm dwelling(s) or other buildings are supplied from the distribution point. For the purposes of applying the requirements of this Section, this disconnecting means, shall be classified as a site isolating device and shall have provisions for bonding the grounding electrode conductor to the grounded conductor.
(1) Purpose. The disconnecting means shall simultaneously interrupt all ungrounded conductors for the purposes of isolation, system maintenance, emergency disconnection or connection of optional standby systems.
(2) Series Disconnects. An additional disconnecting means shall not be required where the serving utility provides a disconnecting means as part of their service requirements and this disconnecting means is accessible to the user and meets the requirements of this section.
(3) Rating. The disconnecting means shall be rated for the calculated load as determined by Part D of Article 220.
(4) Overcurrent. The disconnecting means shall not be required to contain overcurrent protection.
(5) Accessibility. Where not readily accessible, the disconnecting means shall be capable of operation from a readily accessible point.
(6) Grounding. The grounded conductor of the system shall be connected to a grounding electrode through a grounding electrode conductor at the disconnecting means.
(B) Electrical Supply. The buildings or structures shall be permitted to be supplied by either (1) or (2):
(1) Building(s) or Structure(s). Where the disconnecting means and overcurrent protection are located at the buildings or structures, the supply conductors shall be sized in accordance with Part D of Article 220 and installed in accordance with the requirements of Part B of Article 225.
For each building or structure the conditions in either (a) or (b) shall be permitted.
(a) The grounded circuit conductor shall be permitted to be connected to the building disconnecting means and to the grounding electrode system of that building or structure where all the requirements of 250-32(B)(2) are met.
(b) A separate equipment grounding conductor shall be run with the supply conductors to the building(s) or structure(s) and the following conditions shall be met:
1. The equipment grounding conductor is the same size as the largest supply conductor, if of the same material, or is adjusted in size in accordance with the equivalent size columns of Table 250-122 if of different materials.
2. The equipment grounding conductor is bonded to the grounded circuit conductor at the disconnecting means enclosure at the distribution point or at the source of a separately derived system.
3. A grounding electrode system is provided in accordance with Part C of Article 250 and connected to the equipment grounding conductor at the building (s) or structure(s) disconnecting means.
4. The grounded circuit conductor is not connected to a grounding electrode or to any equipment grounding conductor on the load side of the distribution point.
(2) Disconnecting Means and Overcurrent Protection at the Distribution Point. Where the disconnecting means and overcurrent protection for each set of feeder conductors is located at the distribution point, feeders to building(s) or structure(s) shall meet the requirements of 250.32 and Article 225 Parts A and B.
FPN: Methods to reduce neutral-to-earth voltages in livestock facilities include supplying buildings or structures with four-wire single-phase services, sizing of three-wire service conductors to limit voltage drop to 2 percent, and connecting loads line-to-line.
(C) Underground Equipment Grounding Conductors. Where livestock is housed, any portion of the equipment grounding conductor run underground to the building or structure shall be insulated or covered copper.
SUBSTANTIATION: Several comments were submitted on this subject. The panel revises the section to accommodate all the concerns expressed.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 8
VOTE ON PANEL ACTION:
AFFIRMATIVE: 7
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
MCNEIVE: This comment and the original proposal decrease electrical safety. They would result in increased lengths of unprotected conductors, which in turn, exposes the switch and personnel to additional hazards. For the safety of personnel that might be exposed in the zone before the first overcurrent device, NEMA considers that overcurrent protection is required at the isolating device.
COMMENT ON AFFIRMATIVE:
BAUMAN: In 547-8(b)(1)(a) the reference should be 250.32 not 250?32.

(Log #569)

19- 24 - (547-8(a)(6) and (b)(1)): Accept in Principle
SUBMITTER: Robert A. McCullough, Ocean County Construction Insp. Dept., NJ
COMMENT ON PROPOSAL NO: 19-18a
RECOMMENDATION: Revise the following portions of the proposal as follows:
(A)(6) Grounding. The grounded conductor of the system shall be grounded at the ~~distribution~~ disconnecting means and be connected to a grounding electrode through a grounding conductor.
(B)(1) Disconnecting Means and Overcurrent Protection Located at the Building(s) or Structure(s). Where the disconnecting means and overcurrent protection are located at the buildings or structures supplied by the conductors, the conductors shall be sized in accordance with Part D of Article 220 and installed in accordance with the requirements of Part B of Article 225. Conductors of the supply system shall meet the clearances specified in 225.18 and 230.24(b).
(Remainder unchanged)
SUBSTANTIATION: The whole topic of (A) is about requirements for or at the disconnecting means. I believe the panel meant to use the word "disconnecting" rather than "distribution".
The change in (B)(1) is to conform to 4.1.1 of the NEC Style Manual requirements with regard to references to an entire article.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Refer to Comment 19-19a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 8
VOTE ON PANEL ACTION:
AFFIRMATIVE: 8
COMMENT ON AFFIRMATIVE:
BAUMAN: Should refer to Comment 19-19a. There is no 19-23a.
LAROCCA: See my Comment on Affirmative on Comment 19-20.
MCCULLOUGH: In the panel statement, change the referenced comment number to 19-19a. Comment 19-23a was the number used during the panel meeting and was subsequently changed after the statement was written.

(Log #215)

19- 25 - (547-9): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 19-26a
RECOMMENDATION: It was the action of the Technical Correlating Committee that further consideration be given to the comments expressed in the voting. This action will be considered by the panel as a public comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
PANEL STATEMENT: Refer to action on Comment 19-26
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 8
VOTE ON PANEL ACTION:
AFFIRMATIVE: 8
COMMENT ON AFFIRMATIVE:
BAUMAN: Should refer to Comment 19-19a. There is no 19-23a.

(Log #568)

19- 26 - (547-9): Accept in Principle
SUBMITTER: Robert A. McCullough, Ocean County Construction Insp. Dept., NJ
COMMENT ON PROPOSAL NO: 19-26a
RECOMMENDATION: Add the following sentence directly under the title and before (A):
For the purposes of this section, the term livestock does not include poultry.
SUBSTANTIATION: Refer to comment for Proposals 19-11 and 19-28.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Refer to Comment 19-37.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 8
VOTE ON PANEL ACTION:
AFFIRMATIVE: 8

(Log #1441)

19- 27 - (547-9): Accept in Part
SUBMITTER: Barry Bauman, Alliante Energy/Rep. American Society of Agricultural Engineers
COMMENT ON PROPOSAL NO: 19-18a
RECOMMENDATION: Delete text as follows:
(B) Electrical Supply. The buildings shall be permitted to be supplied by either (1) or (2):
(1) Disconnecting Means and Overcurrent Protection Located at the Building(s) or Structure(s). Where the disconnecting means and overcurrent protection are located at the buildings or structures supplied by the conductors, the conductors shall be ~~sized in accordance with Article 220 and~~ installed in accordance with the requirements of Part B of Article 225. ~~Conductors of the supply system shall meet the clearances specified in 225.18 and 230.24(b).~~
SUBSTANTIATION: The deleted language is redundant. Not all conductors are overhead.
PANEL ACTION: Accept in Part.
Refer to Comment 19-19a.
PANEL STATEMENT: Deletion of the reference to Article 220 is not accepted because it is needed for guidance of users.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 8
VOTE ON PANEL ACTION:
AFFIRMATIVE: 8
COMMENT ON AFFIRMATIVE:
MCCULLOUGH: In the panel statement, change the referenced comment number to 19-19a. Comment 19-23a was the number used during the panel meeting and was subsequently changed after the statement was written.

(Log #1678)

19- 28 - (547-9): Accept in Principle
SUBMITTER: Michael Blue, Hinterman Electric
COMMENT ON PROPOSAL NO: 19-26a
RECOMMENDATION: Change panel action from accept, to accept in part. Delete paragraph B in the proposal.
SUBSTANTIATION: Installing wire mesh in dirt floors of animal feeding and living areas is an extreme hazard. Animals will dig into the dirt and the wire mesh will be exposed, (this is very evident where water is present). Some animals that will be exposed to this hazard are very expensive and valuable, such as race horses and show horses. Owners will not want their animals exposed to this type of physical hazard just to minimize exposure to a very low voltage that in most cases is questionable if it has any effect on the animals.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Refer to action on Comment 19-37.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 8
VOTE ON PANEL ACTION:
AFFIRMATIVE: 8

(Log #2110)

19- 29 - (547-9): Accept in Principle
SUBMITTER: Truman C. Surbrook, Michigan State University
COMMENT ON PROPOSAL NO: 19-26a
RECOMMENDATION: Change Accept to Accept in Part and delete paragraph (B) of what will be 547.10 in the Code.
SUBSTANTIATION: Installing a metal mesh in the earth around equipment such as watering devices will result in injury to livestock. These areas will get wet and at some times of the year livestock will sink into the wet earth far enough to make contact with the equipotential plane elements. They are likely to get caught in the metal mesh and will become injured trying to free themselves. I have personally witnessed such damage to livestock. It is an ugly sight and definitely inhumane treatment of livestock. There has been no evidence presented to the Panel that would justify the installation of a metal mesh in earth either outside or inside buildings. The section that should be deleted states horse stalls as an example. Show horses in some cases are valued in the hundreds of thousands of dollars, and race horses are sometimes valued in the millions. Do not make this awful mistake. Even if evidence becomes available in the future that such an installation is recommended, there must be a better way.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Refer to action on Comment 19-37.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 8
VOTE ON PANEL ACTION:
AFFIRMATIVE: 8
COMMENT ON AFFIRMATIVE:
BAUMAN: This action should also refer to action on Comment 19-10 as well as 19-37.

(Log #216)

19- 30 - (547-9(a)): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 19-28
RECOMMENDATION: It was the action of the Technical Correlating Committee that further consideration be given to the comments expressed in the voting. This action will be considered by the panel as a public comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
PANEL STATEMENT: Refer to Comments 19-10 and 19-37.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 8
VOTE ON PANEL ACTION:
AFFIRMATIVE: 8
COMMENT ON AFFIRMATIVE:
BAUMAN: Should refer to Comment 19-19a. There is no 19-23a.

(Log #824)

19- 31 - (547-9(b)(1)): Accept
SUBMITTER: Mike Theisen, St. Cloud, MN
COMMENT ON PROPOSAL NO: 19-18a
RECOMMENDATION: Editorial change to make the first sentence easier to read:
Where the disconnecting means and overcurrent protection are located at the buildings or structures ~~supplied by the conductors,~~ the supply conductors shall be sized in accordance with Article 220 and installed in accordance with the requirements of Part II of Article 225.
SUBSTANTIATION: No change in the content of the sentence is intended.
PANEL ACTION: Accept.
Refer to Comment 19-19a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 8
VOTE ON PANEL ACTION:
AFFIRMATIVE: 8
COMMENT ON AFFIRMATIVE:
LAROCCA: See my Comment on Affirmative on Comment 19-20.
MCCULLOUGH: In the panel statement, change the referenced comment number to 19-19a. Comment 19-23a was the number used during the panel meeting and was subsequently changed after the statement was written.

(Log #1671)

19- 32 - (547-9(c)): Reject
SUBMITTER: Stephen Vitale, Battle Creek, MI
COMMENT ON PROPOSAL NO: 19-33
RECOMMENDATION: Change reject to accept.
SUBSTANTIATION: The problem of circuit tampering stated by the submitter is justified for general use circuits in livestock buildings, and these circuits are used for many applications on a daily basis. The wet conditions and long conductor runs will result in nuisance tripping. The grounding requirement in section in 547-4(f) will provide adequate safety and GFCIs are not needed.
PANEL ACTION: Reject.
PANEL STATEMENT: The GFCI requirements are to protect life and property in wet and damp environments. Nuisance tripping can be alleviated by design and maintenance.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 8
VOTE ON PANEL ACTION:
AFFIRMATIVE: 8

(Log #1703)

19- 33 - (547-9(c)): Reject
SUBMITTER: John Corbat, Breckenridge, MI
COMMENT ON PROPOSAL NO: 19-33
RECOMMENDATION: Change Reject to Accept.
SUBSTANTIATION: The original submitter's substantiation is correct. The Code Panel apparently does not understand the devices that are plugged into general use receptacles in livestock buildings. Loss of heat lamps can result in animal deaths. Loss of power to heat tapes can result in broken pipes and ruined equipment. General use receptacles in livestock barns are not only used for temporary power tools, but are frequently used for a variety of equipment for which failure of the circuit can result in ruined equipment and even animal death. Section 547-4(f) is extra grounding to ensure safety. If this rule is followed, there is no need to go to a GFCI that when nuisance tripping occurs, there will be tampering to make sure it does not happen again.
PANEL ACTION: Reject.
PANEL STATEMENT: Refer to panel statement on Comment 19-32.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 8
VOTE ON PANEL ACTION:
AFFIRMATIVE: 8

(Log #2111)

19- 34 - (547-9(c)): Reject
SUBMITTER: Jonathan R. Althouse, Michigan State University
COMMENT ON PROPOSAL NO: 19-36
RECOMMENDATION: Change Reject to Accept.
SUBSTANTIATION: No accident statistics have been provided by the Panel that justified the requirement of GFCI protection on general use receptacles in buildings with equipotential planes. The Panel is evidently not aware of the equipment that is supplied by general use receptacles in livestock buildings. These receptacles are not simply convenience outlets. These receptacles are used for electrical devices that can even result in animal death if the circuit trips off. The long runs and high humidity will result in nuisance tripping. Section 547-4(f) requires grounding that is beyond most other types of installations. This extra grounding is sufficient to provide the safety that is needed. Agricultural operators will tamper with these circuits when nuisance tripping occurs, often rendering the circuit unsafe for operation.
PANEL ACTION: Reject.
PANEL STATEMENT: Refer to panel statement on Comment 19-32.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 8
VOTE ON PANEL ACTION:
AFFIRMATIVE: 8

(Log #2112)

19- 35 - (547-9(c)): Reject
SUBMITTER: Jonathan R. Althouse, Michigan State University
COMMENT ON PROPOSAL NO: 19-34
RECOMMENDATION: Change Accept in Principle to Reject.
SUBSTANTIATION: No accident statistics have been provided by to justify GFCI protection for general use receptacles in areas with equipotential plans. Now the Panel has approved GFCI protection for outdoor and all wet locations. That just about includes every location on a farm. Why not require them in the same locations for commercial and industrial establishments. There is probably a greater need for them in those locations. If there was a justification for them in industrial and commercial locations, OSHA probably would have required them in those locations long ago. General use receptacles outdoors are frequently used for powering portable motorized equipment. Nuisance tripping will occur. Outdoor general use receptacles will supply equipment frequently with long extension cord runs. There will be nuisance tripping. The grounding requirements of Section 547-4(f) are adequate to provide a reasonable degree of safety to personnel from electrical shock. This change will cause more problems than it attempts to solve.
PANEL ACTION: Reject.
PANEL STATEMENT: Refer to panel statement on Comment 19-32.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 8
VOTE ON PANEL ACTION:
AFFIRMATIVE: 8

(Log #2238)

19- 36 - (547-9(c)): Accept
SUBMITTER: Thomas J. Garvey, Milwaukee, WI
COMMENT ON PROPOSAL NO: 19-34
RECOMMENDATION: Revise the list of locations where GFCI protection is required, to read:
(1) In areas having an equipotential plane.
(2) Outdoors
(3) Damp or Wet Locations.
SUBSTANTIATION: The submitter equated the level of protection to be equal to outdoor and in wet areas of the farm dwelling. The only wet area in a typical farm dwelling is the inside of a tub or shower area. No receptacles permitted there. Yet other "damp" locations in the dwelling are required to have GFCI protected receptacles. An unfinished basement may be damp or dry yet general use receptacle outlets are required to be GFCI protected. The environment inside of a barn is much more hostile than the dwelling basement. Higher levels of moisture, direct contact with a damp concrete or earthen floor, somewhat corrosive atmosphere, increased levels of physical damage to extension cords and portable appliances are all conditions that I commonly observe in the barn. The use of portable appliances to groom animals, heat or de-ice water, and employ portable tools are common. This presents the same type of hazard that permitted Panel 2 to add requirements for GFCI protection in dwelling kitchens, bathrooms, and unfinished basements.
The use of GFCI protection for personnel is also required in commercial garages, and is required with the conditions and use of electrical appliances similar to that of the barn.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 8
VOTE ON PANEL ACTION:
AFFIRMATIVE: 8

(Log #1442)

19- 37 - (547-10): Accept in Principle
Note: **The Technical Correlating Committee understands that the Panel Action on Comment 19-10 modifies the action on this Comment.**
The Technical Correlating Committee directs that "does" be changed to "shall" in the first sentence of 547.10 to comply with 3.1.1 of the NEC Style Manual.
SUBMITTER: Barry Bauman, Alliant Energy/Rep. American Society of Agricultural Engineers
COMMENT ON PROPOSAL NO: 19-26a
RECOMMENDATION: Replace the proposed language in Proposal 19-26a with:
547.10 Equipotential Planes and Bonding of Equipotential Planes
A) Buildings or Areas Within Buildings Requiring Equipotential Planes. Equipotential planes shall be installed in all concrete floor confinement areas of livestock buildings that contain metallic equipment that is accessible to animals and likely to become energized.
B) Areas Requiring Equipotential Planes. Outdoor dirt and concrete

surface confinement areas, such as feedlots, shall have equipotential planes installed around metallic equipment that is accessible to animals and likely to become energized. The equipotential plane shall encompass the area around the equipment where the animal will stand while accessing the equipment.

C) Areas Not Requiring Equipotential Planes. In dirt confinement areas with metallic equipment that is accessible to animals and likely to become energized and where concrete surfaces are detrimental to animal well being, an equipotential plane shall not be required. However, all circuits providing electric power to equipment that is accessible to animals in the confinement area shall have GFCI protection.

D) Bonding. Equipotential planes shall be bonded to the electrical grounding system. The bonding conductor shall be copper, insulated, covered or bare, and not smaller than 8 AWG. The means of bonding to wire mesh or conductive elements shall be by pressure connectors or clamps of brass, copper, copper alloy, or an equally substantial approved means. Slatted floors that are supported by structures that are a part of an equipotential plane shall not require bonding.

FPN No. 1: Methods to establish equipotential planes are described in "Equipotential Planes in Animal Containment Areas", American Society of Agricultural Engineers (ASAE) EP473-1997.

FPN No. 2: Low grounding electrode system resistances may reduce potential differences in livestock facilities.

SUBSTANTIATION: The requirements for equipotential planes have been reorganized to clarify the area where equipotential planes are necessary. A separate section was added for "Areas Not Requiring Equipotential Planes." This section addresses requirements for dirt confinement areas that have equipment that is accessible to animals.

PANEL ACTION: Accept in Principle.

Accept the proposal with the following revisions:

1. Revise 547-10 to read:

547.10 Equipotential Planes and Bonding of Equipotential Planes. For the purposes of this section, the term "livestock" does not include poultry.

(A) Areas Requiring Equipotential Planes. Equipotential planes shall be installed in all concrete floor confinement areas of livestock buildings that contain metallic equipment that is accessible to animals and likely to become energized. Outdoor confinement areas, such as feedlots, shall have equipotential planes installed around metallic equipment that is accessible to animals and likely to become energized. The equipotential plane shall encompass the area around the equipment where the animal stands while accessing the equipment.

(B) Areas Not Requiring Equipotential Planes. Equipotential planes shall not be required in dirt confinement areas containing metallic equipment that is accessible to animals and likely to become energized. All circuits providing electric power to equipment that is accessible to animals in dirt confinement areas shall have GFCI protection.

(C) Bonding. Equipotential planes shall be bonded to the electrical grounding system. The bonding conductor shall be copper, insulated, covered or bare, and not smaller than 8 AWG. The means of bonding to wire mesh or conductive elements shall be by pressure connectors or clamps of brass, copper, copper alloy, or an equally substantial approved means. Slatted floors that are supported by structures that are a part of an equipotential plane shall not require bonding.

FPN No. 1: Methods to establish equipotential planes are described in Equipotential Planes in Animal Containment Areas, American Society of Agricultural Engineers (ASAE) EP473-2001.

FPN No. 2: Low grounding electrode system resistances may reduce potential differences in livestock facilities.

PANEL STATEMENT: The intent of the commentor, and the submitter of other comments on the subject, is accomplished in the revisions that clairfy that equipotential planes are not required in dirt areas.

Comment 19-26 is also incorporated in the revision.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 8

VOTE ON PANEL ACTION:

AFFIRMATIVE: 8

(Log #2303)

19- 38 - (547-10): Accept in Principle

SUBMITTER: Robert J. Flick, Alliant Energy

COMMENT ON PROPOSAL NO: 19-30

RECOMMENDATION: Revise as follows:

(B) Areas Requiring Equipotential Planes. Outdoor and <u>indoor</u> concrete surface confinement areas such as feedlots, ~~and indoor or outdoor dirt surface areas such as horse stalls and feedlots~~ shall have equipotential planes installed around metallic equipment that is accessible to animals and likely to become energized. The equipotential plane shall encompass the area around the equipment where the animal will stand while accessing the equipment.

SUBSTANTIATION: A plane would need to be buried many feet below the surface that the livestock is standing on to ensure that the livestock can not dig down to the plane and be harmed by it. Equipotential planes are rarely if every installed under dirt surfaces and builders/inspectors have minimal information on how to install a plane under dirt and what to require.

PANEL ACTION: Accept in Principle.

PANEL STATEMENT: Refer to action on Comment 19-37.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 8

VOTE ON PANEL ACTION:

AFFIRMATIVE: 8

ARTICLE 550 — MOBILE HOMES, MANUFACTURED HOMES, AND MOBILE HOME PARKS

(Log #217)

19- 39 - (550): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 19-37
RECOMMENDATION: The Technical Correlating Committee advises that Article Scope statements are the responsibility of the Technical Correlating Committee and the Technical Correlating Committee accepts the Panel Action. The Technical Correlating Committee directs that the Panel clarify the Panel action on this Proposal as expressed in the Affirmative Comment and to clarify in 550-13(d)(9) if the inclusion of the word "or" between "lighting" and "fixture" in the third sentence was the Panel's intent. This action will be considered by the Panel as a Public Comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
PANEL STATEMENT: Refer to Panel action on Comment 19-42.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #218)

19- 40 - (550-2-Manufactured Home): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 19-39
RECOMMENDATION: The Technical Correlating Committee understands that the acton on this proposal further modifies the action on Proposal 19-37. The Technical Correlating Committee further directs the Panel to clarify the use of "sq ft" relative to the use of SI units. This action will be considered by the Panel as a Public Comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
PANEL STATEMENT: Refer to action on Comment 19-72.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #1615)

19- 41 - (550-2-Manufactured Home): Reject
SUBMITTER: Robert Molde, Xeel Energy
COMMENT ON PROPOSAL NO: 19-39
RECOMMENDATION: We do not agree with the proposal as accepted. The labeling that presently identifies a building as a manufactured home has been removed from this proposed wording. We propose that the committee reinsert the wording "that bears a label identifying it as a manufactured home" after the word "structure" in the first line of the proposed definition.
SUBSTANTIATION: The present definitions in the NEC for manufactured homes and mobile homes causes confusion between electrical contractors and utilities serving the home. Utilities identify a manufactured home by the labeling. It is our understanding that not all transportable-homes are wired the same. Removing the label will only add confusion.
PANEL ACTION: Reject.
PANEL STATEMENT: The FPN to 550.1 in the 2002 edition will refer the user to Part 3280, Manufactured Home Safety Standards and NFPA 501 where labeling requirements are located.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #564)

19- 42 - (550-13(d)(9)): Accept in Principle
SUBMITTER: Robert A. McCullough, Ocean County Construction Insp. Dept., NJ
COMMENT ON PROPOSAL NO: 19-37
RECOMMENDATION: In item #3 of the panel action for 550.13(D)(9), revise the third sentence as follows:

This receptacle shall be in addition to any receptacle that is a part of a ~~lighting or fixture~~ luminaire or appliance.

SUBSTANTIATION: The inclusion of the word "or" was inadvertent and should be removed. Additionally, the term "lighting fixture" is to be replaced with the term "luminaire" based on the panel's acceptance in principle and in part of Proposals 19-1 and 19-2.
PANEL ACTION: Accept in Principle.
In item #3 of the panel action for 550.13(D)(9), revise the third sentence as follows:

This receptacle shall be in addition to any receptacle that is a part of a ~~lighting or fixture~~ luminaire (fixture) or appliance.

PANEL STATEMENT: The comment is accepted and the word "fixture" in parenthesis is added to correlate with the action on Comment 19-1.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #627)

19- 43 - (550-23(a)): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
COMMENT ON PROPOSAL NO: 19-59
RECOMMENDATION: Accept proposal.
SUBSTANTIATION: The disconnecting means required downstream from the service equipment which is not located in sight from and within 30 ft of the mobile home is not the service equipment unless there can be two services in series. It appears to be a feeder disconnecting means. A disconnecting means may be suitable for service equipment but such suitability does not make it service equipment. Subsection (c) specifies a minimum rating for service equipment. An intermediate disconnecting means may be rated less than 100 amperes and be listed (suitable) for use as service equipment. If a nonfusible switch is used, is it covered by the definition of Mobile Home Service Equipment in 550-2?
PANEL ACTION: Reject.
PANEL STATEMENT: The panel affirms its statement in the ROP, and notes that the submitter provides no documentation of problems.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #1186)

19- 44 - (550-23(a)): Reject
SUBMITTER: Joseph D. Baber, Minnesota State Board of Electricity
COMMENT ON PROPOSAL NO: 19-61
RECOMMENDATION: Provide an exception to 550-23(a) as follows:

Exception: Service equipment for both mobile and manufactured homes located on private property shall be permitted to be in sight from and not more than 100 ft from the exterior wall of the home it serves provided that all of the conditions listed in 550-23(b) are met.

SUBSTANTIATION: In addition to the substantiation I presented in my original proposal, I would like to add my safety concern speaking as a member of a rural fire department. Procedure for most fire departments is the disconnection of power to the home before any water is used. The service disconnect that is required to be within 30 ft is usually adjacent to the home and almost always near a propane tank. These fires are extremely hot and well underway by the time the firefighters arrive. The close proximity of the service disconnect and the propane tank put the firefighters in a dangerous situation. Most of the time, these homes and their contents are a total loss because of the risk involved. I'm sure the NFPA has these statistics.

Note: Supporting material available for review upon request at NFPA headquarters.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel affirms its reason for rejection in the ROP and notes that technical justification of the proposed distance is still not provided. In the ROC for the 1996 edition extensive comments, with technical justification, were received to reject a proposal to change the distance to 50 ft.

Spacing of propane tanks is covered by NFPA 58, Liquefied Petroleum Gas Code.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #1008)

19- 45 - (550-23(a), Exception (New)): Reject
SUBMITTER: Harlan Rustad, PKM Electric
COMMENT ON PROPOSAL NO: 19-61
RECOMMENDATION: Provide an exception to 550-23(a) as follows:

Exception: Service equipment for both mobile and manufactured homes located on private property shall be permitted to be in sight from and not more than 100 ft. from the exterior wall of the home it serves provided that all of the conditions listed in 550-23(b) are met.

SUBSTANTIATION: The 30 ft rule many times causes a duplication of disconnects as the yard switch PKM elect installs is a combination meter and SW UL listed for service equipment but may be more than 30 ft away from home.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel affirms its reason for rejection in the ROP and notes that technical justification of the proposed distance is still not provided. In the ROC for the 1996 edition extensive comments, with technical justification, were received to reject a proposal to change the distance to 50 ft.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #1015)

19- 46 - (550-23(a), Exception (New)): Reject
SUBMITTER: Ronald Abrahamson, PKM Electric Cooperative, Inc.
COMMENT ON PROPOSAL NO: 19-61
RECOMMENDATION: Provide an exception to 550-23(a) as follows:

Exception: Service equipment for both mobile and manufactured homes located on private property shall be permitted to be in sight from and not more than 100 ft from the exterior wall of the home it serves provided that all of the conditions listed in 550-23(b) are met.

SUBSTANTIATION: In 99% of the cooperative's installations our cooperative has a service disconnect less than 100 feet from any home or mobile home, I see no reason to duplicate having a second disconnect by having one any closer.
PANEL ACTION: Reject.
PANEL STATEMENT: Refer to panel statement on Comment 19-45.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #1487)

19- 47 - (550-23(a), Exception): Reject
SUBMITTER: Maurice Lind, Lind Electric
COMMENT ON PROPOSAL NO: 19-61
RECOMMENDATION: Provide an exception to 550-23(a) as follows:

Exception: Service equipment for both mobile and manufactured homes located on private property shall be permitted to be in sight from and not more than 100 ft. from the exterior wall of the home it serves provided that all of the conditions listed in 550-23(b) are met.

SUBSTANTIATION: None.
PANEL ACTION: Reject.
PANEL STATEMENT: The commentor provides no substantiation as required in 4-4.5 (d) of the NFPA Regulations Governing Committee Projects. Also, refer to panel statement on Comment 19-45.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #916)

19- 48 - (550-23(d)): Accept
SUBMITTER: Gary R. Davis, Saratoga Springs, NY
COMMENT ON PROPOSAL NO: 19-65
RECOMMENDATION: This proposal as it would read below should be "accept in principle" with the suggested additions shown:

550.23(d) Additional Outside Electrical Equipment. Means for connecting a mobile home accessory building or structure, or additional electrical equipment located outside a mobile home by a fixed wiring method shall be provided in either the mobile home service equipment or the local external disconnecting means permitted in Section 550.23(a).

SUBSTANTIATION: The issue concerns the elimination of 230-82, Exception No. 2 from the 1996 NEC. When that Exception was removed, it clarified that a tenant breaker in metering equipment was to be considered the "Service Equipment." As a result, "multiple meter packs" would not be able to be used in mobile home parks because they have provisions for the tenant breaker only. The intent of the NEC is to provide a means for connecting outside equipment without using the panel inside the mobile home and the local external disconnecting means permitted in Section 550.23(a) is certainly an alternate location that could be used to serve other outside equipment. However, the NEC currently has this requirement for the "Service Equipment." Prior to the elimination of 230-82, Exception No. 2 from the 1996 NEC, it was permitted to consider the disconnect at the metering merely that, a disconnect ahead of service equipment. The "local disconnect" was then established as the actual "Service Equipment" and everybody was happy.

The language needs to be clarified in order to prevent the combination meter-breaker center from being a violation and to permit the requirements of 550.23(d) to be met at the local disconnect. I have taken another attempt at the rewrite to make the section more clear.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #1365)

19- 49 - (550-23(d)): Accept in Principle
SUBMITTER: David P. Brown, Baltimore Gas and Electric Co/EEI
COMMENT ON PROPOSAL NO: 19-65
RECOMMENDATION: This Proposal should be "Accept in Principle".
SUBSTANTIATION: The Panel did not provide specific technical substantiation to reject the proposal. Please refer to the sketch provided and commentary to gain a better understanding of the problem and the need to "Accept In Principle".

The key issue here is that the additional disconnect is not service equipment. The combination meter-breaker center becomes the "service equipment". The disconnect contained in the combination meter-breaker center is not permitted ahead of a "service disconnect" (see Section 230-82). The combination meter-breaker center, in fact, becomes the service equipment and the "local disconnect" is no more than a sub-panel being fed from a feeder. Just because the local disconnect is to be listed for use as service equipment doesn't mean it is service equipment. The language needs to be clarified in order prevent the combination meter-breaker center from being a violation and to permit the requirements of 550-23(d) to be met at the local disconnect.

NOTE: Supporting Material is available for review at NFPA Headquarters.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Refer to action on Comment 19-48.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #562)

19- 50a - (550-25 (New)): Reject
SUBMITTER: Robert A. McCullough, Ocean County Construction Insp. Dept., NJ
COMMENT ON PROPOSAL NO: 19-69
RECOMMENDATION: Reject the proposal.
SUBSTANTIATION: To further state my negative vote on the proposal, NFPA 501 is slated to become the primary source of construction standards for manufactured housing and be incorporated into the HUD Part 3280 rules. It will contain the "what you need" requirements for electrical installations. The NEC is a referenced standard and basically would be used for the "how you do it" requirements. If there are inconsistencies between the rules of the NEC and the Federal Standard, the Federal Standard preempts. As such, placing the requirement for AFCIs in the NEC will not accomplish the goal of requiring their installation in manufactured housing. The NFPA 501 committee rejected the

proposal for adding this requirement in the 2000 edition of NFPA 501. CMP 19's action on Proposal 19-37 was to ensures consistency with NFPA 501. That was the panel's statement. Acceptance of this proposal ensure inconsistency with respect to the AFCI issue. This comment is not intended to debate the merits of AFCIs it is only to point out that relative to construction requirements for manufactured housing, placing this rule in the NEC will not result in the installation of AFCIs in a manufactured home. It will merely place two excellent NFPA documents at odds with each other.
PANEL ACTION: Reject.
PANEL STATEMENT: The Panel affirms its action on the proposal.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #1799)

19- 50 - (550-25): Accept
SUBMITTER: Robert J. Clarey, Cutler-Hammer, Inc.
COMMENT ON PROPOSAL NO: 19-69
RECOMMENDATION: Continue to accept in principle in part.
SUBSTANTIATION: The Code Making Panel, by their action, have ensured that the bedrooms of mobile homes and manufactured homes will receive the same AFCI protection as dwelling unit bedrooms (NEC 210-12). With respect to Mr. McCullough's comment, we consider that it is timely to include this safety requirement in the National Electrical Code. The NEC safety requirements for bedrooms will be consistent and there can be subsequent discussion with NFPA 501. With respect to Mr. Weakley's comment, at the proposal stage there was considerable panel discussion about the relevance of Chapters 1 through 4 to manufactured homes. Cutler-Hammer considers that inclusion of the requirement in 550-25 is the correct approach, and that possible redundancy is more than offset by the provision of increased fire safety. The other comment was that the product would eventually be an integral part of all circuit breakers, and by reference would be covered in other articles. This situation, however, is many years in the future. The present code panel action is a necessary first step towards overall protection for dwelling units, mobile homes and manufactured homes.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #319)

19- 51 - (550-32): Reject
SUBMITTER: Alan H. Nadon, City of Elkhart, IN
COMMENT ON PROPOSAL NO: 19-37
RECOMMENDATION: Text changes to part (b) of 550-~~23~~32 should be rejected.
SUBSTANTIATION: HUD labeled manufactured homes are not the same as site built homes or manufactured homes built to CABO or BOCA standards. Locating the service in or on a HUD home unless installed at the factory is a field conversion not permitted under HUD standard 3280.
Note: Supporting material is available for review at NFPA Headquarters.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel affirms it action as published in the ROP. The HUD standard does not apply after the first retail sale of Manufactured Housing.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #825)

19- 52 - (550-32): Reject
SUBMITTER: Mike Theisen, St. Cloud, MN
COMMENT ON PROPOSAL NO: 19-57, 19-60, 19-61
RECOMMENDATION: Please reconsider the proposals which would allow for a manufactured home, located on private property, to have the service/disconnecting means located more than 30 ft from the manufactured home. This can be accomplished by adding text to the last sentence of section 550.32(B) as follows:
Where the service equipment is not installed in or on the unit, the installation shall comply with ~~the other provisions of this section~~ all of the following requirements:
(1) The manufactured home is secured to a permanent foundation and located on private property.
(2) The remote service/disconnecting means is located within sight from and not more than 100 ft from the exterior wall of the manufactured home.
SUBSTANTIATION: Owner/occupants of manufactured homes are required to purchase redundant equipment, pay for the additional installation time for that equipment, and have to contend with an additional obstacle in their yard; all of which appears to be overkill. Economically disadvantaged people can afford a manufactured home more readily than purchase a site built home. The "mobile home park" requirements applied to private property are discriminating against these folks, who cannot afford these extra costs.
PANEL ACTION: Reject.
PANEL STATEMENT: Refer to statement on Comment 19-45.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #565)

19- 53 - (550-32(b)(1)): Accept
SUBMITTER: Robert A. McCullough, Ocean County Construction Insp. Dept., NJ
COMMENT ON PROPOSAL NO: 19-37
RECOMMENDATION: In item #5 of the panel action for 550.32(B)(1), revise the text to read as follows:
(1) The manufacturer shall include in its written installation instructions information indicating that the home shall be secured in place by an anchoring system or installed on and secured to a permanent foundation.
SUBSTANTIATION: The revised language reflects the panel's intent for its action on 550.32(B)(1). The correct language as shown above is contained in the ROP draft.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

ARTICLE 551 — RECREATIONAL VEHICLES AND RECREATIONAL VEHICLE PARKS

(Log #219)

19- 54 - (551-2-Recreational Vehicle Site): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 19-73
RECOMMENDATION: It was the action of the Technical Correlating Committee that further consideration be given to the comments expressed in the voting. This action will be considered by the panel as a public comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
PANEL STATEMENT: Refer to the substantiation on Comment 19-55.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #555)

19- 55 - (551-2-Recreational Vehicle Site): Accept
SUBMITTER: Robert A. McCullough, Ocean County Construction Insp. Dept., NJ
COMMENT ON PROPOSAL NO: 19-73
RECOMMENDATION: Continue to accept the panel action.
SUBSTANTIATION: The panel has accepted the submitter's text and substantiation on the premise that this text was the single consistent definition for the term as determined by the glossary project. The panel was also advised by a member that the document number had been changed and the panel statement reflects that. The March 2000 CD-ROM version of NFPA 1194 contains the following definitions: [Note that the text of A-1-3 is

from Appendix A and is not an actual definition]

Camping Unit. A tent or other type of portable shelter intended, designed, or used for temporary human occupancy.

Camping Unit Site. A specific area within a campground or recreational vehicle park that is set aside for uses as a temporary living site by a camping unit. [See also definitions of Recreational Vehicle Site (including A-1-3) and Recreational Unit Site.]

Recreational Unit Site. Either a recreational vehicle site or a camping unit site. [See definitions of Recreational Vehicle Site (including A-1-3) and Camping Unit Site.]

Recreational Vehicle Site*. A plot of ground within a recreational vehicle park set aside for the accommodation of a recreational vehicle on a temporary basis that can be used as either a recreational vehicle site or as a camping unit site. (See definition of Camping Unit Site.)

A-1-3 Recreational Vehicle Site. The term "recreational unit site" (see definition) is used in this standard when it is desired to describe conditions that apply equally to a "recreational vehicle site" and to a "camping unit site" (see definitions).

If the panel were to substitute the term "Camping Unit Site" in place of "Recreational Vehicle Site" as the defined term, the two documents would be even further apart. This would then entail adding a further definition of what a Camping Unit is and neither "Camping Unit" or "Camping Unit Site" mention a recreational vehicle except by a parenthetical note. All references throughout Article 551 would have to be checked in context to determine which term should be used in a particular section. I believe this would introduce too much confusion at the comment stage and may possibly introduce new material that has not had adequate public review.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13

VOTE ON PANEL ACTION:

AFFIRMATIVE: 13

(Log #288)

19- 56 - (551-20(b)): Accept

SUBMITTER: Kent Perkins, RVIA

COMMENT ON PROPOSAL NO: 19-79

RECOMMENDATION: Revise the proposal to read as follows:

.... in the closed position or refrigerators with a 120V function shall not be...

SUBSTANTIATION: If the refrigerator has a 120V function, it does not matter if the 120V function has automatic priority over the 12V function. The customer will not use the 12V function on a nonautomatic mode selection refrigerator where the 120V function is present. 12 volts are not as efficient as 120 volts. Also, refrigerator instructions indicate 12V function is only for maintenance during travel and after cooling is accomplished. Therefore, a refrigerator with 120V function should not be included as a load when conducting converter rating calculations.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

NEGATIVE: 2

EXPLANATION OF NEGATIVE:

VEENSTRA: I concur with negative ballot and comment by Mike Zieman.

ZIEMAN: The acceptance of this comment by the committee creates a dangerous and hazardous electrical installation which is unparalleled in the NEC.

First, and as background, we need to remember that the current 1999 NEC and all previous editions require that the refrigerator load be included in calculating or sizing the converter. The original proposal as submitted by Terry Current of Jayco, Inc., and accepted by the committee would exclude "refrigerators with 120-volt function priority over 12-volt function". This change can be justified since as soon as the RV is connected to 120-volts the refrigerator will automatically switch from 12-volt to 120-volt, thus the refrigerator load will never be applied to the converter.

The subject comment submitted by RVIA eliminates the automatic "function priority" and has the net effect of allowing the 12-volt refrigerator load (which is significant) to be supplied by the converter without sizing the converter for this additional load. The proponent states that this will not happen because "... the customer will not use the 12V function on a nonautomatic mode selection refrigerator where the 120V function is present." I strongly disagree that we can rely on the "customer" to replace the automatic function priority requirement. And if we do rely on the "customer" as the proponent puts forth what are the consequences of repeatable overloading the converter when the customer fails, as he surely will, to switch over to 120-volt operation?

I believe the following is a scenario which will be repeated thousands of times if we eliminate the automatic function priority requirement. The nonautomatic function priority refrigerator will be set in the 12-volt mode during travel. The RV owner then pulls into an RV site and connects his power supply cord to 120/240 forgetting to first manually switch the refrigerator to 120-volt operation. As other 12-volt loads such as space heaters, water heaters, lights, etc. kick in the converter trips its breaker or kicks out on its over temperature thermal protection. If the RV owner is bright, he may figure out why this keeps happening and start manually switching the refrigerator each time he connects to 120/240 power. The less bright owner will take his RV back to the dealer or manufacturer and ask them to fix the "problem" with the converter that keeps kicking out. Worse yet some owners will do nothing subjecting the converter to many overload cycles which could potentially damage the over temperature thermal protection leading to fires or other catastrophes.

The proponent also implies that we can rely on the customer to follow the "... refrigerator instructions..." which state to only use the 12-volt mode in travel, etc. I do not believe this is prudent.

Lastly, I would like to draw an analogy and ask a rhetorical question. Would we allow two 15-amp air conditions to be placed on a single 20-amp circuit based solely upon reliance on the "customer" to follow inconspicuous "instructions" to only operate one unit at a time?

Currently, the 12-volt refrigerator load is always included in sizing the converter. The original proposal allows a justifiable exception when the refrigerator has automatic function priority. The proposal put forth in the comment from RVIA will create a hazard not to mention thousands of RV owners inconvenienced by converters which keep kicking out. If the RV manufacturer wants to exclude the 12-volt refrigerator load from the converter let him spend the few extra dollars to upgrade the refrigerator from nonautomatic function priority to automatic function priority.

(Log #289)

19- 57 - (551-20(c)): Accept in Principle

SUBMITTER: Kent Perkins, RVIA

COMMENT ON PROPOSAL NO: 19-80

RECOMMENDATION: Accept original proposal but change to the unit shall ~~should~~ be provided...

SUBSTANTIATION: The original proposal prevents a potentially unsafe situation concerning the path of fault currents in specific situations and should be accepted.

PANEL ACTION: Accept in Principle.

Revise 551-20(c) to read:

(c) Bonding Voltage Converter Enclosures. The noncurrent-carrying metal enclosure of the voltage converter shall be bonded to the frame of the vehicle with a minimum 8 AWG copper conductor. The voltage converter shall be provided with a separate chassis bonding conductor that shall not be used as a current carrying conductor.

PANEL STATEMENT: The comment is accepted, and the second sentence is revised editorially for clarity.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13

VOTE ON PANEL ACTION:

AFFIRMATIVE: 13

(Log #290)

19- 58 - (551-44): Reject

SUBMITTER: Kent Perkins, RVIA

COMMENT ON PROPOSAL NO: 19-83

RECOMMENDATION: Reject the panel action to change this paragraph.

SUBSTANTIATION: There is nothing unsafe about an RV having two (or more) properly installed power supply assemblies. The lack of proper service to supply RVs with increasing overall load capacities should be corrected by a change in the park service(s), not the RV. The market has already shown that customers desire RVs with higher total electrical load capacity, and increased service capability at the parks is needed.

PANEL ACTION: Reject.

PANEL STATEMENT: The use of more than one power supply assembly can overload the conductors for the site services. It would also nullify Table 551-73.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13

VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
COMMENT ON AFFIRMATIVE:
SABIN-MERCADO: The requested change could be supported if a proposal(s) were submitted and approved to amend Section 551.73 and Table 551.73 as needed for the 2005 NEC.

(Log #2389)

19- 59 - (551-44): Reject
SUBMITTER: John Nelson, Alfa Leisure Inc.
COMMENT ON PROPOSAL NO: 19-83
RECOMMENDATION: I urge the panel to reject the recommendation to revise (551-44) adding, "Each recreational vehicle should have one and only of the following main power supply assemblies.
SUBSTANTIATION: If a recreational vehicle park wants to assure that consumers do not exceed the calculated load at a park, it is a simple and low cost matter to use a disconnecting means rated to the highest rated receptacle at the site. The proliferation of adapters and other "cheaters" that are not listed cannot be controlled by RV manufacturers or parks and are a fact of life.
More than one power assembly can be installed on an RV and be safe following existing code. Restricting RV manufacturers from supplying more than one power assembly is not the solution. If there is a safety problem, it is on the line side of the site, and it is the responsibility and under the control of the park.
PANEL ACTION: Reject.
PANEL STATEMENT: Refer to Comment 19-58.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
COMMENT ON AFFIRMATIVE:
SABIN-MERCADO: The requested change could be supported if a proposal(s) were submitted and approved to amend Section 551.73 and Table 551.73 as needed for the 2005 NEC.

(Log #528)

19- 60 - (551-46): Accept
SUBMITTER: Craig M. Wellman, Newark, DE
COMMENT ON PROPOSAL NO: 19-85
RECOMMENDATION: Revise as follows:
The cord exposed usable length, measured to the point of entry on the vehicle exterior, shall be a minimum of ~~25 ft (7.62 m)~~ 7.5 m (25 ft) where the proposed entry is at the side of the vehicle, or shall be a minimum of ~~30 ft (9.15 m)~~ 9 m (30 ft) where the point of entrance is at the rear of the vehicle.
SUBSTANTIATION: The proposed revision is intended to comply with the NFPA No. 1M Manual of Style Section 4 with respect to the placement of units and values of measurement. It was developed by the NEC Technical Correlating Committee Metrication Task Group which included: James Daly; Bruce Barrow; Michael Callanan; Richard Berman; Ed Lawry; Neil LaBrake, Jr.; Jim Pauley; Jack A Gruber; George Dauberger; Ravi Ganatra; and Craig Wellman.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #1443)

19- 61 - (551-72): Accept
SUBMITTER: Barry Bauman, Alliante Energy/Rep. American Society of Agricultural Engineers
COMMENT ON PROPOSAL NO: 19-110
RECOMMENDATION: Revise the first sentence of 551.72 to read as follows:
551.72 Distribution System. Receptacles rated at 50-ampere shall be supplied from a branch circuit of the voltage class and rating of the receptacle.
SUBSTANTIATION: This language indicates the requirement to have 120/240 volts at the receptacle. I believe the intent of this sentence is to indicate the voltage required at the receptacle and not to specify the utility service voltage. This language is now similar to that used in 555-5 of the 1999 NEC and 555.19 of the proposed 2002 NEC for Marinas and Boatyards.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
COMMENT ON AFFIRMATIVE:
WEAKLEY: If this language is used, it should be supported by a "FPN" as in 1999 NEC 555-5. This will alert users of the code to the 120/240V requirement.

(Log #220)

19- 62 - (551-77(a)): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 19-114
RECOMMENDATION: The Technical Correlating Committee directs that the Panel clarify the Panel Action on this Proposal regarding the SI units. This action will be considered by the Panel as a Public Comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
PANEL STATEMENT: Refer to Comment 19-63
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #561)

19- 63 - (551-77(a)): Accept
Note: The Technical Correlating Committee understands that the last sentence in the Recommendation is a separate paragraph as shown in the Report on Proposals
SUBMITTER: Robert A. McCullough, Ocean County Construction Insp. Dept., NJ
COMMENT ON PROPOSAL NO: 19-114
RECOMMENDATION: Revise the panel action as follows:
Delete the existing text of 551-77(a) and replace with the following:
(A) Location. Where provided on back-in sites, the recreational vehicle site electrical supply equipment shall be located on the left (road) side of the parked vehicle, on a line that is 1.5 m to 2.1 m (5 ft to 7 ft) from the left edge (driver's side of the parked RV) of the stand and shall be located at any point on this line from the rear of the stand to 4.5 m (15 ft) forward of the rear of the stand.
For pull-through sites, the electrical supply equipment shall be permitted to be located at any point along the line that is 1.5 m to 2.1 m (5 ft to 7 ft) from the left edge (driver's side of the parked RV) from 4.9 m (16 ft) forward of the rear of the stand to the center point between the two roads that gives access to and egress from the pull-through sites. The left edge (driver's side of the parked RV) of the stand shall be marked.
SUBSTANTIATION: This language reflects the panel's intent,clarifies which dimensions were meant to be changed, and shows the net result of the panel's action. This text appears in the ROP draft document.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #221)

19- 64 - (551-77(d)): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 19-115
RECOMMENDATION: The Technical Correlating Committee directs that the Panel reconsider the Panel Action and correlate with 380-8(a) regarding the SI units. This action will be considered by the Panel as a Public Comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
PANEL STATEMENT: Refer to Comment 19-65.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #559)

19- 65 - (551-77(d)): Accept
SUBMITTER: Robert A. McCullough, Ocean County Construction Insp. Dept., NJ
COMMENT ON PROPOSAL NO: 19-115
RECOMMENDATION: Continue to accept panel action.
SUBSTANTIATION: The panel did not wish to increase the height allowance to 6 ft 7 in. at this time based solely on the submitter's recommendation. The desire for consistency with 380-8(a) contemplated by the submitter and the Technical Correlating Committee while admirable, may not be the entire issue here. 380-8(a) deals only with switches and circuit breakers used as switches whereas the site supply equipment covered in 551-77(d) may, and will probably, consist of more than just a switch or circuit breaker. RVs are plug-in units and the power outlets provided for this purpose are by definition part of the supply equipment. Introducing a change at the comment stage to raise the height of this entire assembly would in my opinion, introduce new material that has not had sufficient public comment. Relates to this, the panel should probably look at 551-77(c) as well since the section requires a minimum access height of 6 1/2 feet with no language to take into account a greater height of equipment as is done in 110-26(e). This whole issue should be dealt with for the 2005 cycle and the panel should introduce language that clarifies what part of the site equipment the height restriction applies to. Finally, the whole metrication issue raises some possible inconsistencies where the SI unit of 2.0 m equals 6 ft 6 in. in some sections and 6 ft 7 in. in others. I believe that all of the instances of 6 ft 6 in. in the code relate to height requirements and the Technical Correlating Committee or the Usability Task Group should decide what dimension we should be referencing.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

ARTICLE 552 — PARK TRAILERS

(Log #560)

19- 66 - (552-49): Accept
SUBMITTER: Robert A. McCullough, Ocean County Construction Insp. Dept., NJ
COMMENT ON PROPOSAL NO: 19-131
RECOMMENDATION: Continue to accept in principle but revise panel action as follows:
Delete 552-49(b) in its entirety. Rewrite remaining text as follows:
552-49. Conductors and Boxes.
~~(a) Maximum Number of Conductors.~~ The maximum number of conductors permitted in boxes shall be in accordance with 370-16.
SUBSTANTIATION: The above action is what my notes indicate the panel wished. The panel discussed the Style Manual issues as to redundant references and chose not to add another one. It felt that the existing references were needed to provide clarity.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #222)

19- 67 - (552-49(b)): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 19-131
RECOMMENDATION: It was the action of the Technical Correlating Committee that further consideration be given to the comments expressed in the voting. This action will be considered by the panel as a public comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
PANEL STATEMENT: See action on Comment 19-66.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

ARTICLE 555 — MARINAS AND BOATYARDS

(Log #223)

19- 68 - (555): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 19-135
RECOMMENDATION: The Technical Correlating Committee advises that Article Scope statements are the responsibility of the Technical Correlating Committee and the Technical Correlating Committee accepts the Panel Action in part. The Technical Correlating Committee directs the Panel to reconsider the second sentence of the Scope relative to the statement of intent. This action will be considered by the panel as a public comment. The Technical Correlating Committee directs that the action on this proposal be rewritten to comply with the NEC Style Manual regarding references to entire Articles.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
PANEL STATEMENT: Refer to panel action on Comments 19-71 and 19-75.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 9
VOTE ON PANEL ACTION:
AFFIRMATIVE: 9

(Log #1567)

19- 69 - (555): Reject
SUBMITTER: Philip Teah, Charles Industries
COMMENT ON PROPOSAL NO: 19-135
RECOMMENDATION: Please see the latest version of NFPA 303 (2001) referenced in Mr. McCullough's substantiation for the correct verbage.
SUBSTANTIATION: Mr. McCollough's substantiation for the complete rewrite of 555 is correct. However, the changes he recommends differs from the final version of NFPA 303. For example, the newest version of 303 addresses a TIA that was placed on the document after it was printed concerning angled receptacles. Additionally, since there was no evidence to substantiate the 24 in. rule (555.19) it was changed through comment to 12 in.
Please revise verbage to agree with correct version of 303.
PANEL ACTION: Reject.
PANEL STATEMENT: The comment does not comply with 4-4.5 (c) of the NFPA Regulations Governing Committee Projects. No specific revisions are provided.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 9
VOTE ON PANEL ACTION:
AFFIRMATIVE: 9

(Log #2254)

19- 70 - (555): Accept
SUBMITTER: John Wirtz, Midwest Electrical Products
COMMENT ON PROPOSAL NO: 19-135
RECOMMENDATION: Change all references to NFPA-303-1995 to reflect the latest NFPA release of NFPA 303-2000.
SUBSTANTIATION: Confusion will be generated by the NEC taking a more proactive role in article 555, by referencing NFPA 303-1995. NFPA 303-1995 was upgraded to NFPA 303-2000. We have to assume that the committee for NFPA 303 has some insight to the protection and safety of Marinas and Boatyards, and they have updated NFPA 303-1995 for the betterment and safety of the industry. It also makes sense that we try to utilize the knowledge that they have acquired over the years and reference NFPA 303-2000 in NEC 555-2002.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 9
VOTE ON PANEL ACTION:
AFFIRMATIVE: 9

(Log #557)

19- 71 - (555-1): Accept

Note: The Technical Correlating Committee advises that article scope statements are the responsibility of the Technical Correlating Committee and the Technical Correlating Committee accepts the Panel Action.

SUBMITTER: Robert A. McCullough, Ocean County Construction Insp. Dept., NJ

COMMENT ON PROPOSAL NO: 19-135

RECOMMENDATION: Revise the last sentence of 555.1 as follows:

~~A single, private, noncommercial docking facility for a one family dwelling is not intended to be covered by this Article.~~ Private, noncommercial docking facilities constructed or occupied for the use of the owner or residents of the associated single-family dwelling are not covered by this article.

SUBSTANTIATION: Revisions are made to comply with TCC direction regarding "intent" statements in the scope of an article. The text is modified to be consistent with changes made to NFPA 303.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 9

VOTE ON PANEL ACTION:

AFFIRMATIVE: 9

(Log #563)

19- 72 - (550-2-Manufactured Home): Accept

SUBMITTER: Robert A. McCullough, Ocean County Construction Insp. Dept., NJ

COMMENT ON PROPOSAL NO: 19-39

RECOMMENDATION: Change panel action to accept in principle and revise the text as follows:

Manufactured Home. A structure, transportable in one or more sections, that is ~~8 body ft (24.4 cm)~~ 24.4 cm (8 body ft) or more in width or ~~40 body ft (1219 cm)~~ 1219 cm (40 body ft) or more in length in the traveling mode or, when erected on site, is ~~320 ft (28 m2)~~28m^2(320 ft^2) or more; which is built on a chassis and designed to be used as a dwelling, with or without a permanent foundation, when connected to the required utilities, including the plumbing, heating, air conditioning, and electrical systems contained therein. Calculations used to determine the number of ~~sq ft~~ square meters (square feet) in a structure will be based on the structure's exterior dimensions, measured at the largest horizontal projections when erected on site. These dimension include all expandable rooms, cabinets, and other projections containing interior space, but do not include inside bay windows.

For the purpose of this code, and unless otherwise indicated, the term mobile home includes manufactured homes.

SUBSTANTIATION: The revisions reflect the direction of the Technical Correlating Committee with regards to metrication. The panel's intent was to replace the technical definition of manufactured home found in 550.2 and retain the additional language of the last sentence from the existing definition.

PANEL ACTION: Accept.

1. Accept and revise the metric units as follows:
   2.5 m (8 body ft)
   12 m (40 body ft)
   30 m2 (320 ft2)
2. FPNs unchanged

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 9

VOTE ON PANEL ACTION:

AFFIRMATIVE: 9

COMMENT ON AFFIRMATIVE:

BAUMAN: The NEC reference for this comment should be 550-2 not 555-2.

LAROCCA: The heading should refer to Section 550-2 rather than 555-2.

(Log #1512)

19- 73 - (551-10(a) through (h)): Reject

SUBMITTER: Bruce A. Hopkins, Recreation Vehicle Industry Assn.

COMMENT ON PROPOSAL NO: 19-75

RECOMMENDATION: Recommend that the proposal be accepted.

SUBSTANTIATION: The ANSI/RVIA 12V Low Voltage Systems in Conversion and Recreational Vehicles, 2000 edition, has been approved by the Accredited Canvass List. It was submitted to ANSI on 9/19/00 for final vote and approval by the ANSI Board of Standards Review. They will meet in November 2000 and no problems are anticipated at this point in the code cycle.

PANEL ACTION: Reject.

PANEL STATEMENT: The Panel has not received documentation of ANSI approval of the document that would replace the text proposed for deletion.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 9

VOTE ON PANEL ACTION:

AFFIRMATIVE: 9

COMMENT ON AFFIRMATIVE:

BAUMAN: The NEC reference for this comment should be 551-10(a) not 555-10(a).

LAROCCA: The heading should refer to Section 551-10(a) through (h) rather than 555-10(a) through (h).

(Log #1472)

19- 74 - (555-11(a)): Reject

SUBMITTER: Vincent J. Saporita, Cooper Bussmann

COMMENT ON PROPOSAL NO: 19-135

RECOMMENDATION: This part should be rejected.

SUBSTANTIATION: This is a restraint of trade.

There is no technical substantiation provided to exclude the use of fuses for this application. There are applications where fuses provide the only acceptable overcurrent protection, such as for HVAC equipment where the nameplate shows a "maximum fuse size". There are other applications where fuses are used as part of tested, listed, and marked series rated systems. To disallow fuses for these applications will create a hardship for the contractor and owner. Finally, 90-1(b) already states that provisions of the Code man not necessarily be convenient, so this proposed exclusion of fuses to avoid the difficulty of replacing them has no place in the Code.

PANEL ACTION: Reject.

PANEL STATEMENT: The panel has made its decisions on a safety basis, as has the NFPA 303 committee on the same subject.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 9

VOTE ON PANEL ACTION:

AFFIRMATIVE: 8

NEGATIVE: 1

EXPLANATION OF NEGATIVE:

MCNEIVE: Correlation with NFPA 303 is not sufficient substantiation for this change. The substantiation behind the requirement in 303 has not been brought forward to Code-Making Panel 19. Convenience does not in any way substantiate the elimination of proven technology when it does not benefit safety. This is in effect what this change would accomplish.

(Log #558)

19- 75 - (555-12): Accept

SUBMITTER: Robert A. McCullough, Ocean County Construction Insp. Dept., NJ

COMMENT ON PROPOSAL NO: 19-135

RECOMMENDATION: Revise 555.12 as follows:

555.12 Load Calculations for Service and Feeder Conductors. General lighting and other loads shall be calculated in accordance with Article 220 and in addition ~~T~~ the load for each service and/or feeder circuit supplying receptacles that provide shore power for boats shall be calculated using the demand factors shown in Table 555.12. These calculations shall be permitted to be modified as indicated in notes (1) and (2). ~~General lighting and other loads shallb e calculated in accordance with Article 220. The minimum rating and size of conductors shall comply with Article 215 or Article 230 as applicable.~~

SUBSTANTIATION: Added text to the beginning of the sentence is done to comply with the Technical Correlating Committee direction and NEC Style Manual. Section 4.1.1 allows a reference to an entire article where additional requirements are specified. This is the case here. 555.12 contains specific requirements for determining the load of the shore power receptacles which are meant to be added to any other loads as determined from Article 220. The last sentence dealing with the minimum rating and size of conductors is deleted as it is redundant. There is nothing in Article 555 that modifies the basic minimum size and rating requirements from Articles 215 or 230 so the requirement is covered by 90.3.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 9

VOTE ON PANEL ACTION:

AFFIRMATIVE: 9

(Log #1510)

19- 76 - (555-19): Accept in Principle
SUBMITTER: Elliott Turk, International Dock Products
COMMENT ON PROPOSAL NO: 19-135
RECOMMENDATION: Revise text to read as follows:
Receptacles shall be mounted not less than 12 in. (305 mm) above dock surface of the pier, and not below the electrical datum plane on a fixed pier.
SUBSTANTIATION: The proposed change to the minimum height per receptacle mounting has been previously considered and rejected under NFPA 303, 3.14.1(c). It is necessary that NFPA 70, Article 555 conform with NFPA 303. For further explanation, please see NFPA 303, May 2000 ROC, 303-25 (3.14.1(c)).
PANEL ACTION: Accept in Principle.
1. Revise 555-19 to read:
Receptacles shall be mounted not less than 305 mm (12 in.) above the deck surface of the pier, and not below the electrical datum plane on a fixed pier.
2. Leave (A) and (B) unchanged
PANEL STATEMENT: Accepted with editorial revisions.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 9
VOTE ON PANEL ACTION:
AFFIRMATIVE: 9

(Log #2252)

19- 77 - (555-19): Reject
SUBMITTER: John Wirtz, Midwest Electrical Products
COMMENT ON PROPOSAL NO: 19-135
RECOMMENDATION: Add to 555.19 "The area below the receptacles shall be free of any other component (switch or circuit breaker handle, receptacle, or the like), the access to which would be blocked by the flexible cord (Shore Power Cord) attached to the receptacle."
SUBSTANTIATION: This change is based on UL 231 Power Outlets 8.2.8 which states that a receptacle other than the duplex type that is mounted with its face in a vertical plane shall be positioned so that the grounding contact is at the top and the area below the receptacle shall be free of any other component (switch or circuit breaker handle, receptacle, or the like), the access to which would be blocked by the flexible cord attached to a right-angle attachment plug. I believe that UL placed this in UL 231 to make sure there is not an obstruction to the disconnect or any other device when a right angled attachment plug is used. With the addition of the 555.19(2), the face position will not be mounted in the vertical position, to allow for strain relief. But, with this improved design, the shore power cord will hang close to the Marine Power Outlet, similar to a flexible cord attached to a right-angled plug. With this change, the cord could obstruct access to any component (switch or circuit breaker handle, receptacle, or the like).
PANEL ACTION: Reject.
PANEL STATEMENT: The commentors concerns are covered by the product standards. See Section 110-3(b).
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 9
VOTE ON PANEL ACTION:
AFFIRMATIVE: 9

(Log #2253)

19- 78 - (555-19): Accept in Principle
SUBMITTER: John Wirtz, Midwest Electrical Products
COMMENT ON PROPOSAL NO: 19-135
RECOMMENDATION: Revise 555.19 from "receptacles shall be located not less than 24 in. (610 mm) above the deck surface of the pier, and not below the datum plane on a fixed pier." to "Receptacles shall be located not less than 12 in. (305 mm) above the deck surface or the pier, and not below the electrical datum plane on a fixed pier."
SUBSTANTIATION: This change would make the wording consistent, and remove confusion with NEC 555.9 which states "all electrical connections shall be located at least 12 in. (305 mm) above the deck of a floating pier. All electrical connections shall be located at least 12 in (305 mm) above the deck of a fixed pier, but not below the electrical datum plan." This change would also be consistent with NFPA 303-2000 paragraph 3-14.1.C.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Refer to Comment 19-76.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 9
VOTE ON PANEL ACTION:
AFFIRMATIVE: 9

(Log #1509)

19- 79 - (555-19(a)(1)): Accept in Principle
Note: The Technical Correlating Committee understands that the material in this Comment is not extracted material.
SUBMITTER: Elliott Turk, International Dock Products
COMMENT ON PROPOSAL NO: 19-135
RECOMMENDATION: Revise text to read as follows:
Receptacles shall be housed in marine power outlets or listed for wet locations or shall be installed in listed enclosures. The integrity of the assembly shall not be effected when the receptacles are in use with any type of booted or non-booted attachment plug/cap inserted.
SUBSTANTIATION: The language under NFPA 70, Article 555 should conform with the language in NFPA 303. For further explanation, please see NFPA 303, May 2000 ROC, 303-17 (3.14.1(a)).
PANEL ACTION: Accept in Principle.
Revise 555-19(a)(1) to read:
(1) Enclosures. Receptacles intended to supply shore power to boats shall be housed in marine power outlets listed as marina power outlets or listed for wet locations, or shall be installed in listed enclosures protected from the weather or in listed weatherproof enclosures. The integrity of the assembly shall not be affected when the receptacles are in use with any type of booted or nonbooted attachment plug/cap inserted.
PANEL STATEMENT: The intent of the comment is accepted by extracting text from NFPA 303.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 9
VOTE ON PANEL ACTION:
AFFIRMATIVE: 9
COMMENT ON AFFIRMATIVE:
MCCULLOUGH: The panel statement should be clarified to indicate that Code-Making Panel 19 is using the language from NFPA 303 for consistency. It is not a formal extract. Code-Making Panel 19 wishes to remain the cognizant authority for the language contained in Article 555 with respect to electrical requirements.

(Log #554)

19- 80 - (555-19(a)(2)): Accept
SUBMITTER: Robert A. McCullough, Ocean County Construction Insp. Dept., NJ
COMMENT ON PROPOSAL NO: 19-135
RECOMMENDATION: Revise 555.19(A)(2) as follows:
(2) Strain Relief. Means shall be provided where necessary to reduce the strain on the plug and receptacle caused by the weight and catenary angle of the shore power cord ~~, by either of the following methods:~~
~~(1) The receptacle face shall be at any angle from horizontal to 65 degrees below horizontal. See Figure 555.19(A)(2)(1).~~
Delete Figure 555.19(A)(2)(1).
~~(2) Separate mechanical strain relief which will not damage the shore power cord.~~
SUBSTANTIATION: The section of NFPA 303 (3-14.1) that was the basis for this language has been modified by the NFPA 303 committee for the 2000 edition of that standard. The requirements for strain relief either by providing separate mechanical means or by installing the outlet at an angle have been deleted. Much of the argument centered on the issue of the angle to be used, whether this placed an undue restriction upon the manufacturers of certain marine equipment, and if in fact installing the receptacles in the vertical position actually caused a safety problem with the cords. Since CMP 19 was not privy to all of the discussion it would seem prudent to not require such specific requirements in the NEC. The NFPA 303 Committee did, however, retain the concept of providing some form of strain relief. They opted to include an appendix note in A-3-14 as follows: "A-3.14.1 Considerations should be made to reduce the hazards resulting from opening and misalignment of plug/receptacle connections caused by the strain to receptacles intended to supply shore power to boats due to the weight and catenary of the shore power cable. Such considerations may include the installation of receptacles with faces angled in a direction to reduce the strain of the cable, reinforcement of the receptacle, other means to support the cable when such connections are made, or be properly attaching the plug." The accompanying panel statement reads as follows: "The Committee accepted the recommendation to delete the proposed requirement in this section. The committee remains concerned with the possibility of problems caused by the strain resulting from connected shore power cables or inadequately supported shore power cables. This appendix offers some guidance to users of this

standard without being in the form of a mandatory requirement."
It is obvious that the possibility of damage to cords, plugs, and receptacles exists and the language used in the revised text will require that the Authority Having Jurisdiction make a determination of whether or not some form of strain relief is required based on that particular installation. Some people may say that this language is unenforceable but in reality it is no different from many other rules in the code such as protecting a wiring method from physical damage. In those cases the Authority Having Jurisdiction makes a determination based on the specifics of that installation and that particular set of circumstances. I believe it more than logical to apply this concept to this very real possibility. While not offering this as part of my comment, it may be advisable to include the language from the A-3.14.1 appendix note in this section as a fine print note to provide guidance to the Authority Having Jurisdiction with regard to the possible problem and some of the solutions.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 9
VOTE ON PANEL ACTION:
AFFIRMATIVE: 9

(Log #1476)

19- 81 - (555-19(a)(2)): Reject
SUBMITTER: McClanahan Ingles, Sea Technology, Inc.
COMMENT ON PROPOSAL NO: 19-135
RECOMMENDATION: Delete the following text:
~~Strain Relief. Means shall be provided to reduce the strain on the plug and receptacle caused by the weight and catenary angle of the shore power cord by either of the following methods:~~
SUBSTANTIATION: There is no justification for this requirement. If this were a problem, an angling requirement would have been imposed on boat manufacturers. There are literally tens of thousands of power outlets which have been in use for many years with no means to reduce the strain on the plug and with no apparent safety problem. This "problem" appears to be a marketing scheme rather than a safety issue. Please see memorandum I have provided (Memorandum not provided with comment). This issue was also addressed in TIA No. 492 issued by the Standards Council on October 1, 1996. This issue was also addressed by the NFPA 303 Committee which deleted this language from the text and added Appendix Note to 303-20-(3-14.1(b)) with the following language:
A-3-14.1 Considerations should be made to reduce the hazards from opening and mis-alignment of plug/receptacle connections caused by the strain to receptacles intended to supply shore power to boats due to the weight and catenary of the shore power cable. Such considerations may include the installation of receptacles with faces angled in a direction to reduce the strain of the cable, reinforcement of the receptacle, other means to support the cable which such connections are made, or by properly attaching the plug.
If NFPA 70, Article 555, is to conform with NFPA 303, the proposed language should be deleted.
PANEL ACTION: Reject.
PANEL STATEMENT: The subject of strain relief is retained. Refer to the substantiation of Comment 19-80.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 9
VOTE ON PANEL ACTION:
AFFIRMATIVE: 9

(Log #1511)

19- 82 - (555-19(a)(2)): Reject
SUBMITTER: Elliott Turk, International Dock Products
COMMENT ON PROPOSAL NO: 19-135
RECOMMENDATION: Delete text in entirety.
SUBSTANTIATION: The language under NFPA 70, Article 555 should conform with the language in NFPA 303. For further explanation, please see NFPA 303, May 2000 ROC, 303-20 (3.14.1(b)).
PANEL ACTION: Reject.
PANEL STATEMENT: Refer to panel action on Comments 19-80 and 19-81.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 9
VOTE ON PANEL ACTION:
AFFIRMATIVE: 9

(Log #2123)

19- 83 - (555-19(a)(2)): Reject
SUBMITTER: Jeffrey O. Evans, Will-Burt Co./Parent to Accurate Electronics
COMMENT ON PROPOSAL NO: 19-135
RECOMMENDATION: I strongly propose eliminating the new text regarding strain relief.
SUBSTANTIATION: See letter provided (No letter was received at NFPA).
PANEL ACTION: Reject.
PANEL STATEMENT: No substantiation was provided. Refer to panel action on Comments 19-80 and 19-81.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 9
VOTE ON PANEL ACTION:
AFFIRMATIVE: 9

(Log #1475)

19- 84 - (555-19(a)(2)1): Accept
SUBMITTER: McClanahan Ingles, Sea Technology, Inc.
COMMENT ON PROPOSAL NO: 19-135
RECOMMENDATION: Delete the following text:
~~The receptacle face shall be at any angle form horizontal to 65 degrees below horizontal. See Figure 555.19(A)(2)(1).~~
SUBSTANTIATION: If NFPA 70, Section 555.19(A) is to conform with NFPA 303-22-(3-14.1(b).1), the action of that committee in deleting this language is important to review. The following are my comments to the 303 Committee:
As NFPA 303 Committee member Mr. Roberts noted in his comment, there is no substantiation that existing power outlets placed in a vertical orientation and used with proper weatherproof boots are not dangerous or problematic. Therefore, the Committee should not consider adopting this language. Furthermore, the Committee's comments would leave one to believe that the Committee was changing only the degrees from 55 degrees to 65 degrees, however, the NFPA 303 Committee changed the language to change the method of measurement of the angle. Prior to TIA No. 492, the Committee had adopted language that required the receptacle to face downward at any angle from horizontal to 55 degrees above horizontal. The new proposal contains a requirement that the receptacle face at any angle from horizontal to 65 degrees below horizontal. The Committee's statement appears to ignore this distinction. In addition, there appears to be no justification for requiring adherence to any particular angle as stated in Committee member Roberts' comments. This issue was also addressed by the Standards Council in TIA No. 492. This was corrected by the NFPA 303 Committee. Please note current wording of NFPA 303-22-(3-14.1(b).1) which deleted the proposed language. If NFPA 70, Article 555 is to conform with NFPA 303, the proposed language should be deleted.
PANEL ACTION: Accept.
Refer to Comment 19-80.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 9
VOTE ON PANEL ACTION:
AFFIRMATIVE: 9

(Log #1477)

19- 85 - (555-19(a)(2)2): Accept
SUBMITTER: McClanahan Ingles, Sea Technology, Inc.
COMMENT ON PROPOSAL NO: 19-135
RECOMMENDATION: Delete the following text:
~~Separate mechanical strain relief which will not damage the shore power cord.~~
SUBSTANTIATION: This language is unjustified and should be deleted per my comments regarding 555.19(A)(2) and pertaining to 555.19(A)(2)(1). I have previously submitted comments regarding NFPA 303.
PANEL ACTION: Accept.
Refer to Comment 19-80.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 9
VOTE ON PANEL ACTION:
AFFIRMATIVE: 9

Note: The sequence no. 19-86 was not used.

ARTICLE 600 — ELECTRIC SIGNS AND OUTLINE LIGHTING

(Log #625)

18- 42 - (600-6(2)a): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
COMMENT ON PROPOSAL NO: 18-75
RECOMMENDATION: Accept in principle in part, revise panel action:

(2)(a) The disconnecting means shall be permitted to be located within sight of the controller or in the same enclosure with the controller, in lieu of the requirements of (a)(1).

SUBSTANTIATION: The permissive wording does not mandate a specific location for the disconnecting means and leaves (a)(1) as the only mandatory requirements for location. If (2)(a) is intended as an alternative, the proposal clarifies that intent.
PANEL ACTION: Reject.
PANEL STATEMENT: The current wording in Proposal 18-75 clearly states that Section 600.6(2)(A) applies only to signs operated by controllers. Section 600.6(1) applies to all others.

In the draft of the 2002 NEC in Section 600.6 (A)(2), subsections 1, 2 and 3 should read a, b, and c.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1794)

18- 43 - (600-32(h)): Accept
SUBMITTER: Stephen G. Kieffer, Randall K. Wright, Kieffer & Co., & 21st Century Signs
COMMENT ON PROPOSAL NO: 18-99
RECOMMENDATION: After the word "terminal", insert "or lead" so the subsection will read:

(h) Between Neon Tubing and Midpoint Return. Conductors shall be permitted to run between the ends of neon tubing or to the secondary circuit midpoint return of transformers or electronic power supplies listed for the purpose and provided with terminals or leads at the midpoint.

SUBSTANTIATION: Transformers and electronic power supplies may be listed with either terminals or leads for connection to neon tubing circuits. As worded, the proposal could be interpreted to eliminate listed product manufactured with secondary circuit leads, rather than terminals.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1191)

18- 44 - (600-32(j)): Accept in Principle
SUBMITTER: Joel A. Rencsok, Scottsdale, AZ
COMMENT ON PROPOSAL NO: 18-101
RECOMMENDATION: This proposal should have been rejected.
SUBSTANTIATION: I have reproduced the submitter's test and get the identical graph that was submitted to the panel to substantiate this request. The electrical field generated in all four cases are approximately identical. The only change was to the duration of the ringing voltage time that field remained high. GTO cable will not in any way reduce this field. The test shows this. If the panel wishes, we can set up this identical test for them when they meet here in Phoenix, AZ. Test invalid.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Comment 18-48.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NEGATIVE: 1
EXPLANATION OF NEGATIVE:

KIEFFER: 1. The submitters of 18-44, 18-45 and 18-48 provided no technical substantiation with their comments or any supplemental written material prior to the meeting for our study and consideration. I personally called one of the submitters and requested this information. It was not provided. This alone should have been sufficient to reject these proposals.

2. The submitters were permitted to make an oral presentation to the panel. During that presentation they claimed to have replicated some of the testing used to develop Proposal 18-101 yet they submitted no technical data from their testing, photographs or other proof that the testing occurred. When questioned regarding one of the tests, their responses clearly indicated this was not a duplication of the original testing. They answered that the tubing was not flickering. Flickering neon tubing is caused by a continuous capacitance state and would have occurred if they duplicated the test. The lack of this visual indication is clear evidence that they did not duplicate the original test.

They claimed to have obtained test setup information from me. As I stated, that was a false claim. Mr. Recnsock and Mr. Yee called me months ago, asking general questions about my testing and results. They never requested information concerning the test setup and how to replicate those tests.

3. The submitters did testify that the secondary circuit(s) they tested did begin failing. As I recall they stated, within 30 minutes after starting their test. Their presentation focused on redirecting our attention from a secondary circuit failure due to overloading, towards questioning the validity of a properly developed ANSI standard for GTO: a standard which has recently been revised with more restrictive test conditions. Yet, they offered no real evidence to indicate that this standard is faulty. Their convoluted "logic" appears to be that if you place GTO in a secondary circuit that is improperly designed with an overload condition, and the GTO fails, then there must be something wrong with the standard for that conductor. This "logic" would be true for every conductor in use in every circuit covered by the code.

4. During the 1996 code cycle, the panel action on Article 600 would have resulted in no code sections specifying maximum lengths of conductor in conduit for secondary circuits. The panel's logic was that this issue was a system design concern which should not be addressed in the code. That panel position was overturned on appeal by the standards council. Restrictions to the length of conductor in conduit were included in Article 600. It appears clear to me, that although there may be additional provisions in the code which also address electrical safety, secondary circuit design is a valid area which should be of concern to the panel and when there is clearly demonstrated circuit failure appropriate restrictions should be included in the code.

We must ignore the attempts to redirect our efforts towards criticism of UL and valid ANSI standards. The submitter's discussed on this subject is void of valid logic. We're left with a verbal presentation which confirms the existence of an overload circuit that fails rapidly. The presentation is clearly in support of adoption of the original proposal, and does not support their submitted written comments. In addition, they stated that their testing focused on neon filled tubing because that is where they believe the major problems occur. Therefore, their presentation is in support of acceptance of Comment 18-46 which was submitted on behalf of the International Sign Association.

Proposal 18-101 and Comment 18-46 will result in a secondary circuit load that passes the transformer manufacturers' load test when the minimum specified length of neon filled tubing is installed on a grounded metal surface, with listed insulated tube supports, with 10 feet of GTO in 1/2 in. flexible metal conduit from each high-voltage terminal to the first tube, and with short lengths of GTO in metal conduit providing the wiring connection between each tube. This would define, for example, normal field installed skeleton tubing mounted on a metal building. Any additional length of GTO in conduit to the first tube would result in a necessary reduction in total tubing length below the lengths listed in the transformer manufacturers' footage charts.

Part B of Article 600 only covers unlisted field installed skeleton tubing. An ANSI standard, which might include detailed circuit loading instructions, is not available. It is therefore prudent to structure Part B to provide proper guidance to AHJs and tubing installers to avoid overloaded conditions during the most hazardous, normally expected installation.

Comments 18-44, 18-45 and 18-48 must be rejected and Comment 18-47 must be accepted.

(Log #1513)

18- 45 - (600-32(j)): Reject
SUBMITTER: Herbert Moulton, Masters Technology Inc.
COMMENT ON PROPOSAL NO: 18-101
RECOMMENDATION: Delete subsection (j) in its entirety as recommended.
SUBSTANTIATION: Data submitted by applicants doesn't substantiate the reduction from 20 ft. to 10 ft. We have confirmed applicants data and can find no correlation for reduction of secondary conductors and need for increase in transformer size to accommodate 20 ft. of transformer lead.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Comment 18-48.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
COMMENT ON AFFIRMATIVE:
KIEFFER: See my comment on vote on Comment 18-44.

(Log #1795)

18- 46 - (600-32(j)): Accept in Principle
SUBMITTER: Stephen G. Kieffer, Randall K. Wright, Kieffer & Co., & 21st Century Signs
COMMENT ON PROPOSAL NO: 18-101
RECOMMENDATION: After the word "terminals", insert "or lead" so the subsection will read:
"(j) Length of Secondary Circuit Conductors.
(1) Secondary conductor to the first electrode. The length of secondary conductors from a high voltage terminal or lead of a transformer or electronic power supply to the first neon tube electrode shall not exceed:
(a) 3m (10 ft.) when installed in metal conduit or tubing for a transformer or electronic power supply rated 45 ma or less.
(b) 6m (20 ft) when installed in metal conduit or tubing for a transformer or electronic power supply rated greater than 45 ma.
(c) 15m (50 ft.) when installed in nonmetallic conduit.
(2) Other secondary circuit conductors. All other sections of secondary circuit conductor in a neon tube circuit shall be as short as practicable."
SUBSTANTIATION: Transformers and electronic power supplies may be listed with either terminals or leads for connection to neon tubing circuits. As worded, the proposal could be interpreted to eliminate listed product manufactured with secondary circuit leads, rather than terminals.
PANEL ACTION: Accept in Principle.
After the word "terminals", insert "or lead" so the subsection will read:
"(j) Length of Secondary Circuit Conductors.
(1) Secondary conductor to the first electrode. The length of secondary conductors from a high voltage terminal or lead of a transformer or electronic power supply to the first neon tube electrode shall not exceed:
(a) 3m (10 ft.) when installed in metal conduit or tubing for a transformer or electronic power supply rated 45 ma or less.
(b) 6m (20 ft) when installed in metal conduit or tubing for a transformer or electronic power supply rated greater than 45 ma.
(c) 15m (50 ft.) when installed in nonmetallic conduit.
(2) Other secondary circuit conductors. All other sections of secondary circuit conductor in a neon tube circuit shall be as short as practicable."
PANEL STATEMENT: The panel accepts the submitters recommendation to add the words "or lead" after the word "terminal" in the text of Section 600.32(J) as revised by Comment 18-48.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1796)

18- 47 - (600-32(j)): Reject
SUBMITTER: Stephen G. Kieffer, Randall K. Wright, Kieffer & Co., & 21st Century Signs
COMMENT ON PROPOSAL NO: 18-101
RECOMMENDATION: At the end of (j)(1)(a) insert "which is supplying power to neon tubing filled exclusively with Neon or Helium gas or a mixture of those two gases." So the section will read:
"(j) Length of Secondary Circuit Conductors.
(1) Secondary conductor to the first electrode. The length of secondary conductors from a high voltage terminal or lead of a transformer or electronic power supply to the first neon tube electrode shall not exceed:
(a) 3 m (10 ft.) when installed in metal conduit or tubing for a transformer or electronic power supply rated 45 ma or less which is supplying power to neon tubing filled exclusively with Neon or Helium gas or a mixture of those two gases.
(b) 6 m (20 ft) when installed in metal conduit or tubing for a transformer or electronic power supply rated greater than 45 ma.
(c) 15 m (50 ft.) when installed in nonmetallic conduit.
(2) Other secondary circuit conductors. All other sections of secondary circuit conductor in a neon tube circuit shall be as short as practicable."
SUBSTANTIATION: The original documentation submitted with the ROP clearly displays operating differences between neon gas filled tubing and mercury tubing. Industry experience has shown that only neon filled tubing, when operated with long lengths of GTO in metal conduit, results in potentially hazardous circuits. The high voltage spikes depicted in the oscilloscope displays of neon filled tubing included with the ROP substantiated field experience.
The original ROP did not consider this distinction between neon and mercury tubes in the belief that AHJs might have difficulty in distinguishing between the various gas used in neon tubing. In fact, neon tubes are easily distinguished as the gas produced a unique, easily identifiable red color.
Further feedback from the industry has resulted in this comment, which recommends that the code must recognize this distinction and only limit the installations which include neon tubing filled with neon or helium gas. Mercury tubing does not present a hazard when operated with conductors in metal conduit in lengths up to 20 feet. The ROP did not contain substantiation for restricting mercury tubing.
Helium is four times as resistant as neon, and although not commonly used in commercial application, must be included in this restriction for those rare cases where it is used.
PANEL ACTION: Reject.
PANEL STATEMENT: Refer to panel action and statement on Comment 18-48.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
KIEFFER: See my explanation of negative vote on Comment 18-44.

(Log #2131)

18- 48 - (600-32(j)): Accept in Principle
Note: The Technical Correlating Committee understands that the panel action on this Comment is the final action on this section, including the addition of the words "or lead" after the word "terminal" in (1).
SUBMITTER: David Yee, Scottsdale, AZ
COMMENT ON PROPOSAL NO: 18-101
RECOMMENDATION: The proposal should be rejected because the data submitted (waveform photos) does not substantiate the proposals to decrease the length to 10 ft.
SUBSTANTIATION: The waveforms show that the peak to peak voltage did not change. There were no differences in voltage with a reduction in length of cable.
PANEL ACTION: Accept in Principle.
Revise the text in Section 600.32(J) to read as follows:
"(J) Length of Secondary Circuit conductors.
(1) Secondary conductor to the first electrode. The length of secondary circuit conductors from a high voltage terminal of a transformer or electronic power supply to the first neon tube electrode shall not exceed:
(a) 6m (20 ft.) when installed in metal conduit or tubing.
(b) 15m (50 ft.) when installed in nonmetallic conduit.
(2) Other secondary circuit conductors. All other sections of secondary circuit conductor in a neon tube circuit shall be as short as practicable."
PANEL STATEMENT: The submitter made a presentation at the ROC meeting convincing the panel to retain the text from the 1999 NEC.
It appears that certain issues in the present use of GTO cable in electric sign installations (sharp bends, sharp/point contact, homogeneity of the cable insulation material, concentrated ozone environment within the conduit and installation instructions provided by the transformer manufacturers as related to GTO installation) are not fully addressed in the current standard UL 814 and UL 2161. CMP 18 recommends UL review these issues and consider further revisions to UL 814 and UL 2161 to address them.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
KIEFFER: See my explanation of negative vote on Comment 18-44.

COMMENT ON AFFIRMATIVE:
PIERCE: Before this article is revised further, substantive third party data needs to be generated regarding the issues of length of GTO, conduit size/length and material, and length of tubing and transformer capacity. I further suspect that the GTO cable standard UL 814 is still not anticipating or addressing all of these issues.

ARTICLE 604 — MANUFACTURED WIRING SYSTEMS

(Log #224)

19- 87 - (604-6, Exceptions No. 4 through No. 9): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 19-150
RECOMMENDATION: The Technical Correlating Committee notes that the word "clause" will be deleted. The Technical Correlating Committee directs that the Action on this Proposal be rewritten to comply with the NEC Style Manual 3.1.4 relative to the excessive use of Exceptions. The Technical Correlating Committee directs that the Panel clarify the Panel Action on this Proposal regarding the cables added in the Exception to 604-6(a)(1) and (2). This action will be considered by the Panel as a Public Comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
PANEL STATEMENT: Refer to comment 19-90.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 8
VOTE ON PANEL ACTION:
AFFIRMATIVE: 8

(Log #2262)

19- 88 - (604-6 Exception No. 3): Reject
SUBMITTER: Don Miletich, Cooper Lighting Div.
COMMENT ON PROPOSAL NO: 19-149
RECOMMENDATION: Change the proposed wording to exclude electric-discharge fixtures since they are covered by Section 410-30(c). Item 3 of the proposed wording should read as follows:
(3) Flexible Cord ~~Exception No. 3 to (1) and (2):~~ Flexible cord suitable for hard usage, with minimum No. 12 conductors, shall be permitted as part of a listed factory-made assembly not exceeding 6 ft (1.83 m) in length when making a transition between components of a manufactured wiring system and utilization equipment (excluding electric-discharge fixtures covered by 410-30(c), not permanently secured to the building structure. The cord shall be visible for its entire length and shall not be subject to strain or physical damage.
SUBSTANTIATION: The addition of this exception in the 1999 edition of the NEC has created confusion in the field with electrical inspection authorities in that this requirement is being interpreted as applying to electric-discharge lighting fixtures even though Section 410-30(c) has no limitation on cord length or wire gauge. The reason this exception was added in the 1999 code cycle is to permit the use of flexible cords as branch circuit extensions when connecting displays and other portable products that are typically provided with outlets (See 1999 NEC Handbook). Equipment covered by Section 410-30(c) is listed equipment of known electrical load. Therefore, there is no reason to limit its use to 6 ft and 12 AWG. Proposed wording change would clarify original intent of this article.
PANEL ACTION: Reject.
PANEL STATEMENT: Insufficient substantiation is provided to expand the use of flexible cords in manufactured wiring systems.
The original intent of the article was not to allow manufactured wiring systems consisting of flexible cords for this application.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 8
VOTE ON PANEL ACTION:
AFFIRMATIVE: 8

(Log #2275)

19- 89 - (604-6(3), Exception (New)): Reject
SUBMITTER: Richard Bauman, City of Kenosha Electircal Inspection
COMMENT ON PROPOSAL NO: 19-149
RECOMMENDATION: Add exception for (3) Flexible Cord:
Exception No. 1: A luminaire (fixture) tap, maximum 1.8 m (6 ft) long, intended for connection to a single luminaire (fixture) shall be permitted to contain conductors smaller than 12 AWG but not smaller than 18 AWG.
SUBSTANTIATION: Since flexible cord has been approved as a wiring method, the above exception should be added to promote uniformity with the wiring methods of 604-6. There is no justification for the limitation of the flexible cord wiring method as compared to flexible metal conduit with this type of installation.
PANEL ACTION: Reject.
PANEL STATEMENT: Refer to Comment 19-88.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 8
VOTE ON PANEL ACTION:
AFFIRMATIVE: 8

(Log #573)

19- 90 - (604-6(a)(1)and 2): Accept
SUBMITTER: Robert A. McCullough, Ocean County Construction Insp. Dept., NJ
COMMENT ON PROPOSAL NO: 19-150
RECOMMENDATION: Revise 604.6(A)(1) and (2) as follows:
(1) Cables. Cable shall be listed armored cable or metal-clad cable containing nominal 600-volt 10 or 12 AWG copper-insulated conductors with a bare or insulated copper equipment grounding conductor equivalent in size to the ungrounded conductor.
Other cables as listed in 725.61, 800-50, 820-50, and 830-5 shall be permitted in manufactured wiring systems for wiring of equipment within the scope of their respective articles.
(2) Conduits. Conduit shall be listed flexible metal conduit or listed liquidtight flexible conduit containing nominal 600-volt 10 or 12 AWG copper-insulated conductors with a bare or insulated copper equipment grounding conductor equivalent in size to the ungrounded conductor.
Exception No. 1 to (1) and (2): A luminaire (fixture) tap, maximum 1.8 m (6 ft) long, intended for connection to a single luminaire (fixture) shall be permitted to contain conductors smaller than 12 AWG but not smaller than 18 AWG.
Exception No. 2 to (1) and (2): Conductors smaller than 12 AWG shall be permitted for remote-control, signaling, or communications circuits. The assembly shall be listed for the purpose.
~~Exception No. 3 to (1) and (2) Cables listed in 725.61 shall be permitted for wiring of devices and appliances identified in Article 725.~~
~~Exception No. 4 to (1) and (2): Cables listed in 800.50 shall be permitted for wiring of equipment identified in 800.1.~~
~~Exception No. 5 to (1) and (2): Cables listed in 820.50 shall be permitted for wiring of equipment identified in 820.1.~~
~~Exception No. 6 to (1) and (2): Cables listed in 830.5 shall be permitted for wiring of equipment identified in 830.1.~~
SUBSTANTIATION: Exceptions are deleted to comply with Technical Correlating Committee direction and the NEC Style Manual. The added last sentence to (A)(1) incorporates the intent of the exceptions which was to recognize that there are Manufactured Wiring Systems made which utilize cable types conforming to Articles 725, 800, 820, and 830. These systems are for use with equipment covered in the scope statements of the respective articles.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 8
VOTE ON PANEL ACTION:
AFFIRMATIVE: 8

ARTICLE 605 — OFFICE FURNISHINGS (CONSISTING OF LIGHTING ACCESSORIES AND WIRED PARTITIONS)

(Log #372)

18- 49 - (605-8(c)): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
COMMENT ON PROPOSAL NO: 18-112
RECOMMENDATION: Accept in principle revised: (c) Individual partitions or groups of partitions shall not contain more than ten ~~thirteen~~ single or multiple receptacles ~~15-ampere 125-volt receptacle outlets~~ where supplied by a cord terminated with a 15-ampere rated attachment plug, nor more than thirteen single or multiple receptacles where supplied by a cord terminated with a 20-ampere rated attachment plug. Receptacles shall be rated 15-amperes 125-volts where the attachment plug is rated 15-amperes, and 15- or 20-amperes 125-volts where the attachment plug is rated 20-amperes. The computed load for the circuit supplying the partitions shall be in accordance with 220-3(b)(9) based on the number of receptacles contained in the partition(s).

FPN: See 210-21(b)(1) where a single partition receptacle is installed on an individual branch circuit.
SUBSTANTIATION: The panel statement that the partition is "likely to be" connected to a 15-ampere circuit is conjecture. The minimum No. 12 cord specified in (a) is suitable for a 20-ampere circuit. This section doesn't preclude either a 15 or 20-ampere circuit.

The limiting number "thirteen" appears based of 180va per receptacle which equals 2340 va, which is the receptacle limit for a 20-ampere circuit, while the limit for a 15-ampere circuit is ten receptacles. Where partitions of 605-6 and 605-7 are installed these total limits would apply whether or not connected to a separate circuit. They don't have any restrictions to 15-ampere receptacles. Section 605-2(b) would apply 210-21(b).

Thirteen outlets does not limit the number of receptacles and may be interpreted as modifying 220-3(b)(9). If the maximum number of outlets each contained two receptacles there would be a total of twenty-six, in violation of 210-19(a) if 220-3(b)(9) applies.

The proposal correlates the number and ratings of receptacles with the rating of attachment plug and proposes a load computation which excludes the supply receptacle since it is provided primarily to permit relocation of partitions. The proposed FPN clarifies that a partition with only a single receptacle supplied by a 20-ampere circuit requires a 20-ampere rated receptacle.
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter has not provided any additional technical substantiation with his comment.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 10
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
COMMENT ON AFFIRMATIVE:
PIERCE: Before this Article is revised further, substantive third party data needs to be generated regarding the issues of length of GTO, conduit size/length and material, length of tubing and transformer capacity. I further suspect that the GTO cable standard UL 814 is still not anticipating or addressing all of these issues.

ARTICLE 610 — CRANES AND HOISTS

(Log #128)

7- 125 - (610-11): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 12-15
RECOMMENDATION: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 7 to correlate the action in Article 333. This action will be considered by the Panel as a Public Comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
Delete 333-4(5) [(333-12(5),in Proposal 7-89a)].
PANEL STATEMENT: This action correlates with the permission to use Type AC cable in 610-11.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #626)

12- 5 - (610-11): Accept in Principle in Part
SUBMITTER: Dan Leaf, Palmdale, CA
COMMENT ON PROPOSAL NO: 12-15
RECOMMENDATION: Accept in principle revised:

Wiring Method. Conductors shall be enclosed in raceways or be Type AC cable with insulated grounding conductor, Type MC cable, or Type MI cable unless otherwise permitted or required in (a) through (e).

(a) No change
(b) No change
(c) Where flexible connections are necessary to motors and ~~similar~~ equipment, flexible stranded conductors shall be installed in flexible metal conduit, liquidtight flexible metal conduit, liquidtight flexible nonmetallic conduit, multiconductor flexible cord ~~cable~~ or an approved nonmetallic enclosure.
SUBSTANTIATION: Where flexible connections are necessary (c) does not permit stranded conductors but requires them. What equipment is "similar" to motors? "Otherwise permitted" multiconductor cable of (c) seems to exempt requirements of the first paragraph and includes stranded conductors of NM or SE cables. Subsection (e) and 610-13(c) suggest that multiconductor cord is intended.
PANEL ACTION: Accept in Principle in Part.
The panel accepts the addition of the words "or required" in the first part of the comment. The panel accepts in principle part (c) of the comment and revises text to read as follows: "Where flexible connections are necessary, flexible stranded conductors shall be used. Conductors shall be in flexible metal conduit, liquidtight flexible metal conduit, liquidtight flexible nonmetallic conduit, multiconductor cable, or an approved nonmetallic flexible raceway."

The panel rejects the proposed change of the word "cable" to "flexible cord".
PANEL STATEMENT: The panel accepts the submitter's concerns that part (c) does not "permit" flexible stranded conductors, but "requires" them. The revision made by the panel clarifies that this section requires flexible stranded conductors.

The panel does not accept the submitter's concerns regarding the use of the words "flexible cord" rather than "cable". It is the intent of this section to permit cable and not restrict it to flexible cord.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 2 Kelley, Laney

(Log #1190)

12- 6 - (610-11(c)): Accept
SUBMITTER: Joel A. Rencsok, Scottsdale, AZ
COMMENT ON PROPOSAL NO: 12-16
RECOMMENDATION: Change "enclosure" in this section as revised by the panel action to "raceway."
SUBSTANTIATION: I do not know how a flexible enclosure is connected to motors, etc. What is a "nonmetallic flexible enclosure". See definitions of enclosure and raceway.
PANEL ACTION: Accept.
PANEL STATEMENT: The panel addressed the submitter's concerns in comment 12-5.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 2 Kelley, Laney

(Log #129)

12- 7 - (610-14(a)): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 12-19
RECOMMENDATION: It was the action of the Technical Correlating Committee that this Proposal be reconsidered and correlated with the action on Proposal 6-5. This action will be considered by the Panel as a Public Comment.

SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
The panel accepts Proposal 12-19.
PANEL STATEMENT: The panel accepts the direction of the Technical Correlating Committee. The panel accepts Proposal 12-19 due to the action by CMP-6.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 2 Kelley, Laney

(Log #130)

12- 8 - (610-14(c)): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 12-20
RECOMMENDATION: The Technical Correlating Committee directs that the Panel to add a number and title to the Table. This action will be considered by the Panel as a Public Comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
At the end of Section 610-14(d), replace "the following:" with "as shown in Table 610-14(d)."
Add a title to read: Table 610-14(d)
Contact Conductor Supports
PANEL STATEMENT: The panel accepts the recommendation of the Technical Correlating Committee but respectfully submits that there is no table regarding Section 610-14(c).
The panel assumes the reference is to Table 610-14(d).
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 2 Kelley, Laney

ARTICLE 620 — ELEVATORS, DUMBAITERS, ESCALATORS, MOVING WALKS, WHEELCHAIR LIFTS, AND STAIRWAY CHAIR LIFTS

(Log #131)

12- 9 - (620): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 12-24a
RECOMMENDATION: The Technical Correlating Committee directs that the Panel clarify the Panel Action on this Proposal with regard to the title recommended in Section 620-61(b)(1) to read as follows: "Duty Rating on Elevator, Dumbwaiter, and Motor-Generator Sets Driving Motors." This action will be considered by the Panel as a Public Comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NOT RETURNED: 2 Kelley, Laney

(Log #1055)

12- 10 - (620-Control Room, Control Space, Machinery Space Part H): Accept
SUBMITTER: Nick Marchitto, Otis Elevator Co./Rep. National Elevator Industry Inc. (NEII)
COMMENT ON PROPOSAL NO: 12-61
RECOMMENDATION: Request that the Panel reconsider its action and accept Proposal 12-61.
SUBSTANTIATION: The current NFPA-70, NEC, Article 620 does not address the new type elevator installations covered in the ASME, A17.1 Elevator Safety Code. The terms "control rooms", "control spaces" and "machinery spaces" are presently used in the A17.1 Elevator Safety Code. The elevator industry understanding of these terms is as follows:
Control Room - A fully enclosed control space outside the hoistway, intended for full bodily entry by authorized personnel only, which contains the elevator motor controller. the room may also contain associated elevator electrical and/or mechanical equipment, except for the elevator driving machine or the hydraulic machine in the case of a hydraulic elevator.
NOTE: See figure 1 *
Control Space - A space inside or outside the hoistway, intended to be accessed with or without full bodily entry by authorized personnel only, which contains the elevator motor controller. this space may also contain associated elevator electrical and/or mechanical equipment, except for the elevator driving machine or the hydraulic machine in the case of a hydraulic elevator.
NOTE: See figure 2 *
Machinery Space - A space inside or outside the hoistway, intended to be accessed with or without full bodily entry by authorized personnel only, which contains elevator mechanical equipment, and may also contain associated elevator electrical equipment. This space may also contain the elevator driving machine.
NOTE: See figures 1 * & 2*
* These figures depict only a few examples and are not to be construed as the only possible configurations. The addition of these terms to the NEC are intended to make sure that the Electrical Code addresses those installation configurations that are addressed in the A17.1 Elevator Safety Code. The terminology used in Article 620 should reflect the terminology used in A17.1.
Note: Supporting Material is available for review at NFPA Headquarters.
PANEL ACTION: Accept.
PANEL STATEMENT: The submitter of the proposal and comment addressed the panel's concerns regarding the original proposal. The additional substantiation provided has made this proposal acceptable to the panel.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NOT RETURNED: 2 Kelley, Laney

(Log #1038)

12- 11 - (620-21-Control Space): Accept
SUBMITTER: Nick Marchitto, Otis Elevator Co./Rep. National Elevator Industry Inc. (NEII)
COMMENT ON PROPOSAL NO: 12-31
RECOMMENDATION: Request that the Panel reconsider its action and accept Proposal 12-31.
SUBSTANTIATION: Statement of Problem and Substantiation for Comment: The current NFPA-70, NEC, Article 620 does not address the new type elevator installations covered in the ASME, A17.1 Elevator Safety Code. The term "control space" is presently used in the A17.1 Elevator Safety Code. The elevator industry understanding of this term is as follows:
Control Space - A space inside or outside the hoistway, intended to be accessed with or without full bodily entry by authorized personnel only, which contains the elevator motor controller. This space may also contain associated elevator electrical and/or mechanical equipment, except for the elevator driving machine or the hydraulic machine in the case of a hydraulic elevator. NOTE: See figure 2 *
* This figure depicts only one example and is not to be construed as the only possible configuration. The addition of this term to the NEC is intended to make sure that the Electrical Code addresses those installation configurations that are addressed in the A17.1 Elevator Safety Code. The terminology used in Article 620 should reflect the terminology used in A17.1.
Note: Supporting material is available for review at NFPA Headquarters
PANEL ACTION: Accept.
PANEL STATEMENT: See panel action and statement on Comment 12-10.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NOT RETURNED: 2 Kelley, Laney

(Log #1039)

12- 12 - (620-21(a)(3)-Control Room, Control Space): Accept
SUBMITTER: Nick Marchitto, Otis Elevator Co./Rep. National Elevator Industry Inc. (NEII)
COMMENT ON PROPOSAL NO: 12-37
RECOMMENDATION: Request that the Panel reconsider its action and accept Proposal 12-37.
SUBSTANTIATION: The current NFPA-70, NEC, Article 620 does not address the new type elevator installations covered in the ASME, A17.1 Elevator Safety Code. The terms "control rooms" and "control spaces" are presently used in the A17.1 Elevator Safety Code. The elevator industry understanding of these terms is as follows:

Control Room - A fully enclosed control space outside the hoistway, intended for full bodily entry by authorized personnel only, which contains the elevator motor controller. The room may also contain associated elevator electrical and/or mechanical equipment, except for the elevator driving machine or the hydraulic machine in the case of a hydraulic elevator.
NOTE: See figure 1 *

Control Space - A space inside or outside the hoistway, intended to be accessed with or without full bodily entry by authorized personnel only, which contains the elevator motor controller. This space may also contain associated elevator electrical and/or mechanical equipment, except for the elevator driving machine or the hydraulic machine in the case of a hydraulic elevator.
NOTE: See Figure 2 *

* These figures depict only a few examples and are not to be construed as the only possible configurations. The addition of these terms to the NEC are intended to make sure that the Electrical Code addresses those installation configurations that are addressed in the A17.1 Elevator Safety Code. The terminology used in Article 620 should reflect the terminology used in A17.1.

Note: Supporting material is available for review at NFPA Headquarters
PANEL ACTION: Accept.
PANEL STATEMENT: See panel action and statement on Comment 12-10.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NOT RETURNED: 2 Kelley, Laney

(Log #1040)

12- 13 - (620-22(a)-Control Room, Control Space): Accept
SUBMITTER: Nick Marchitto, Otis Elevator Co./Rep. National Elevator Industry Inc. (NEII)
COMMENT ON PROPOSAL NO: 12-39
RECOMMENDATION: Request that the Panel reconsider its action and accept Proposal 12-39.
SUBSTANTIATION: The current NFPA-70, NEC, Article 620 does not address the new type elevator installations covered in the ASME, A17.1 Elevator Safety Code. The terms "control rooms" and "control spaces" are presently used in the A17.1 Elevator Safety Code. The elevator industry understanding of these terms is as follows:

Control Room - A fully enclosed control space outside the hoistway, intended for full bodily entry by authorized personnel only, which contains the elevator motor controller. The room may also contain associated elevator electrical and/or mechanical equipment, except for the elevator driving machine or the hydraulic machine in the case of a hydraulic elevator.
NOTE: See figure 1 *

Control Space - A space inside or outside the hoistway, intended to be accessed with or without full bodily entry by authorized personnel only, which contains the elevator motor controller. This space may also contain associated elevator electrical and/or mechanical equipment, except for the elevator driving machine or the hydraulic machine in the case of a hydraulic elevator.
NOTE: See Figure 2 *

* These figures depict only a few examples and are not to be construed as the only possible configurations. The addition of these terms to the NEC are intended to make sure that the Electrical Code addresses those installation configurations that are addressed in the A17.1 Elevator Safety Code. The terminology used in Article 620 should reflect the terminology used in A17.1.

Note: Supporting material is available for review at NFPA Headquarters
PANEL ACTION: Accept.
PANEL STATEMENT: See panel action and statement on Comment 12-10.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NOT RETURNED: 2 Kelley, Laney

(Log #1041)

12- 14 - (620-22(b)-Control Room, Control Space): Accept
SUBMITTER: Nick Marchitto, Otis Elevator Co./Rep. National Elevator Industry Inc. (NEII)
COMMENT ON PROPOSAL NO: 12-40
RECOMMENDATION: Request the Panel reconsider its action and accept Proposal 12-40.
SUBSTANTIATION: The current NFPA-70, NEC, Article 620 does not address the new type elevator installations covered in the ASME, A17.1 Elevator Safety Code. The terms "control rooms" and "control spaces" are presently used in the A17.1 Elevator Safety Code. The elevator industry understanding of these terms is as follows:

Control Room - A fully enclosed control space outside the hoistway, intended for full bodily entry by authorized personnel only, which contains the elevator motor controller. The room may also contain associated elevator electrical and/or mechanical equipment, except for the elevator driving machine or the hydraulic machine in the case of a hydraulic elevator.
NOTE: See figure 1 *

Control Space - A space inside or outside the hoistway, intended to be accessed with or without full bodily entry by authorized personnel only, which contains the elevator motor controller. This space may also contain associated elevator electrical and/or mechanical equipment, except for the elevator driving machine or the hydraulic machine in the case of a hydraulic elevator.
NOTE: See Figure 2 *

* These figures depict only a few examples and are not to be construed as the only possible configurations. The addition of these terms to the NEC are intended to make sure that the Electrical Code addresses those installation configurations that are addressed in the A17.1 Elevator Safety Code. The terminology used in Article 620 should reflect the terminology used in A17.1.

Note: Supporting material is available for review at NFPA Headquarters
PANEL ACTION: Accept.
PANEL STATEMENT: See panel action and statement on Comment 12-10.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NOT RETURNED: 2 Kelley, Laney

(Log #1042)

12- 15 - (620-23-Control Room, Control Space): Accept
SUBMITTER: Nick Marchitto, Otis Elevator Co./Rep. National Elevator Industry Inc. (NEII)
COMMENT ON PROPOSAL NO: 12-41
RECOMMENDATION: Request that the Panel reconsider its action and accept Proposal 12-41.
SUBSTANTIATION: The current NFPA-70, NEC, Article 620 does not address the new type elevator installations covered in the ASME, A17.1 Elevator Safety Code. The terms "control rooms" and "control spaces" are presently used in the A17.1 Elevator Safety Code. The elevator industry understanding of these terms is as follows:

Control Room - A fully enclosed control space outside the hoistway, intended for full bodily entry by authorized personnel only, which contains the elevator motor controller. The room may also contain associated elevator electrical and/or mechanical equipment, except for the elevator driving machine or the hydraulic machine in the case of a hydraulic elevator.
NOTE: See figure 1 *

Control Space - A space inside or outside the hoistway, intended to be accessed with or without full bodily entry by authorized personnel only, which contains the elevator motor controller. This space may also contain associated elevator electrical and/or mechanical equipment, except for the elevator driving machine or the hydraulic machine in the case of a hydraulic elevator.
NOTE: See Figure 2 *

* These figures depict only a few examples and are not to be construed as the only possible configurations. The addition of these terms to the NEC are intended to make sure that the

Electrical Code addresses those installation configurations that are addressed in the A17.1 Elevator Safety Code. The terminology used in Article 620 should reflect the terminology used in A17.1.

Note: Supporting material is available for review at NFPA Headquarters

PANEL ACTION: Accept.

PANEL STATEMENT: See panel action and statement on Comment 12-10.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

NOT RETURNED: 2 Kelley, Laney

(Log #1043)

12- 16 - (620-23(a)-Control Room, Control Space): Accept

SUBMITTER: Nick Marchitto, Otis Elevator Co./Rep. National Elevator Industry Inc. (NEII)

COMMENT ON PROPOSAL NO: 12-42

RECOMMENDATION: Request that the panel reconsider its action and accept Proposal 12-42.

SUBSTANTIATION: The current NFPA-70, NEC, Article 620 does not address the new type elevator installations covered in the ASME, A17.1 Elevator Safety Code. The terms "control rooms" and "control spaces" are presently used in the A17.1 Elevator Safety Code. The elevator industry understanding of these terms is as follows:

Control Room - A fully enclosed control space outside the hoistway, intended for full bodily entry by authorized personnel only, which contains the elevator motor controller. The room may also contain associated elevator electrical and/or mechanical equipment, except for the elevator driving machine or the hydraulic machine in the case of a hydraulic elevator.

NOTE: See figure 1 *

Control Space - A space inside or outside the hoistway, intended to be accessed with or without full bodily entry by authorized personnel only, which contains the elevator motor controller. This space may also contain associated elevator electrical and/or mechanical equipment, except for the elevator driving machine or the hydraulic machine in the case of a hydraulic elevator.

NOTE: See Figure 2 *

* These figures depict only a few examples and are not to be construed as the only possible configurations. The addition of these terms to the NEC are intended to make sure that the Electrical Code addresses those installation configurations that are addressed in the A17.1 Elevator Safety Code. The terminology used in Article 620 should reflect the terminology used in A17.1.

Note: Supporting material is available for review at NFPA Headquarters

PANEL ACTION: Accept.

PANEL STATEMENT: See panel action and statement on Comment 12-10.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

NOT RETURNED: 2 Kelley, Laney

(Log #1044)

12- 17 - (620-23(b)-Control Room, Control Space): Accept

SUBMITTER: Nick Marchitto, Otis Elevator Co./Rep. National Elevator Industry Inc. (NEII)

COMMENT ON PROPOSAL NO: 12-43

RECOMMENDATION: Request that the Panel reconsider its action and accept Proposal 12-43.

SUBSTANTIATION: The current NFPA-70, NEC, Article 620 does not address the new type elevator installations covered in the ASME, A17.1 Elevator Safety Code. The terms "control rooms" and "control spaces" are presently used in the A17.1 Elevator Safety Code. The elevator industry understanding of these terms is as follows:

Control Room - A fully enclosed control space outside the hoistway, intended for full bodily entry by authorized personnel only, which contains the elevator motor controller. The room may also contain associated elevator electrical and/or mechanical equipment, except for the elevator driving machine or the hydraulic machine in the case of a hydraulic elevator.

NOTE: See figure 1 *

Control Space - A space inside or outside the hoistway, intended to be accessed with or without full bodily entry by authorized personnel only, which contains the elevator motor controller. This space may also contain associated elevator electrical and/or mechanical equipment, except for the elevator driving machine or the hydraulic machine in the case of a hydraulic elevator.

NOTE: See Figure 2 *

* These figures depict only a few examples and are not to be construed as the only possible configurations. The addition of these terms to the NEC are intended to make sure that the Electrical Code addresses those installation configurations that are addressed in the A17.1 Elevator Safety Code. The terminology used in Article 620 should reflect the terminology used in A17.1.

Note: Supporting material is available for review at NFPA Headquarters

PANEL ACTION: Accept.

PANEL STATEMENT: See panel action and statement on Comment 12-10.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

NOT RETURNED: 2 Kelley, Laney

(Log #1045)

12- 18 - (620-23(c)-Control Room, Control Space): Accept

SUBMITTER: Nick Marchitto, Otis Elevator Co./Rep. National Elevator Industry Inc. (NEII)

COMMENT ON PROPOSAL NO: 12-44

RECOMMENDATION: Request that the Panel reconsider its action and accept Proposal 12-44.

SUBSTANTIATION: The current NFPA-70, NEC, Article 620 does not address the new type elevator installations covered in the ASME, A17.1 Elevator Safety Code. The terms "control rooms" and "control spaces" are presently used in the A17.1 Elevator Safety Code. The elevator industry understanding of these terms is as follows:

Control Room - A fully enclosed control space outside the hoistway, intended for full bodily entry by authorized personnel only, which contains the elevator motor controller. The room may also contain associated elevator electrical and/or mechanical equipment, except for the elevator driving machine or the hydraulic machine in the case of a hydraulic elevator.

NOTE: See figure 1 *

Control Space - A space inside or outside the hoistway, intended to be accessed with or without full bodily entry by authorized personnel only, which contains the elevator motor controller. This space may also contain associated elevator electrical and/or mechanical equipment, except for the elevator driving machine or the hydraulic machine in the case of a hydraulic elevator.

NOTE: See Figure 2 *

* These figures depict only a few examples and are not to be construed as the only possible configurations. The addition of these terms to the NEC are intended to make sure that the Electrical Code addresses those installation configurations that are addressed in the A17.1 Elevator Safety Code. The terminology used in Article 620 should reflect the terminology used in A17.1.

Note: Supporting material is available for review at NFPA Headquarters

PANEL ACTION: Accept.

PANEL STATEMENT: See panel action and statement on Comment 12-10.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

NOT RETURNED: 2 Kelley, Laney

(Log #1046)

12- 19 - (620-25-Control Room, Control Space, Machinery Space (New)): Accept

SUBMITTER: Nick Marchitto, Otis Elevator Co./Rep. National Elevator Industry Inc. (NEII)

COMMENT ON PROPOSAL NO: 12-45

RECOMMENDATION: Request that the Panel reconsider a portion of its action and accept Proposal 12-45 in part (b) concerning the use of the words "control room" and "control space".

SUBSTANTIATION: The current NFPA-70, NEC, Article 620 does not address the new type elevator installations covered in the ASME, A17.1 Elevator Safety Code. The terms "control rooms" and "control spaces" are presently used in the A17.1 Elevator Safety

Code. The elevator industry understanding of these terms is as follows:

Control Room - A fully enclosed control space outside the hoistway, intended for full bodily entry by authorized personnel only, which contains the elevator motor controller. The room may also contain associated elevator electrical and/or mechanical equipment, except for the elevator driving machine or the hydraulic machine in the case of a hydraulic elevator.
NOTE: See figure 1 *

Control Space - A space inside or outside the hoistway, intended to be accessed with or without full bodily entry by authorized personnel only, which contains the elevator motor controller. This space may also contain associated elevator electrical and/or mechanical equipment, except for the elevator driving machine or the hydraulic machine in the case of a hydraulic elevator.
NOTE: See Figure 2 *

* These figures depict only a few examples and are not to be construed as the only possible configurations. The addition of these terms to the NEC are intended to make sure that the Electrical Code addresses those installation configurations that are addressed in the A17.1 Elevator Safety Code. The terminology used in Article 620 should reflect the terminology used in A17.1.

In support of the proposal for a new section 620-25, reference is made to existing terms used in both the NEC and the A17.1 Codes:

Machine Room - A fully enclosed machinery space outside the hoistway, intended for full bodily entry by authorized personnel only, which contains the elevator driving machine or the hydraulic machine in the case of a hydraulic elevator. The room may also contain associated elevator electrical and/or mechanical equipment.
NOTE: See figure 3

Machinery Space - A space inside or outside the hoistway, intended to be accessed with or without full bodily entry by authorized personnel only, which contains elevator mechanical equipment, and may also contain associated elevator electrical equipment. This space may also contain the elevator driving machine.
NOTE: See previous figures 1 & 2

These figures depict only a few examples and are not to be construed as the only possible configurations.

Note: Supporting material is available for review at NFPA Headquarters

PANEL ACTION: Accept.
PANEL STATEMENT: See panel action and statement on Comment 12-10.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NOT RETURNED: 2 Kelley, Laney

(Log #1047)

12- 20 - (620-37-Control Room, Control Space, Machinery Space): Accept

SUBMITTER: Nick Marchitto, Otis Elevator Co./Rep. National Elevator Industry Inc. (NEII)
COMMENT ON PROPOSAL NO: 12-46
RECOMMENDATION: Request that the Panel reconsider its action and accept Proposal 12-46.
SUBSTANTIATION: The current NFPA-70, NEC, Article 620 does not address the new type elevator installations covered in the ASME, A17.1 Elevator Safety Code. The terms "control rooms", "control spaces" and "machinery spaces" are presently used in the A17.1 Elevator Safety Code. The elevator industry understanding of these terms is as follows:

Control Room - A fully enclosed control space outside the hoistway, intended for full bodily entry by authorized personnel only, which contains the elevator motor controller. The room may also contain associated elevator electrical and/or mechanical equipment, except for the elevator driving machine or the hydraulic machine in the case of a hydraulic elevator.
NOTE: See figure 1 *

Control Space - A space inside or outside the hoistway, intended to be accessed with or without full bodily entry by authorized personnel only, which contains the elevator motor controller. This space may also contain associated elevator electrical and/or mechanical equipment, except for the elevator driving machine or the hydraulic machine in the case of a hydraulic elevator.
NOTE: See figure 2 *

Machinery Space - A space inside or outside the hoistway, intended to be accessed with or without full bodily entry by authorized personnel only, which contains elevator mechanical equipment, and may also contain associated elevator electrical equipment. This space may also contain the elevator driving machine.
NOTE: See figures 1 * & 2 *

* These figures depict only a few examples and are not to be construed as the only possible configurations. The addition of these terms to the NEC are intended to make sure that the Electrical Code addresses those installation configurations that are addressed in the A17.1 Elevator Safety Code. The terminology used in Article 620 should reflect the terminology used in A17.1.

NOTE: Supporting material is available for review at NFPA Headquarters

PANEL ACTION: Accept.
PANEL STATEMENT: See panel action and statement on Comment 12-10.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NOT RETURNED: 2 Kelley, Laney

(Log #1048)

12- 21 - (620-37(a)-Control Room, Control Space, Machinery Space): Accept

SUBMITTER: Nick Marchitto, Otis Elevator Co./Rep. National Elevator Industry Inc. (NEII)
COMMENT ON PROPOSAL NO: 12-47
RECOMMENDATION: Request that the Panel reconsider its action and accept Proposal 12-47.
SUBSTANTIATION: The current NFPA-70, NEC, Article 620 does not address the new type elevator installations covered in the ASME, A17.1 Elevator Safety Code. The terms "control rooms", "control spaces" and "machinery spaces" are presently used in the A17.1 Elevator Safety Code. The elevator industry understanding of these terms is as follows:

Control Room - A fully enclosed control space outside the hoistway, intended for full bodily entry by authorized personnel only, which contains the elevator motor controller. The room may also contain associated elevator electrical and/or mechanical equipment, except for the elevator driving machine or the hydraulic machine in the case of a hydraulic elevator.
NOTE: See figure 1 *

Control Space - A space inside or outside the hoistway, intended to be accessed with or without full bodily entry by authorized personnel only, which contains the elevator motor controller. This space may also contain associated elevator electrical and/or mechanical equipment, except for the elevator driving machine or the hydraulic machine in the case of a hydraulic elevator.
NOTE: See figure 2 *

Machinery Space - A space inside or outside the hoistway, intended to be accessed with or without full bodily entry by authorized personnel only, which contains elevator mechanical equipment, and may also contain associated elevator electrical equipment. This space may also contain the elevator driving machine.
NOTE: See figures 1 * & 2 *

* These figures depict only a few examples and are not to be construed as the only possible configurations. The addition of these terms to the NEC are intended to make sure that the Electrical Code addresses those installation configurations that are addressed in the A17.1 Elevator Safety Code. The terminology used in Article 620 should reflect the terminology used in A17.1.

NOTE: Supporting material is available for review at NFPA Headquarters

PANEL ACTION: Accept.
PANEL STATEMENT: See panel action and statement on Comment 12-10.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NOT RETURNED: 2 Kelley, Laney

(Log #1049)

12- 22 - (620-44-Control Room, Control Space, Machinery Space): Accept

Note: The Technical Correlating Committee directs that Section 620-44 of Proposal 12-48 read as follows: "Traveling cables shall be permitted to be continued to elevator controller…".

SUBMITTER: Nick Marchitto, Otis Elevator Co./Rep. National Elevator Industry Inc. (NEII)

COMMENT ON PROPOSAL NO: 12-48

RECOMMENDATION: Request that the Panel reconsider its action and accept Proposal 12-48.

SUBSTANTIATION: The current NFPA-70, NEC, Article 620 does not address the new type elevator installations covered in the ASME, A17.1 Elevator Safety Code. The terms "control rooms", "control spaces" and "machinery spaces" are presently used in the A17.1 Elevator Safety Code. The elevator industry understanding of these terms is as follows:

Control Room - A fully enclosed control space outside the hoistway, intended for full bodily entry by authorized personnel only, which contains the elevator motor controller. The room may also contain associated elevator electrical and/or mechanical equipment, except for the elevator driving machine or the hydraulic machine in the case of a hydraulic elevator.

NOTE: See figure 1 *

Control Space - A space inside or outside the hoistway, intended to be accessed with or without full bodily entry by authorized personnel only, which contains the elevator motor controller. This space may also contain associated elevator electrical and/or mechanical equipment, except for the elevator driving machine or the hydraulic machine in the case of a hydraulic elevator.

NOTE: See figure 2 *

Machinery Space - A space inside or outside the hoistway, intended to be accessed with or without full bodily entry by authorized personnel only, which contains elevator mechanical equipment, and may also contain associated elevator electrical equipment. This space may also contain the elevator driving machine.

NOTE: See figures 1 * & 2 *

* These figures depict only a few examples and are not to be construed as the only possible configurations. The addition of these terms to the NEC are intended to make sure that the Electrical Code addresses those installation configurations that are addressed in the A17.1 Elevator Safety Code. The terminology used in Article 620 should reflect the terminology used in A17.1.

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

PANEL ACTION: Accept.

PANEL STATEMENT: See panel action and statement on Comment 12-10.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

NOT RETURNED: 2 Kelley, Laney

COMMENT ON AFFIRMATIVE:

MARCHITTO: In the original Proposal 12-48, the wording from the 1999 NEC (620-44) was inadvertently miscopied in creating the proposal. This erroneous wording has been carried through to the ROC Panel Action and was never noticed. I did not discover the incorrect wording until after I sent in my affirmative vote on the ROC ballot. I firmly believe that the panel acted in good faith on the proposal and would not object to correcting the original 1999 NEC wording in that part of the code that is not being changed.

Therefore, in Comment 12-22 change the words "Traveling cables shall be continued to be permitted..." to "Traveling cables shall be permitted to be continued...".

This is the correct wording as it appears in the 1999 NEC and should appear in the 2002 NEC. The transposed words "continued to be permitted" was never intended by the submitter (alas, it was I) to be a change and to be a part of the proposal.

(Log #1904)

12- 23 - (620-51(a)): Accept

SUBMITTER: Michael I. Callanan, International Brotherhood of Electrical Workers

COMMENT ON PROPOSAL NO: 12-49

RECOMMENDATION: Accept this proposal in principle.

Replace "430-109 Exception No. 3" with "430-109 (c)". The rest of the proposal remains unchanged.

SUBSTANTIATION: The intent of this proposal has merit. It provides a disconnecting means within sight of the wheelchair lift. Unfortunately, the submitter accidentally referenced material from the 1996 NEC. The above suggested change references the 1999 NEC.

This comment represents the official position of the International Brotherhood of Electrical Workers Codes & Standards Committee.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

NOT RETURNED: 2 Kelley, Laney

(Log #2365)

12- 24 - (620-51(a)): Accept in Principle

SUBMITTER: Monte R. Ewing, State of Wisconsin

COMMENT ON PROPOSAL NO: 12-49

RECOMMENDATION: The disconnecting means shall be an enclosed externally operable fuses motor circuit switch or circuit breaker. Where an individual branch circuit supplies a wheelchair lift, the disconnecting means shall be permitted to comply with 430-109. Disconnects shall be capable of being locked in the open position. The disconnecting means shall be a listed device.

SUBSTANTIATION: Most lifts are wired with individual branch circuits. There is typically no machine room associated with these chair lifts since they are selfcontained. The lift enclosure does not typically provide for disconnect workspace per 110-26 but 620-51(c) requires the disconnect to be readily accessible to the lift. If the installer uses 430-109(c) as an option they can locate the disconnect accessible to the lift without having a workspace problem with 110-26.

PANEL ACTION: Accept in Principle.

PANEL STATEMENT: See panel action and statement on Comment 12-23 which meets the submitter's intent.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

NOT RETURNED: 2 Kelley, Laney

(Log #132)

12- 25 - (620-51(a), Exception (New)): Accept

SUBMITTER: Technical Correlating Committee National Electrical Code

COMMENT ON PROPOSAL NO: 12-49

RECOMMENDATION: It was the action of the Technical Correlating Committee that further consideration be given to the comments expressed in the voting. This action will be considered by the panel as a public comment.

SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.

PANEL ACTION: Accept.

PANEL STATEMENT: See panel action and statement on Comment 12-23.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

NOT RETURNED: 2 Kelley, Laney

(Log #1050)

12- 26 - (620-51(b)-Control Room, Control Space): Accept

SUBMITTER: Nick Marchitto, Otis Elevator Co./Rep. National Elevator Industry Inc. (NEII)

COMMENT ON PROPOSAL NO: 12-50

RECOMMENDATION: Request that the panel reconsider is action and accept Proposal 12-50.

SUBSTANTIATION: The current NFPA-70, NEC, Article 620 does not address the new type elevator installations covered in the ASME, A17.1 Elevator Safety Code. The terms "control rooms", "control spaces" and "machinery spaces" are presently used in the A17.1 Elevator Safety Code. The elevator industry understanding of these terms is as follows:

Control Room - A fully enclosed control space outside the hoistway, intended for full bodily entry by authorized personnel only, which contains the elevator motor controller. The room may also contain associated elevator electrical and/or mechanical

equipment, except for the elevator driving machine or the hydraulic machine in the case of a hydraulic elevator.
NOTE: See figure 1 *
Control Space - A space inside or outside the hoistway, intended to be accessed with or without full bodily entry by authorized personnel only, which contains the elevator motor controller. This space may also contain associated elevator electrical and/or mechanical equipment, except for the elevator driving machine or the hydraulic machine in the case of a hydraulic elevator.
NOTE: See figure 2 *
* These figures depict only a few examples and are not to be construed as the only possible configurations. The addition of these terms to the NEC are intended to make sure that the Electrical Code addresses those installation configurations that are addressed in the A17.1 Elevator Safety Code. The terminology used in Article 620 should reflect the terminology used in A17.1.
NOTE: Supporting material is available for review at NFPA Headquarters.
PANEL ACTION: Accept.
PANEL STATEMENT: See panel action and statement on Comment 12-10.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NOT RETURNED: 2 Kelley, Laney

(Log #1051)

12- 27 - (620-53-Control Room): Accept
SUBMITTER: Nick Marchitto, Otis Elevator Co./Rep. National Elevator Industry Inc. (NEII)
COMMENT ON PROPOSAL NO: 12-55
RECOMMENDATION: Request that the Panel reconsider its action and accept Proposal 12-55.
SUBSTANTIATION: Addressing the first sentence in the Panel statement - The current NFPA-70, NEC, Article 620 does not address the new type elevator installations covered in the ASME, A17.1 Elevator Safety Code. The term "control room" is presently used in the A17.1 Elevator Safety Code. The elevator industry understanding of this term is as follows:
Control Room - A fully enclosed control space outside the hoistway, intended for full bodily entry by authorized personnel only, which contains the elevator motor controller. The room may also contain associated elevator electrical and/or mechanical equipment, except for the elevator driving machine or the hydraulic machine in the case of a hydraulic elevator.
NOTE: See figure 1 *
* This figure depicts only one example and is not to be construed as the only possible configuration. The addition of this term to the NEC is intended to make sure that the Electrical Code addresses those installation configurations that are addressed in the A17.1 Elevator Safety Code. The terminology used in Article 620 should reflect the terminology used in A17.1.
NOTE: Supporting material is available for review at NFPA Headquarters.
PANEL ACTION: Accept.
PANEL STATEMENT: See panel action and statement on Comment 12-10.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NOT RETURNED: 2 Kelley, Laney

(Log #1052)

12- 28 - (620-54-Control Room): Accept
SUBMITTER: Nick Marchitto, Otis Elevator Co./Rep. National Elevator Industry Inc. (NEII)
COMMENT ON PROPOSAL NO: 12-56
RECOMMENDATION: Request that the Panel reconsider its action and accept Proposal 12-56.
SUBSTANTIATION: Addressing the first sentence in the Panel statement - The current NFPA-70, NEC, Article 620 does not address the new type elevator installations covered in the ASME, A17.1 Elevator Safety Code. The term "control room" is presently used in the A17.1 Elevator Safety Code. The elevator industry understanding of this term is as follows:
Control Room - A fully enclosed control space outside the hoistway, intended for full bodily entry by authorized personnel only, which contains the elevator motor controller. The room may also contain associated elevator electrical and/or mechanical equipment, except for the elevator driving machine or the hydraulic machine in the case of a hydraulic elevator.
NOTE: See figure 1 *
* This figure depicts only one example and is not to be construed as the only possible configuration. The addition of this term to the NEC is intended to make sure that the Electrical Code addresses those installation configurations that are addressed in the A17.1 Elevator Safety Code. The terminology used in Article 620 should reflect the terminology used in A17.1.
NOTE: Supporting material is available for review at NFPA Headquarters.
PANEL ACTION: Accept.
PANEL STATEMENT: See panel action and statement on Comment 12-10.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NOT RETURNED: 2 Kelley, Laney

(Log #1053)

12- 29 - (620-55-Control Room, Control Space (New)): Accept
Note: The Technical Correlating Committee understands that the action of the panel in accepting this comment is to amend its action on Proposal 12-57 to replace the wording "machine room/machinery space" with "machine room or control room/machine space or control space."
SUBMITTER: Nick Marchitto, Otis Elevator Co./Rep. National Elevator Industry Inc. (NEII)
COMMENT ON PROPOSAL NO: 12-57
RECOMMENDATION: Request that the Panel reconsider a portion of its action and accept Proposal 12-57 in the second sentence concerning the use of the words "control room" and "control space".
SUBSTANTIATION: The current NFPA-70, NEC, Article 620 does not address the new type elevator installations covered in the ASME, A17.1 Elevator Safety Code. The terms "control rooms", "control spaces" and "machinery spaces" are presently used in the A17.1 Elevator Safety Code. The elevator industry understanding of these terms is as follows:
Control Room - A fully enclosed control space outside the hoistway, intended for full bodily entry by authorized personnel only, which contains the elevator motor controller. The room may also contain associated elevator electrical and/or mechanical equipment, except for the elevator driving machine or the hydraulic machine in the case of a hydraulic elevator.
NOTE: See figure 1 *
Control Space - A space inside or outside the hoistway, intended to be accessed with or without full bodily entry by authorized personnel only, which contains the elevator motor controller. This space may also contain associated elevator electrical and/or mechanical equipment, except for the elevator driving machine or the hydraulic machine in the case of a hydraulic elevator.
NOTE: See figure 2 *
* These figures depict only a few examples and are not to be construed as the only possible configurations. The addition of these terms to the NEC are intended to make sure that the Electrical Code addresses those installation configurations that are addressed in the A17.1 Elevator Safety Code. The terminology used in Article 620 should reflect the terminology used in A17.1.
In support of the proposal for a new section 620-55, reference is made to existing terms used in both the NEC and the A17.1 Codes:
Machine Room - A fully enclosed machinery space outside the hoistway, intended for full bodily entry by authorized personnel only, which contains the elevator driving machine or the hydraulic machine in the case of a hydraulic elevator. The room may also contain associated elevator electrical and/or mechanical equipment.
NOTE: See figure 3
Machinery Space - A space inside or outside the hoistway, intended to be accessed with or without full bodily entry by authorized personnel only, which contains elevator mechanical equipment, and may also contain associated elevator electrical equipment. This space may also contain the elevator driving machine.
NOTE: See previous figures 1 & 2
These figures depict only a few examples and are not to be construed as the only possible configurations.
NOTE: Supporting material is available for review at NFPA Headquarters.
PANEL ACTION: Accept.

PANEL STATEMENT: See panel action and statement on Comment 12-10.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NOT RETURNED: 2 Kelley, Laney

(Log #2120)

12- 30 - (620-62): Reject
SUBMITTER: George Gregory, Square D Company
COMMENT ON PROPOSAL NO: 12-58
RECOMMENDATION: Accept Proposal 12-58.
SUBSTANTIATION: The intent of Proposal 12-58 is to help assure that selective coordination exists for ground-fault conditions as well as for other conditions. It is well known and documented that a very high percentage of faults are ground faults. For example, IEEE Standard 242-1986 states on page 271, "The majority of electric faults involve ground. Even those that are initiated as phase-to-phase will spread quickly to any adjacent metallic housing, conduit, or tray that provides a return path to the system grounding point."

Overcurrent protective devices alone may provide selective coordination in many cases. However, some choices of overcurrent protection will not provide for selective coordination with ground-fault protection installed as required by 230-95 or for other reasons.

The ground-fault protection on the main circuit breaker is set at the maximum setting. It does not coordinate selectively with the 400 A fuse and is in a race with the 250 A fuse.

The wording for the proposal was written to parallel that in 517-17. It is not intended to imply that additional ground-fault protection devices are always required. Perhaps more simple wording such as the addition of "including ground fault protective devices" at the end of the present sentence would be adequate.

Note: Supporting Material is available for review at NFPA Headquarters.
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter has not offered sufficient new technical substantiation to support his original Proposal 12-58, which was rejected for lack of technical substantiation. The submitter agrees in his substantiation that additional ground-fault protective devices are not always required in this type of installation and the panel is of the opinion that the concerns of the submitter would best be handled by design on each installation.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NOT RETURNED: 2 Kelley, Laney

(Log #1054)

12- 31 - (620-71-Machinery Space, Control Space): Accept
SUBMITTER: Nick Marchitto, Otis Elevator Co./Rep. National Elevator Industry Inc. (NEII)
COMMENT ON PROPOSAL NO: 12-60
RECOMMENDATION: Request that the Panel reconsider its action and accept Proposal 12-60.
SUBSTANTIATION: The current NFPA-70, NEC, Article 620 does not address the new type elevator installations covered in the ASME, A17.1 Elevator Safety Code. The term "space" is referring to machinery space or control space. The elevator industry understanding of these terms is as follows:

Machinery Space - A space inside or outside the hoistway, intended to be accessed with or without full bodily entry by authorized personnel only, which contains elevator mechanical equipment, and may also contain associated elevator electrical equipment. This space may also contain the elevator driving machine.
NOTE: See figures 1 * & 2 *

Control Space - A space inside or outside the hoistway, intended to be accessed with or without full bodily entry by authorized personnel only, which contains the elevator motor controller. This space may also contain associated elevator electrical and/or mechanical equipment, except for the elevator driving machine or the hydraulic machine in the case of a hydraulic elevator.
NOTE: See figure 2 *

* These figures depict only one example and are not to be construed as the only possible configurations. The addition of this term "space" to the NEC is intended to make sure that the Electrical Code addresses those installation configurations that are addressed in the A17.1 Elevator Safety Code.

NOTE: Supporting material is available for review at NFPA Headquarters.
PANEL ACTION: Accept.
PANEL STATEMENT: See panel action and statement on Comment 12-10.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NOT RETURNED: 2 Kelley, Laney

ARTICLE 625 — ELECTRIC VEHICLE CHARGING SYSTEM EQUIPMENT

(Log #312)

12- 32 - (625-17): Accept in Part
SUBMITTER: Craig B. Toepfer, Ford Motor Company
COMMENT ON PROPOSAL NO: 12-66
RECOMMENDATION: Present wording:

625.17 Cable … The overall length of the cable shall not exceed 7.5 m (25 ft). Where the electric vehicle supply equipment cable is suspended from overhead or is intended for portable use within the facility, the overall length of the cable shall be permitted to exceed 7.5 m (25 ft) if equipped with a cable management system that is identified and listed as suitable for the purpose.

Proposed wording:

625.17 Cable … The overall length of the cable shall not exceed 7.5 m (25 ft) unless equipped with a cable management system that is identified and listed as suitable for the purpose…
SUBSTANTIATION: The revised wording more clearly reflects the intent of the revision in a more concise general manner to comply with the requirements of the NEC Style Manual with respect to positive language text.

The proposed text has been reviewed with and accepted by the original submitter.
PANEL ACTION: Accept in Part.
In the first sentence, delete the words "identified and".
PANEL STATEMENT: The panel deleted the words "identified and" because they are redundant.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NOT RETURNED: 2 Kelley, Laney

ARTICLE 630 — ELECTRIC WELDERS

(Log #133)

12- 33 - (630-11): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 12-72
RECOMMENDATION: The Technical Correlating Committee directs that the Panel revise the Panel Action relative to the Fine Print Note in accordance with 3.1 of the NEC Style Manual. This action will be considered by the Panel as a Public Comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
Revise 630.11(b) to read as follows:

(b) Group of Welders. Conductor ampacity shall be based on the individual currents determined in 630-11(a) as the sum of 100 percent of the two largest welders, plus 85 percent of the third largest welder, plus 70 percent of the fourth largest welder, plus 60 percent of all remaining welders.

Exception: Percentage values lower than those given in (b) shall be permitted in cases where the work is such that a high-operating duty cycle for individual welders is impossible.

FPN: Duty cycle considers welder loading based on the use to be made of each welder and the number of welders supplied by the conductors that will be in use at the same time. The load value used for each welder considers both the magnitude and the duration of the load while the welder is in use.

PANEL STATEMENT: The panel accepts the direction of the Technical Correlating Committee and has revised the wording of 630.11(b). This revision turns the former FPN into properly formatted mandatory language. The rule for calculating ampacity has been reformatted and a FPN has been added, which will assist in applying the new exception.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Kelley, Laney

(Log #852)

12- 34 - (630-15, FPN (New)): Accept in Principle
SUBMITTER: Larry F. Miller, National Electrical Manufacturers Association (NEMA)
COMMENT ON PROPOSAL NO: 12-75
RECOMMENDATION: The panel should continue to accept the proposal in principal in part but the following fine print note should be added:
FPN: Where grounding of a welding secondary circuit is required by local regulation or when needed to minimize electromagnetic interference, it is not good practice for welding current to flow in the equipment grounding conductors.
SUBSTANTIATION: NEMA agrees with the code-making panel 12 assessment that the Section 630-15 proposal addressed workplace procedures rather than equipment installation concerns, the normal purview of the NEC. Nevertheless, NEMA believes that the 2002 NEC would do its users a service by indicating that welding current may flow in the equipment grounding conductors–a potential safety hazard–depending on the workpiece grounding procedure used. Therefore, NEMA proposes that a Fine Print Note (a revision of the FPN originally proposed) be added to Section 630-15.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Comment 12-35.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Kelley, Laney

(Log #1130)

12- 35 - (630-15, FPN (New)): Accept
SUBMITTER: Paul Dobrowsky, Holley, NY
COMMENT ON PROPOSAL NO: 12-75
RECOMMENDATION: Continue to accept the proposal as modified and add the following fine print note.
FPN: Connecting welder secondary circuits to grounded objects can create parallel paths and can cause objectionable current over equipment grounding conductors.
SUBSTANTIATION: Welder secondary circuits should not be considered premises wiring. Flexible cords, used to supply portable grounded tools and equipment, have been "melted" in a spiral fashion (following the equipment grounding conductor "spiral" in the cord). The most probable cause was having a welder secondary clamped to a metal work table on which the tool was laying. Similar incidents occurred with work lights that were clamped to the work surface.
This comment was developed and reviewed by a task group consisting of Paul Dobrowsky (CMP 5), Andre Cartal (CMP 12), David Dini (CMP 1 and CMP 5), Michael Johnston (CMP 5), Charles Mello (CMP 5), and Gregory Steinman (CMP 5).
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Kelley, Laney

ARTICLE 640 — AUDIO SIGNAL PROCESSING, AMPLIFICATION, AND REPRODUCTION EQUIPMENT

(Log #1569)

16- 3 - (640-2-Abandoned Cable): Accept in Principle
SUBMITTER: Wayne G. Carson, Carson Assoc. Inc.
COMMENT ON PROPOSAL NO: 16-1a
RECOMMENDATION: Add definition:
Abandoned Cable: Cable that is not terminated at both ends, not connected to equipment, or not identified for future use with a tag.
SUBSTANTIATION: Section 640.3(A) includes a requirement to remove abandoned cable but abandoned cable is not defined in this section. It is not believed that this is new material as the term "abandoned cable" was added to this section. Also, the definition has been added to five other sections (725-2, 760-2, 770-2, 800-2, and 820-2). This comment provides consistency between sections of the code and assists the user in understanding terms used in the code.
PANEL ACTION: Accept in Principle.
Revise the recommendation to read as follows:
"Abandoned Audio Distribution Cable. Installed audio distribution cable that is not terminated at equipment and not identified for future use with a tag."
PANEL STATEMENT: The revised text expresses the intended definition and complies with the Manual of Style.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22
VOTE ON PANEL ACTION:
AFFIRMATIVE: 22
COMMENT ON AFFIRMATIVE:
LANNI: We didn't go far enough. Everyone will tag the cable to avoid removing it.

(Log #265)

16- 4 - (640-3(a)): Accept in Principle
SUBMITTER: Stanley Kaufman, Lucent Technologies
COMMENT ON PROPOSAL NO: 16-1a
RECOMMENDATION: Delete "not intended for future use."
SUBSTANTIATION: It is redundant to state "Abandoned cables not intended for future use...", since abandoned cables are defined as not being intended for future use.
PANEL ACTION: Accept in Principle.
Revise the second sentence of Section 640-3(a) in the recommendation of Proposal 16-1a to read as follows:
"The accessible portion of abandoned audio distribution cables shall not be permitted to remain."
PANEL STATEMENT: The revised text meets the intent of the submitter and is correlated with similar text in Articles 725, 760, 770, 800, 820 and 830.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22
VOTE ON PANEL ACTION:
AFFIRMATIVE: 22

(Log #1308)

16- 5 - (640-3(a)): Accept in Principle
SUBMITTER: Allen C. Weidman, The Society of the Plastics Industry, Inc.
COMMENT ON PROPOSAL NO: 16-1a
RECOMMENDATION: We support the action of the panel.
SUBSTANTIATION: None.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Refer to panel action and statement on Comment 16-4.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21
ABSTENTION: 1
EXPLANATION OF ABSTENTION:
CAUDILL: The Society of the Plastics Industries could not reach a consensus position on this issue.

(Log #1577)

16- 6 - (640-3(a)): Accept in Principle in Part
SUBMITTER: Wayne G. Carson, Carson Assoc. Inc.
COMMENT ON PROPOSAL NO: 16-1a
RECOMMENDATION: Revise text to read as follows:
Spread of Fire or Products of Combustion. Installations in hollow spaces, vertical shafts, and ventilation or air-handling ducts shall be made so that the possible spread of fire or products of combustion will not be substantially increased. Openings around penetrations through fire resistance-rated walls, partitions, floors, or ceilings shall be firestopped using approved methods to maintain the fire resistance rating.
Abandoned cables not intended for future use shall not be permitted to remain.
FPN: Directories of electrical construction materials published by qualified testing laboratories contain many listing installation restrictions necessary to maintain the fire-resistive rating of assemblies where penetrations or openings are made.

SUBSTANTIATION: This definition under the section entitled "Spread of Fire or Products of Combustion" is not consistent throughout the Code. This comment uses language from ROP 16-250 [850-52(B)] to provide a consistent requirement throughout the code.

The same comment is being made for the following sections:
645-5D6 (ROP 12-106)
725-3B (ROP 16-80)
760-3A (ROP 16-144)
770-3A (ROP 16-176)
820-3A (ROP 16-313)
820-52B (ROP 16-311)
830-3A (ROP 16-364)
830-58B (ROP 16-368)

PANEL ACTION: Accept in Principle in Part.
PANEL STATEMENT: The panel accepts in principle the statement regarding abandoned cables. Refer to panel action on Comment 16-4. This satisfies the submitter's concerns.

The current reference to Section 300-21 satisfies the balance of the comment, which is rejected. That portion of the comment repeats the text of Section 300-21.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22
VOTE ON PANEL ACTION:
AFFIRMATIVE: 22

(Log #2387)

16- 7 - (640-3(a)): Accept in Principle
SUBMITTER: Toxicity Technical Advisory Committee
COMMENT ON PROPOSAL NO: 16-1a
RECOMMENDATION: The TTAC finds that this is an issue of fire hazard analysis and less one of toxic hazard.
SUBSTANTIATION: Summary of Proposal: Unused signal cable should be removed.

Toxicity Issues: The TTAC comments on Proposals 7-135 and 7-137 (Comment 7-45) on toxic potency apply here as well. Since there is no limit on the amount of active cables, and since the flammability and smoke toxicity properties of neither the existing nor new cables are specified, it is impossible to assess the added impact of the abandoned cable on toxic hazard.

In this context, the NFPA TTAC builds on the recommendation of the Task Group on Nonmetallic-Sheathed Cable to the NEC Technical Correlating Committee and recommends that methodology and data be developed to enable comparing the contribution to fire hazard (and toxic fire hazard in particular) of the various types of allowed wiring products.

General Statements: This comment was developed by the NFPA Toxicity Technical Adviosry Committee. Members of this committee are as follows: Richard G. Gann, Ph.D., Chair; Craig Beyler, Ph.D; Edward V. Clougherty, Ph.D; Christopher Laux, AIA, CBO; James P. Lyon, Ph.D; and Richard Pehrson, Ph.D.

The 12 proposals for the 2002 NEC that were forwarded to the Toxicitiy Technical Advisory Committee (TTAC) on May 26, 2000 for comment all involve potential changes in the mass and location of combustible or degradable (C/D) materials within a building. Such changes might affect the fire's rate of heat release, the single most important variable affecting hazard to people since it is the driving force leading to the spread of fire and products of combustion. Having been advised that the NEC task groups contain the necessary expertise to address fire growth and overall fire hazard, the TTAC is only submitting comments on the impacts of the proposed changes on smoke toxicity and toxic hazard.

In the following comments, references to "occupants" are meant to include firefighters operating in accordance with NFPA 1500.

The composition of the C/D products, and thus the smoke generated in a fire, may evolve over time. Thus, the TTAC comments apply to general changes in the mass and location of C/D products and are not limited to the current formulation of such products.

Section 331-1 of the NEC requires that the toxicity characteristics of NMT be no worse than those of unplasticized PVC, but does not name those characteristics nor cite a test method for measuring them. NFPA 269 was developed for such purposes. It can be used to provide (a) data on the lethal toxic potency of smoke and (b) gas yields of key toxicants for use in fire hazard modeling. Section 331-1 should be modified to note both the method to be used and that these are the data to be provided. A prescriptive (e.g., LC_{50}) comparison with unplasticized PVC should be replaced by a comparison of Toxic hazard of the proposed product and unplasticized PVC.

PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Refer to the panel action and statement on Comment 16-4. The Code Making Panel appreciates the Technical Toxicity Advisory Committee support for the removal of abandoned cables.

The panel assumes that the "Summary of Proposal" is actually the "Recommendation."
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22
VOTE ON PANEL ACTION:
AFFIRMATIVE: 22

(Log #191)

16- 8 - (640-3(l)): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 16-2
RECOMMENDATION: The Technical Correlating Committee directs that the Action on this Proposal be rewritten to comply with the NEC Style Manual to delete the reference to Article 445. This action will be considered by the Panel as a Public Comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
Modify the recommendation of Proposal 16-2 to revise the reference in the first sentence from "Article 445" to "445.2 through 445.10"
PANEL STATEMENT: The specific section references are provided instead of the article reference.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22
VOTE ON PANEL ACTION:
AFFIRMATIVE: 22

(Log #1421)

16- 9 - (640-6): Accept in Part
SUBMITTER: Kari Barrett, American Chemistry Council
COMMENT ON PROPOSAL NO: 16-2a
RECOMMENDATION: Delete the following text:
~~Such cables shall be attached to structural components at intervals not exceeding 1.52 m (5 ft) and within 305 mm (12 In.) from every cabinet, box or fitting by straps, staples, hangers or similar fittings designed and installed so as not to damage the cable. The installation shall also conform with Section 300-4(d).~~
SUBSTANTIATION: The addition of this text would make the mandatory requirements of this section overly specific. The present wording is sufficient guidance to both the installer and the authority having jurisdiction.
PANEL ACTION: Accept in Part.
Revise the third sentence of the panel action text of Proposal 16-2a to read as follows:
"Such cables shall be attached to structural components by straps, staples, hangers or similar fittings designed and installed so as not to damage the cable."
PANEL STATEMENT: The panel accepts the removal of specific distances for the attachment of the cable. The panel does not agree that the existing code wording is sufficient guidance to both the installer and the authority having jurisdiction.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22
VOTE ON PANEL ACTION:
AFFIRMATIVE: 22

(Log #1641)

16- 10 - (640-6): Reject
SUBMITTER: Andy Scott, National Cable Television Association
COMMENT ON PROPOSAL NO: 16-2a
RECOMMENDATION: Reject Proposal 16-2a.
SUBSTANTIATION: NCTA, on behalf of the cable television industry, strongly urges Panel 16 to reject these proposals. While attachment every 5 ft may be a practice in many cases, it also may be overly restrictive and unnecessary in others. The requirement to support cables every 5 ft is outside the scope of the code. The NCTA urges Panel 16 not to allow the NEC to serve as an Installation Manual.
PANEL ACTION: Reject.
PANEL STATEMENT: This proposal provides additional rules for the mechanical execution of the work. Since there are additional rules, the fine print note is not necessary. This provides parallel

requirements to those used in Articles 725, 760, 770, 800, 820 and 830. Although the panel rejected the submitter's comment to reject Proposal 16-2a, the panel did act to remove the 5 ft attachment requirement that the submitter requested.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22
VOTE ON PANEL ACTION:
AFFIRMATIVE: 22

(Log #192)

16- 11 - (640-42(e)(1), (2)): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 16-18
RECOMMENDATION: The Technical Correlating Committee directs the Panel to clarify the Action on this Proposal relative to the reference to "Section 400", specifically what section number is to be included. The Technical Correlating directs that the Action on this Proposal be revised to comply with the NEC Style Manual 4.1.1 regarding referencing an entire article. This action will be considered by the Panel as a Public Comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
Modify the recommendation of Proposal 16-18 to replace "Section 400" with "Table 400.4"
Also replace "Articles 520 and/or 525" with "Sections 520.5, 520.10 and 525.3"
PANEL STATEMENT: The change is made to comply with the Manual of Style.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22
VOTE ON PANEL ACTION:
AFFIRMATIVE: 22

ARTICLE 645 — INFORMATION TECHNOLOGY EQUIPMENT

(Log #134)

12- 36 - (645-2): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 12-80
RECOMMENDATION: It was the action of the Technical Correlating Committee that this Proposal be reconsidered and correlated with the action on Proposal 12-79. See Technical Correlating Committee action on Proposal 12-79. This Proposal is a Comment that was Held for Further Study during the processing of the 1999 NEC. As such, the Technical Correlating Committee directs that the Panel act upon this Proposal based on its merits. This action will be considered by the Panel as a Public Comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
The panel continues to reject Proposal 12-80 as it included recommendations that were not electrical in nature. The panel accepted Proposal 12-79 as it was submitted by a task-group consisting of members from both CMP-12 and the committee on Electronic Computer Systems and was relating only to electrical requirements.
PANEL STATEMENT: The panel accepts the direction of the Technical Correlating Committee and recognizes that additional correlation would be an asset. Panel 12 requests that the Technical Correlating Committee recognize that the scope of NFPA 75 does not correspond to the scope of Article 645. All the requirements of a computer room in NFPA 75 are not necessary to gain the relaxations granted by Article 645 of the NEC.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NOT RETURNED: 2 Kelley, Laney

(Log #1571)

12- 37 - (645-2-Abandoned Cable): Reject
SUBMITTER: Wayne G. Carson, Carson Assoc. Inc.
COMMENT ON PROPOSAL NO: 12-106
RECOMMENDATION: Add definition section 645.2:
Abandoned Cable: Cable that is not terminated at both ends, not connected to equipment, or not identified for future use with a tag.
Renumber existing section 645.2 to 645.3.
SUBSTANTIATION: Section 645.5 includes a requirement to remove abandoned cable but abandoned cable is not defined in this section. It is not believed that this is new material as the term "abandoned cable" was added to this section of the Code. Also, the definition has been added to five other sections (725-2, 760-2, 770-2, 800-2, and 820-2). This comment provides consistency between sections of the code and assists the user in understanding terms used in the code.
PANEL ACTION: Reject.
PANEL STATEMENT: See the panel statement on Proposal 12-106. Any cable could be marked "for future use". Regardless of the actions of Panel 16 relating to abandoned cables, the jurisdiction of under-floor spaces in information technology equipment rooms is within the scope of Panel 12. It is the opinion of the panel that tagging or marking of abandoned cables does not solve the many demonstrated problems of increased safety hazards in under-floor spaces and does not in any way restrict the amount of cables that can be marked for future use.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NEGATIVE: 1
NOT RETURNED: 2 Kelley, Laney
EXPLANATION OF NEGATIVE:
WHITE: Negative vote on panel action "to reject" the proposal should be accepted. Abandoned cable and spare cable need to be defined for the authority having jurisdiction and by identifying cables for "future use" with tags, it will allow the authority having jurisdiction to enforce the code and allows the user to have cables for emergencies and future expansion.
COMMENT ON AFFIRMATIVE:
TROUT: Jurisdiction over Information Technology Rooms is within the scope of Code-Making Panel 12 and not with Code-Making Panel 16. The accumulation of abandoned cables under raised floors in these rooms creates a tremendous combustible fuel load. Recognizing this fact, many fire prevention jurisdictions demand that these cables be removed in the interest of fire safety. There is, in fact, considerable information in the many proposals submitted showing justification for the removal of these abandoned cables. The efforts by these many persons to have these abandoned cables removed is commendable until they present a definition of abandoned cables that appears to be designed to provide a manner in which the abandoned cables may be permitted to remain under the guise of "future use." I believe the panel action taken on these comments is proper and in accordance with the purpose of the code.

(Log #833)

12- 38 - (645-2(a)): Reject
SUBMITTER: Roger Witt, State Farm Ins. Co.
COMMENT ON PROPOSAL NO: 12-82
RECOMMENDATION: The proposal should stand as originally submitted.
SUBSTANTIATION: With the help of NFPA staff, we have researched the origin of the Emergency Power Off requirement in data processing rooms.
Unfortunately there were no documents that could help determine the original intent or reason. If we create a logical reason for the original need of the EPO it may follow this path:
- The cables under the raised floor did not have a flame spread rating providing fuel for the fire and possibly some toxicity depending on the wire insulation
- The HVAC system could fan the flame, and recirculate smoke
- The electrical system could provide the source of ignition.

With the above we have the three components of a fire
- fuel
- oxygen
- source of ignition

The thought of removing any or all of three components (by the use of EPO) would help in reducing the adverse affects of fire. The benefit could also be:
- containment of smoke
- reduce the spread of toxic fumes due to the burning of wire insulation materials
- A handy spot for the firemen or others to shut down the electricity in the room when water spray is eminent

Over the years the codes have become more stringent in requiring less hazardous materials to be used in the data center. Fire protection systems have also become more sophisticated.
- cables under the floor must be plenum rated
- VESDA systems are often installed for early warning fire detection

• Smoke detectors on the supply side and sometimes return side of the modular cooling units or the air handling units supplying environmental air to the room and under the raised floor are required to shut down those systems upon the sensing of smoke. NFPA 90-4

• The fire fighters are often aware of main power source to a building and the NEC requires notification of alternate power source be posted.

• Building codes are requiring fire sprinkler systems in the data room (all depending on size of building).

• Main frame computers have high temperature shutoff devices.

When the code was written, attitudes, materials and code requirements were different. There was less information (data) on computers so in relative terms less was at stake if the computers were put out of operation (by accident or malicious cause). Today, banking, ATM machines, medical records, billing, and many other functions are important to the everyday life of people. The loss of operation of data centers can cause irreparable damage in the personal and business life of people who rely on the data.

Operation of the EPO is not simply a case of turning off the power to the data room where one might think "what's the big deal just turn it back on". Abrupt changes in the power source (either on or off) causes a transient voltage condition that more often than not, damages computer equipment. Depending on the equipment destroyed, the data center can be severely crippled waiting on replacement equipment.

Mr. Jones took a poll on the activation of EPO [fire emergency vs accidental activation]. None of the NFPA 75 members found an instance where it was required in a fire situation and most activation remembered was accidental.

The information I have from members of the Uptime Institute notes that all of the EPO operations have been accidental. No one will report malicious operations due to the sensitivity of the event, but it does happen.

Guards may help prevent accidental operation of the EPO as long as they are well marked and possibly annunciated, but guards will not prevent malicious operation of the device.

The point to be made is that data centers are no longer isolated to a single company's business but computer operations are now an important part of many business and are imperative in the daily lives of many people whether it be their financial dealings, medical information, or personal concerns. Since the EPO was first introduced as a safety feature, more stringent codes are in place, newer materials, and more sophisticated fire detection systems are available, it is possible to eliminate the EPO as a requirement in the code and still maintain the safety it was intended to provide.

Since activation of the EPO can cause premature equipment failure and public concern, and since there is no verifiable evidence that the EPO has been used for its intended purpose, the proposal should stand as originally submitted to effectively remove the requirement for the Emergency Power Off device.

PANEL ACTION: Reject.

PANEL STATEMENT: The panel reaffirms its position that the disconnecting means required by Section 645-10 is consistent with the purpose of the NEC. The submitter has offered no new substantiation that would serve to change the opinion of the panel.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13

VOTE ON PANEL ACTION:

AFFIRMATIVE: 10

NEGATIVE: 1

NOT RETURNED: 2 Kelley, Laney

EXPLANATION OF NEGATIVE:

JONES: I agree witht he submitter and think this requirement is outdated. The NEC should consider alternatives to this disconnecting means that will still be consistent with the purpose of the NEC.

COMMENT ON AFFIRMATIVE:

POCH: I think it is important to point out that since: 1) a poll of NFPA 75 members found no incident of EPO activation for a fire situation, but almost every member could identify an accidental cause; and, 2) the Uptime Institute also recalled that all remembered activations of an EPO switch in a computer room were of an accidental nature. Because of the two reasons stated, for computer rooms, we should consider more restrictive placement and double action activation requirements.

(Log #832)

12- 39 - (645-2(b)): Reject

SUBMITTER: Roger Witt, State Farm Ins. Co.

COMMENT ON PROPOSAL NO: 12-83

RECOMMENDATION: The proposal should stand as originally submitted.

SUBSTANTIATION: With the help of NFPA staff, we have researched the origin of the Emergency Power Off requirement in data processing rooms.

Unfortunately there were no documents that could help determine the original intent or reason. If we create a logical reason for the original need of the EPO it may follow this path:

• The cables under the raised floor did not have a flame spread rating providing fuel for the fire and possibly some toxicity depending on the wire insulation

• The HVAC system could fan the flame, and recirculate smoke

• The electrical system could provide the source of ignition.

With the above we have the three components of a fire

• fuel

• oxygen

• source of ignition

The thought of removing any or all of three components (by the use of EPO) would help in reducing the adverse affects of fire. The benefit could also be:

• containment of smoke

• reduce the spread of toxic fumes due to the burning of wire insulation materials

• A handy spot for the firemen or others to shut down the electricity in the room when water spray is eminent

Over the years the codes have become more stringent in requiring less hazardous materials to be used in the data center. Fire protection systems have also become more sophisticated.

• cables under the floor must be plenum rated

• VESDA systems are often installed for early warning fire detection

• Smoke detectors on the supply side and sometimes return side of the modular cooling units or the air handling units supplying environmental air to the room and under the raised floor are required to shut down those systems upon the sensing of smoke. NFPA 90-4

• The fire fighters are often aware of main power source to a building and the NEC requires notification of alternate power source be posted.

• Building codes are requiring fire sprinkler systems in the data room (all depending on size of building).

• Main frame computers have high temperature shutoff devices.

When the code was written, attitudes, materials and code requirements were different. There was less information (data) on computers so in relative terms less was at stake if the computers were put out of operation (by accident or malicious cause). Today, banking, ATM machines, medical records, billing, and many other functions are important to the everyday life of people. The loss of operation of data centers can cause irreparable damage in the personal and business life of people who rely on the data.

Operation of the EPO is not simply a case of turning off the power to the data room where one might think "what's the big deal just turn it back on". Abrupt changes in the power source (either on or off) causes a transient voltage condition that more often than not, damages computer equipment. Depending on the equipment destroyed, the data center can be severely crippled waiting on replacement equipment.

Mr. Jones took a poll on the activation of EPO [fire emergency vs accidental activation]. None of the NFPA 75 members found an instance where it was required in a fire situation and most activation remembered was accidental.

The information I have from members of the Uptime Institute notes that all of the EPO operations have been accidental. No one will report malicious operations due to the sensitivity of the event, but it does happen.

Guards may help prevent accidental operation of the EPO as long as they are well marked and possibly annunciated, but guards will not prevent malicious operation of the device.

The point to be made is that data centers are no longer isolated to a single company's business but computer operations are now an important part of many business and are imperative in the daily lives of many people whether it be their financial dealings, medical information, or personal concerns. Since the EPO was first introduced as a safety feature, more stringent codes are in place, newer materials, and more sophisticated fire detection systems are available, it is possible to eliminate the EPO as a requirement in the code and still maintain the safety it was intended to provide.

Since activation of the EPO can cause premature equipment failure and public concern, and since there is no verifiable evidence that the EPO has been used for its intended purpose, the

proposal should stand as originally submitted to effectively remove the requirement for the Emergency Power Off device.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Comment 12-38.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NEGATIVE: 1
NOT RETURNED: 2 Kelley, Laney
EXPLANATION OF NEGATIVE:
JONES: See my Explanation of Negative on Comment 12-38.

(Log #135)

12- 40 - (645-5(d)(2)): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 12-96
RECOMMENDATION: It was the action of the Technical Correlating Committee that this Proposal be reconsidered and correlated with the actions on Proposals 12-97, 12-98, and 12-99. This action will be considered by the Panel as a Public Comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
Revise 645-5(d)(2) to read as follows:
"(2) The branch-circuit supply conductors to receptacles or field-wired equipment are in rigid metal conduit, rigid nonmetallic conduit, intermediate metal conduit, electrical metallic tubing, electrical nonmetallic tubing, metal wireway, nonmetallic wireway, surface metal raceway with metal cover, nonmetallic surface raceway, flexible metal conduit, liquid-tight flexible metal conduit or liquidtight flexible nonmetallic conduit, Type MI cable, Type MC cable, or Type AC cable. These supply conductors shall be installed in accordance with the requirements of Section 300-11."
PANEL STATEMENT: The panel accepts the direction of the TCC. The panel has combined and correlated Proposals 12-96, 12-97, 12-98, and 12-99.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NOT RETURNED: 2 Kelley, Laney

(Log #2290)

12- 41 - (645-5(d)(3)): Reject
SUBMITTER: Christopher R. Pharo, Marlton, NJ
COMMENT ON PROPOSAL NO: 12-100
RECOMMENDATION: I agree with this proposal.
SUBSTANTIATION: It is important to realize that after construction has been completed, others will have access to the space below the raised floor. People who work in these Information Technology Areas may decide to run cables via the raised floor system. The problem comes in when they do not know what wiring methods are approved.
By placing smoke detectors under the raised floor to cease air distribution, the plenum issue should no longer be in question and a method of safeguarding people and property is in place.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel rejects the comment and reaffirms their original action on the proposal. The submitter has not provided any substantiation that the terminology "sensation" is a better term than the panel's action of replacing "sensation" with "detection".
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NOT RETURNED: 2 Kelley, Laney

(Log #136)

12- 42 - (645-5(d)(5)c): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 12-103
RECOMMENDATION: The Technical Correlating Committee directs that the Panel clarify the action on this Proposal with regard to the term "Green/Yellow". See Section 250-119 for the identification of equipment grounding conductors. This action will be considered by the Panel as a Public Comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
On Proposal 12-103, the panel wishes to change the action of "accept" to "accept in principle".
Replace "green/yellow" with "green with one or more yellow stripes".
PANEL STATEMENT: The panel accepts the direction of the Technical Correlating Committee. The terminology in 250-119, "green or green with one or more yellow stripes" has been substituted in Proposal 12-103.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NOT RETURNED: 2 Kelley, Laney

(Log #137)

12- 43 - (645-5(d)(5)(c)): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 12-105
RECOMMENDATION: It was the action of the Technical Correlating Committee that further consideration be given to the comments expressed in the voting. This action will be considered by the panel as a public comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
PANEL STATEMENT: The panel accepts the direction of the Technical Correlating Committee. See panel action and statement on Comment 12-45.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NOT RETURNED: 2 Kelley, Laney

(Log #600)

12- 44 - (645-5(d)(5)c): Accept
SUBMITTER: John E. Propst, Equilon Enterprises, LLC
COMMENT ON PROPOSAL NO: 12-105
RECOMMENDATION: The purpose for this comment is to support the original proposal and to reject the action of the panel.
SUBSTANTIATION: As noted in the substantiation, ITC cable was added to the 1996 NEC and inadvertently left out of Article 645. Mr. White has provided the additional technical substantiation requested by the panel in his explanation of negative ballot. Since being introduced into the 1996 NEC, Type ITC cable has been widely and very successfully used in the petrochemical industry.
PANEL ACTION: Accept.
PANEL STATEMENT: See panel action and statement on Comment 12-45.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NEGATIVE: 1
NOT RETURNED: 2 Kelley, Laney
EXPLANATION OF NEGATIVE:
TROUT: See my explanation of negative vote on Comment 12-45.

(Log #1380)

12- 45 - (645-5(d)(5)c): Accept
SUBMITTER: Kari Barrett, American Chemistry Council
COMMENT ON PROPOSAL NO: 12-105
RECOMMENDATION: The Proposal Should be accepted
SUBSTANTIATION: Mr. White's explanation of negative vote (included below) provides the technical substantiation requested by the panel statement.

"ITC cable, per Section 727-6, shall be insulated conductors in sizes No. 22 through 12. The conductor material shall be copper or thermocouple alloy. Insulation on the conductor shall be rated 300 volts. Shielding shall be permitted. The cable shall be listed as being resistant to the spread of fire. The outer jacket shall be sun light and moisture resistant. Where a smooth metallic sheath, continuous corrugated metallic sheath, or interlocking tape armour is applied over the nonmetallic sheath, an overall nonmetallic jacket shall be permitted to be applied, but not required. In Section 727-4, under "Users Permitted": No. 7 states: "ITC cable is permitted under raised floors in control rooms and rack rooms where arranged to prevent damage to the cable." Code-Making Panel 16 accepted Proposal 16-102 to allow ITC cable under raised floors in information technology rooms' equipment rooms in accordance with Section 645-5(d)(5)(c)."
PANEL ACTION: Accept.
The panel reverses its action on Proposal 12-105 from "reject" to "accept".
PANEL STATEMENT: The panel emphasizes that the addition of ITC cable must be followed by "(Article 727)" to be assured that it is recognized that this cable can only be used under the requirements of Article 727.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 9
NEGATIVE: 2
NOT RETURNED: 2 Kelley, Laney
EXPLANATION OF NEGATIVE:
CARTAL: Code-Making Panel 16 has no jurisdiction regarding the type of wiring or cable that is permitted in a raised floor area of an information technology room so the substantiation citing their approval is not valid.

My vote was based on the premise that the present restrictions in Article 727 would still apply, limiting ITC cable to industrial establishment only.

TROUT: The panel action should have been "Accept in Principle."

In the original proposal and in the comments there was no indication that the submitter or those making comments intended that the use of ITC cable under raised floors in an information technology room would be restricted to such use only in industrial establishments. The placing of parenthesis enclosed 727 after ITC suggests that this use would be adhered to but based on the substantiation I find no assurance that this is the intent. I cannot find anything in the style manual that indicates that the use of "ITC (727) means in accordance with Article 727. I believe this needs clarification.

ITC cable is permitted to be used in industrial establishments where the conditions of maintenance and supervision ensure that only qualified persons will service the installation. There was no substantiation indicating that this cable would be used under raised floors only in information technology rooms located in industrial establishments.

The submitter's statement in the substantiation that "Code-Making Panel 16 accepted a proposal to allow ITC cables under raised floors in information technology rooms in accordance with Section 645-5(d)(5)(c)" is incorrect. Jurisdiction over Article 645, Information Technology Equipment is within the scope of Code-Making Panel 12.

I believe that an exception to Section 645-5(d)(5)(c) stating "ITC cable in industrial establishments in accordance with the requirements of Article 727." would have assured compliance.

(Log #1937)

12- 59 - (645-5(d)(5)c): Accept
SUBMITTER: David Wechsler, Union Carbide Corp.
COMMENT ON PROPOSAL NO: 12-105
RECOMMENDATION: Add "ITC (Article 727)" to the first sentence.
SUBSTANTIATION: The referenced section (645-5(d)(5)(c) currently recognizes Types C12, C13 and PLTC (Article 725). A direct comparison of the product specifications for Type PLTC, defined within UL-13, and Type ITC, defined in UL-2250, will reveal that ITC is subjected to more rigorous tests than PLTC. Additionally, while a Type ITC may be dual marked as an ITC/PLTC, not all PLTCs may be marked as ITC, again mostly due to more stringent dielectric testing. The Panel is welcome to compare these two product specifications. Unfortunately, copyright prohibits me from extracting copies of these product specifications and submitting these to the Panel for verification. The Panel or its representative can contact Underwriter laboratories' cable expert, Mr. Tom Guida at ULs Melville offices (516-271-6200) for verification of the assertions made in this comment that support the inclusion of ITC in the referenced NEC section.

A brief historical review reflects that along with the introduction of Type DP cable and that long debate over data processing cables and fire resistance testing, that types C12, C13, PLTC, were first added to the 1993 NEC, as meeting an "equal-to" fire test to data processing cables., The accepted basis for Committee acceptance of this information was the UL cable product specification that referenced the same vertical flame testing done for both PLTC and ITC.
PANEL ACTION: Accept.
PANEL STATEMENT: See panel action and statement on Comment 12-45.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NEGATIVE: 1
NOT RETURNED: 2 Kelley, Laney
EXPLANATION OF NEGATIVE:
TROUT: See my explanation of negative vote on Comment 12-45.

(Log #138)

12- 46 - (645-5(d)(6) (New)): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 12-106
RECOMMENDATION: It was the action of the Technical Correlating Committee that this Proposal be reconsidered and correlated with the action on Proposal 16-80. This action will be considered by the Panel as a Public Comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
PANEL STATEMENT: The panel accepts the direction of the Technical Correlating Committee. The panel is of the opinion that the requirements for cables under a raised floor in an Information Technology Room, present different considerations than the areas under the jurisdiction of Panel 16, and therefore reaffirms its action on Proposal 12-106. Additional correlation is not appropriate.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NOT RETURNED: 2 Kelley, Laney

(Log #576)

12- 47 - (645-5(d)(6) (New)): Reject
SUBMITTER: Joe Cox, Bluff City, TN
COMMENT ON PROPOSAL NO: 12-106
RECOMMENDATION: The panel should have rejected the proposal.
SUBSTANTIATION: The submitter provides no evidence of any safety concerns with the present code. He does point out that no indication of increased fire hazard exists.

This is a housekeeping issue. Owners/designers/installers who see the benefits of good housekeeping will take care to keep the number of cables under the floors to a reasonable number. Those that do not would only have to tag the circuits for future use. In either case, the proposed requirements in the NEC will not serve to remove any of the unused cables.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Comment 12-37.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NEGATIVE: 1
NOT RETURNED: 2 Kelley, Laney

EXPLANATION OF NEGATIVE:
WHITE: Negative vote on the panel action to reject. There has not been sufficient substantiation that a problem exists. The panel is making it mandatory that all cables are removed even if there is adequate space for cooling and fire detection/suppression exists. This is an unnecessary labor effort and it also can run the risk of unplanned shutdowns of critical equipment.

(Log #658)

12- 48 - (645-5(d)(6) (New)): Reject
SUBMITTER: T. Neil Thorla, I/N Tek
COMMENT ON PROPOSAL NO: 12-106
RECOMMENDATION: Reject the proposal.
SUBSTANTIATION: The substantiation for this proposal provides no technical data to support the addition of this requirement. The substantiation actually speaks against the proposal by stating "the fire record of cables in concealed spaces, both above ceilings and below floors, remain excellent." In order to adopt a proposal that will have such far reaching ramifications, the Panel should require a more defendable substantiation than "this type of preventative action is worthwhile."
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Comment 12-37.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NEGATIVE: 1
NOT RETURNED: 2 Kelley, Laney
EXPLANATION OF NEGATIVE:
WHITE: Negative vote on the panel action to reject, see my explanation of negative vote on Comment 12-47.

(Log #659)

12- 49 - (645-5(d)(6) (New)): Reject
SUBMITTER: T. Neil Thorla, I/N Tek
COMMENT ON PROPOSAL NO: 12-106
RECOMMENDATION: Delay the application of this requirement by adding text stating:
This requirement shall become effective 1/1/2005.
SUBSTANTIATION: This proposal will create retroactive requirements making many installations noncompliant as of the effective date of this standard. Building owners will need ample time to make and execute plans for compliance. In an established IT equipment room, the abandoned cables will be on the bottom of the pile, likely intertwined with active cables. Attempting to pull out an abandoned cable intact is likely to disturb the operation of the IT equipment by placing tension on the active cables and connectors. It may be possible to remove abandoned cables by exposing them and cutting them into short pieces, without disturbing the IT equipment operation, unless the wrong cable is cut!

The IT equipment could be installed in a central processing center for credit card approval, or as the central coordinating system for a large chemical plant. In the latter case, the potential threat to life safety due to an error in removing abandoned cables is likely far worse than the hazard created by leaving abandoned cables intact.

In order to safely remove abandoned cables, the IT equipment needs to be shut down and de-energized in an orderly fashion, the cables removed, the equipment restarted and the system retested for proper operation. In a large IT complex, this will require a great deal of planning and coordination. It may even require the purchase and installation of additional equipment to take over the tasks of the equipment taken out of service to safely remove the abandoned cables.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Comment 12-37. In addition, the panel is of the opinion that the requirement for the removal of abandoned cables is not of a nature that would require a delayed effective date.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NOT RETURNED: 2 Kelley, Laney

(Log #1199)

12- 50 - (645-5(d)(6)): Reject
SUBMITTER: Kenneth P. White, Olin Corp.
COMMENT ON PROPOSAL NO: 12-106
RECOMMENDATION: Delete 645(d)(6) ~~Abandoned cables not intended for future use, shall not be permitted.~~
SUBSTANTIATION: Author does not provide sufficient substantiation that a problem exists and the removing of cables from under a floor is strictly a housekeeping item - a safety issue. The increase of the fuel load for the air handling system is an operating problem.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Comment 12-37.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NEGATIVE: 1
NOT RETURNED: 2 Kelley, Laney
EXPLANATION OF NEGATIVE:
WHITE: Negative vote on the panel action to reject, see my explanation of negative vote on Comment 12-47.

(Log #1381)

12- 51 - (645-5(d)(6) (New)): Reject
SUBMITTER: Kari Barrett, American Chemistry Council
COMMENT ON PROPOSAL NO: 12-106
RECOMMENDATION: The proposal should be accepted as written.
SUBSTANTIATION: Similar proposals were accepted for articles 640(16-1a), 725(16-80), 760(16-109), 770(16-154), 800(16-189), 820(16-273), and 830(16-364). All of the accepted or accepted in principle proposals included the words "not intended for future use". As stated in Mr. White's explanation of negative, this helps define what abandoned cable is for the Authority Having Jurisdiction, and also allows for users to have adequate spare capacity for emergencies and for expansion. Different wording in article 645 indicates that the requirement is different.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Comment 12-37 and Comment 12-46.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NEGATIVE: 1
NOT RETURNED: 2 Kelley, Laney
EXPLANATION OF NEGATIVE:
WHITE: Negative vote on the panel action to reject, see my explanation of negative vote on Comment 12-37.

(Log #1578)

12- 52 - (645-5(d)(6)): Reject
SUBMITTER: Wayne G. Carson, Carson Assoc. Inc.
COMMENT ON PROPOSAL NO: 12-106
RECOMMENDATION: Revise text to read as follows:
Spread of Fire or Products of Combustion. Installations in hollow spaces, vertical shafts, and ventilation or air-handling ducts shall be made so that the possible spread of fire or products of combustion will not be substantially increased. Openings around penetrations through fire resistance-rated walls, partitions, floors, or ceilings shall be firestopped using approved methods to maintain the fire resistance rating.

Abandoned cables not intended for future use shall not be permitted to remain.

FPN: Directories of electrical construction materials published by qualified testing laboratories contain many listing installation restrictions necessary to maintain the fire-resistive rating of assemblies where penetrations or openings are made.
SUBSTANTIATION: This definition under the section entitled "Spread of Fire or Products of Combustion" is not consistent throughout the Code. This comment uses language from ROP 16-250 [850-52(B)] to provide a consistent requirement throughout the code.

The same comment is being made for the following sections:
640-3A (ROP 16-1a)
725-3B (ROP 16-80)
760-3A (ROP 16-144)
770-3A (ROP 16-176)

820-3A (ROP 16-313)
820-52B (ROP 16-311)
830-3A (ROP 16-364)
830-58B (ROP 16-368)
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter's concerns are addressed in Sections 645-2(e) and 300-21. For information regarding the recommendation on abandoned cables, see panel action and statement on Comment 12-37.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NOT RETURNED: 2 Kelley, Laney

(Log #1841)

12- 53 - (645-5(d)(6) (New)): Reject
SUBMITTER: Robert W. Jensen, dbi-Telecommunications Infrastructure Design
COMMENT ON PROPOSAL NO: 12-106
RECOMMENDATION: Continue to accept this proposal and add this definition for abandoned cable:
Abandoned Cable. Installed cable that is neither terminated at both ends at equipment, nor identified for future use with a tag.
SUBSTANTIATION: BICSI has made similar proposals for articles 725, 760, 770, 800 and 820. Acceptance of this comment will correlate with Panel 16 actions.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Comment 12-37.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NEGATIVE: 1
NOT RETURNED: 2 Kelley, Laney
EXPLANATION OF NEGATIVE:
WHITE: Negative vote on the panel action to reject, see my explanation of negative vote on Comment 12-37.

(Log #1903)

12- 54 - (645-5(d)(6)): Accept
SUBMITTER: Michael I. Callanan, International Brotherhood of Electrical Workers
COMMENT ON PROPOSAL NO: 12-106
RECOMMENDATION: Continue to Accept this proposal in principle.
SUBSTANTIATION: In accordance with the instructions of the TCC to reconsider and correlate this proposal with Proposal 16-80, this proposal should continue to be accepted in principle as originally passed by the panel so that it reads, "(6) Abandoned cables shall not be permitted to remain."
The definition of "abandoned cables" accepted in 16-273, 16-189, 16-154, 16-109 and 16-32 render the above wording more appropriate than wording found in 16-80. The definition(s) makes the phrase "not intended for future use" unnecessary. It is recognized that the definitions as listed above do not affect Article 645, but it is assumed that the definitions for "abandoned cables" will be moved to Article 100 by direction of the TCC.
This comment represents the official position of the International Brotherhood of Electrical Workers Codes & Standards Committee.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NOT RETURNED: 2 Kelley, Laney

(Log #660)

12- 55 - (645-5(d)(6), Exception (New)): Accept in Principle
SUBMITTER: T. Neil Thorla, I/N Tek
COMMENT ON PROPOSAL NO: 12-106
RECOMMENDATION: Add the following exception:
Exception: Cables that are contained within metallic raceways.
SUBSTANTIATION: There is little fire hazard associated with cables contained in metallic raceways, since the raceway isolates the fuel source from the source of oxygen.
PANEL ACTION: Accept in Principle.
In proposal 12-106, revise text in the panel action to read:
(6) Abandoned cables shall not be permitted to remain unless contained within metal raceways.
PANEL STATEMENT: The panel's revisions address the submitter's concerns. The proposed exception has been changed to mandatory text.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NEGATIVE: 1
NOT RETURNED: 2 Kelley, Laney
EXPLANATION OF NEGATIVE:
POCH: The reason for Code-Making Panel 12 to only accept in principle this proposal was that it was dropping the phrase "...not intended for future use." because it wasn't enforceable. Now, the reason is being changed for an exception for cables in a metal raceway. I disagree with Code-Making Panel 12's altering the reason for accepting in principle, because its original reasoning was valid, and making exceptions only increases the total amount of abandoned cable in a given area.

(Log #661)

12- 56 - (645-5(d)(6), Exception (New)): Reject
SUBMITTER: T. Neil Thorla, I/N Tek
COMMENT ON PROPOSAL NO: 12-106
RECOMMENDATION: Add the following exception:
Exception: Where the under floor area is protected by a listed fire suppression system.
SUBSTANTIATION: Building owners who have invested in fire suppression systems should not be subjected to the requirement of removing abandoned cables. A fire suppression system mitigates the hazard by removing the source of heat, or oxygen, or both. Removing the source of fuel should not be the only acceptable means of mitigating the fire hazard. In fact, a fire suppression system should provide a greater degree of protection, since it will protect active cables as well as abandoned cables.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel is of the opinion that a listed fire suppression system may not adequately solve the problem of the increased fuel load caused by abandoned cables being left in the underfloor area.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NOT RETURNED: 2 Kelley, Laney

(Log #662)

12- 57 - (645-5(d)(6), Exception (New)): Reject
SUBMITTER: T. Neil Thorla, I/N Tek
COMMENT ON PROPOSAL NO: 12-106
RECOMMENDATION: Add the following exception:
Exception: Where the abandoned cables are protected with a listed fire stop system.
SUBSTANTIATION: Many types of fire stop systems are available for cabling installed in cable trays. Systems employing coating of tray cables with flame-retardant mastic should be suitable to mitigate fire hazards associated with cables installed in under floor areas. The inclusion of the exception, in conjunction with delaying the effective date of this requirement, should provide ample time for listing agencies to develop requirements, and manufacturers to qualify their products.
This will provide an acceptable alternate means of compliance in cases where the act of removing abandoned cables could create a greater potential hazard than leaving them intact.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel is of the opinion that a listed fire stop system may not adequately solve the problem of the increased fuel load caused by abandoned cables being left in the underfloor area.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NOT RETURNED: 2 Kelley, Laney

(Log #1742)

12- 58 - (645-5(d)(6)-Abandoned Cable (New)): Reject
SUBMITTER: Francis W. Peri, Communications Design Corporation
COMMENT ON PROPOSAL NO: 12-106
RECOMMENDATION: Continue to accept this proposal and add this definition for abandoned cable.

Abandoned Cable. Installed cable that is neither terminated at both ends at equipment, nor identified for future use with a tag.
SUBSTANTIATION: Association of Cabling Professionals (ACP) agrees with the proposals made by BICSI for Articles 725, 760, 770, 800, and 820. Acceptance of this comment correlates with Panel 16 actions.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Comment 12-37 and Comment 12-46.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 9
NEGATIVE: 2
NOT RETURNED: 2 Kelley, Laney
EXPLANATION OF NEGATIVE:

POCH: This comment should be accepted in principle because it uses terminology that is enforceable in defining what is abandoned cable. However, the word "documented" should replace "identified", to read as follows: "Abandoned Cable. Installed Cable that is neither terminated at both ends of the equipment, nor ~~identified~~ documented for future use with a tag."

WHITE: Negative vote on the panel action to reject, see my explanation of negative vote on Comment 12-37.

(Log #831)

12- 60 - (645-10): Reject
SUBMITTER: Roger Witt, State Farm Ins. Co.
COMMENT ON PROPOSAL NO: 12-108
RECOMMENDATION: The proposal should stand as originally submitted.
SUBSTANTIATION: With the help of NFPA staff, we have researched the origin of the Emergency Power Off requirement in data processing rooms.

Unfortunately there were no documents that could help determine the original intent or reason. If we create a logical reason for the original need of the EPO it may follow this path:

- The cables under the raised floor did not have a flame spread rating providing fuel for the fire and possibly some toxicity depending on the wire insulation
- The HVAC system could fan the flame, and recirculate smoke
- The electrical system could provide the source of ignition.

With the above we have the three components of a fire

- fuel
- oxygen
- source of ignition

The thought of removing any or all of three components (by the use of EPO) would help in reducing the adverse affects of fire. The benefit could also be:

- containment of smoke
- reduce the spread of toxic fumes due to the burning of wire insulation materials
- A handy spot for the firemen or others to shut down the electricity in the room when water spray is eminent

Over the years the codes have become more stringent in requiring less hazardous materials to be used in the data center. Fire protection systems have also become more sophisticated.

- cables under the floor must be plenum rated
- VESDA systems are often installed for early warning fire detection
- Smoke detectors on the supply side and sometimes return side of the modular cooling units or the air handling units supplying environmental air to the room and under the raised floor are required to shut down those systems upon the sensing of smoke. NFPA 90-4
- The fire fighters are often aware of main power source to a building and the NEC requires notification of alternate power source be posted.
- Building codes are requiring fire sprinkler systems in the data room (all depending on size of building).
- Main frame computers have high temperature shutoff devices.

When the code was written, attitudes, materials and code requirements were different. There was less information (data) on computers so in relative terms less was at stake if the computers were put out of operation (by accident or malicious cause). Today, banking, ATM machines, medical records, billing, and many other functions are important to the everyday life of people. The loss of operation of data centers can cause irreparable damage in the personal and business life of people who rely on the data.

Operation of the EPO is not simply a case of turning off the power to the data room where one might think "what's the big deal just turn it back on". Abrupt changes in the power source (either on or off) causes a transient voltage condition that more often than not, damages computer equipment. Depending on the equipment destroyed, the data center can be severely crippled waiting on replacement equipment.

Mr. Jones took a poll on the activation of EPO [fire emergency vs accidental activation]. None of the NFPA 75 members found an instance where it was required in a fire situation and most activation remembered was accidental.

The information I have from members of the Uptime Institute notes that all of the EPO operations have been accidental. No one will report malicious operations due to the sensitivity of the event, but it does happen.

Guards may help prevent accidental operation of the EPO as long as they are well marked and possibly annunciated, but guards will not prevent malicious operation of the device.

The point to be made is that data centers are no longer isolated to a single company's business but computer operations are now an important part of many business and are imperative in the daily lives of many people whether it be their financial dealings, medical information, or personal concerns. Since the EPO was first introduced as a safety feature, more stringent codes are in place, newer materials, and more sophisticated fire detection systems are available, it is possible to eliminate the EPO as a requirement in the code and still maintain the safety it was intended to provide.

Since activation of the EPO can cause premature equipment failure and public concern, and since there is no verifiable evidence that the EPO has been used for its intended purpose, the proposal should stand as originally submitted to effectively remove the requirement for the Emergency Power Off device.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Comment 12-38.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NEGATIVE: 1
NOT RETURNED: 2 Kelley, Laney
EXPLANATION OF NEGATIVE:

JONES: See my Explanation of Negative on Comment 12-38.

(Log #1382)

12- 61 - (645-10): Reject
SUBMITTER: Kari Barrett, American Chemistry Council
COMMENT ON PROPOSAL NO: 12-110
RECOMMENDATION: Delete the following text:

Where a push button is used to disconnect power, pushing the button in shall disconnect power.
SUBSTANTIATION: Throughout the process industry, computers are now controlling very critical processes and an inadvertent shutdown can result in unnecessary exposure to the environment or operators. The pushbutton as recommended, push to disconnect, can be activated by mistake and chemical processes must be shutdown properly. The submitter references NFPA 79, which is the standard for machinery, not processes. I can understand personnel operating machinery should have the ability to shut down the machinery should an operator get in trouble. Chemical processes if not shut down properly can cause many problems. Therefore, the disconnecting device should be left up to the discretion of the user.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel reaffirms its action on Proposal 12-110. Means are readily available to prevent inadvertent operation.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 9
NEGATIVE: 2
NOT RETURNED: 2 Kelley, Laney
EXPLANATION OF NEGATIVE:

JONES: This is a design issue and should not be a requirement of the NEC. In some cases, a push button that is a pull to disconnect may be more appropriate than a push to disconnect.

WHITE: Negative vote on panel action to accept. There have been too many shutdowns of critical processes due to accidental

contact with emergency push buttons that are pushed in to disconnect power. Computer systems now control very critical processes that when inadvertently shut down result in personnel injury and/or environmental releases. This is unacceptable.

A push to disconnect push button with a cover as is suggested in the proposal requires two hands to operate, whereas a pull to disconnect power button can still be operated with one hand.

(Log #830)

12- 62 - (645-11): Reject
SUBMITTER: Roger Witt, State Farm Ins. Co.
COMMENT ON PROPOSAL NO: 12-111
RECOMMENDATION: The proposal should stand as originally submitted.
SUBSTANTIATION: With the help of NFPA staff, we have researched the origin of the Emergency Power Off requirement in data processing rooms.

Unfortunately there were no documents that could help determine the original intent or reason. If we create a logical reason for the original need of the EPO it may follow this path:

- The cables under the raised floor did not have a flame spread rating providing fuel for the fire and possibly some toxicity depending on the wire insulation
- The HVAC system could fan the flame, and recirculate smoke
- The electrical system could provide the source of ignition.

With the above we have the three components of a fire

- fuel
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- source of ignition

The thought of removing any or all of three components (by the use of EPO) would help in reducing the adverse affects of fire. The benefit could also be:

- containment of smoke
- reduce the spread of toxic fumes due to the burning of wire insulation materials
- A handy spot for the firemen or others to shut down the electricity in the room when water spray is eminent

Over the years the codes have become more stringent in requiring less hazardous materials to be used in the data center. Fire protection systems have also become more sophisticated.

- cables under the floor must be plenum rated
- VESDA systems are often installed for early warning fire detection
- Smoke detectors on the supply side and sometimes return side of the modular cooling units or the air handling units supplying environmental air to the room and under the raised floor are required to shut down those systems upon the sensing of smoke. NFPA 90-4
- The fire fighters are often aware of main power source to a building and the NEC requires notification of alternate power source be posted.
- Building codes are requiring fire sprinkler systems in the data room (all depending on size of building).
- Main frame computers have high temperature shutoff devices.

When the code was written, attitudes, materials and code requirements were different. There was less information (data) on computers so in relative terms less was at stake if the computers were put out of operation (by accident or malicious cause). Today, banking, ATM machines, medical records, billing, and many other functions are important to the everyday life of people. The loss of operation of data centers can cause irreparable damage in the personal and business life of people who rely on the data.

Operation of the EPO is not simply a case of turning off the power to the data room where one might think "what's the big deal just turn it back on". Abrupt changes in the power source (either on or off) causes a transient voltage condition that more often than not, damages computer equipment. Depending on the equipment destroyed, the data center can be severely crippled waiting on replacement equipment.

Mr. Jones took a poll on the activation of EPO [fire emergency vs accidental activation]. None of the NFPA 75 members found an instance where it was required in a fire situation and most activation remembered was accidental.

The information I have from members of the Uptime Institute notes that all of the EPO operations have been accidental. No one will report malicious operations due to the sensitivity of the event, but it does happen.

Guards may help prevent accidental operation of the EPO as long as they are well marked and possibly annunciated, but guards will not prevent malicious operation of the device.

The point to be made is that data centers are no longer isolated to a single company's business but computer operations are now an important part of many business and are imperative in the daily lives of many people whether it be their financial dealings, medical information, or personal concerns. Since the EPO was first introduced as a safety feature, more stringent codes are in place, newer materials, and more sophisticated fire detection systems are available, it is possible to eliminate the EPO as a requirement in the code and still maintain the safety it was intended to provide.

Since activation of the EPO can cause premature equipment failure and public concern, and since there is no verifiable evidence that the EPO has been used for its intended purpose, the proposal should stand as originally submitted to effectively remove the requirement for the Emergency Power Off device.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel reaffirms its position that the disconnecting means required by Section 645-10 is consistent with the purpose of the NEC. The submitter has offered no new substantiation that would serve to change the opinion of the panel.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NEGATIVE: 1
NOT RETURNED: 2 Kelley, Laney
EXPLANATION OF NEGATIVE:
JONES: See my Explanation of Negative on Comment 12-38.

(Log #1448)

15- 69 - (647-8(b)): Accept in Principle
SUBMITTER: Kenneth E. Vannice, Rep. U.S. Insitute for Theatre Technology Engineering Commission
COMMENT ON PROPOSAL NO: 15-72
RECOMMENDATION: Revise new section 647-8(b) as follows:
(b) All luminaires shall be permanently installed and listed, ~~and ballast operated.~~
SUBSTANTIATION: If the goal of this section is to allow noise reduction in lighting systems, why eliminate dimmer operated tungsten sources which are a potential noise source? While it has not been proven that 60v balanced power improves this type of noise, why eliminate nonballasted luminaires from this section?
PANEL ACTION: Accept in Principle.
Revise 647.8(B) of the panel action of Proposal 15-72 to read as follows:
(B) Luminaires. All luminaires (lighting fixtures) shall be permanently installed and listed for connection to a separately derived system at 120 Volts line-to-line and 60 volts to ground.
PANEL STATEMENT: The revised text meets the intent of the submitter while clarifying the listing requirement of the luminaire.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 18
VOTE ON PANEL ACTION:
AFFIRMATIVE: 18

ARTICLE 665 — INDUCTION AND DIELECTRIC HEATING EQUIPMENT

(Log #1652)

12- 63 - (665-5): Accept in Part
SUBMITTER: Thomas M. Burke, Underwriters Laboratories Inc.
COMMENT ON PROPOSAL NO: 12-114
RECOMMENDATION: Revise text as follows:
"665-5 Output Circuit. The output circuit shall include all output components external to the converting device, including contactors, switches, bus bars, and other conductors. Unless guarded in accordance with Section 110-27(a), ~~the current flow form the output circuit to ground under operating and ground fault conditions shall be limited to a value which does not cause more than~~ voltage at 50 volts or more to ground shall not be present ~~to appear~~ on any ~~accessible~~ live part of the heating equipment and its load under operating conditions. The output circuit shall be permitted to be isolated to ground."
SUBSTANTIATION: The requirement in proposed Section 665-5 is written in the form of a product standard and not an installation code. Also, the proposed wording is unenforceable by an authority having jurisdiction (i.e. determining "current flow from the output circuit to ground," in particular under "ground fault conditions."). The recommended wording would more accurately align proposed Section 665-5 to existing Section 110-27(a) of the Code, which the Task Group has indicated is the basis behind the proposed voltage limitations. If voltage regulation to 50 V under a ground fault condition is a critically important safety feature, a method for an

authority having jurisdiction to determine compliance should also be part of the Code. Also, Section 110-2(a) requires guarding of parts operating at 50 V or more. The present proposal requires guarding of parts operating above 50 V.
PANEL ACTION: Accept in Part.
In the original proposal, replace "more than 50 volts" with "50 volts or more".
PANEL STATEMENT: The panel agrees with the submitter that the recommended wording "50 volts or more" would more accurately align proposed Section 665-5 to existing Section 110-27(a). The panel does not agree with the submitter that the proposed wording is unenforceable. The authority having jurisdiction does not have to determine the "current flow from the output circuit to ground"; only the voltage to ground needs to be determined. Also, it is very important that Section 665-5 not be revised as submitted because the revised language would only protect the operator under "operating conditions". Metal penetration to the coil is a fault condition that can be reasonably expected at some time. Therefore, it is very important to limit the voltage on the load to less than 50 volts under operating and fault conditions.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NOT RETURNED: 2 Kelley, Laney

ARTICLE 668 — ELECTROLYTIC CELLS

(Log #367)

12- 64 - (668-21(a)): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
COMMENT ON PROPOSAL NO: 12-119
RECOMMENDATION: Accept proposal.
SUBSTANTIATION: The panel statement that the last sentence of this section somehow specifies the secondary is ungrounded is not accurate. This section merely states "circuits" shall be ungrounded. Isolating or isolated type secondaries of transformers may be grounded and many are required to be grounded. If a 3-wire three-phase circuit is supplied from a wye-grounded transformer secondary the circuit is ungrounded but the secondary is grounded. Similar proposals (18-86, 20-36) have been accepted which may result in noncompliance with 3.3.5 of the Style Manual.
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter has not provided any additional substantiation that would cause the panel to reverse its action on Proposal 12-119. In addition, the statements made by the submitter are technically incorrect.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 2 Kelley, Laney

ARTICLE 670 INDUSTRIAL MACHINERY

(Log #1666)

11- 243 - (670-4(b)): Reject
SUBMITTER: Melvin K. Sanders, TECo., Inc.
COMMENT ON PROPOSAL NO: 11-112
RECOMMENDATION: Revise the second and third sentence of Section 670-4(b) and add information addressing the panel's concern about supplementary overcurrent protection:
(b) Overcurrent Protection. A machine shall be considered as an individual unit and therefore shall be provided with a disconnecting means. ~~The~~ This disconnecting means shall be permitted to be supplied by branch circuits protected by either fuses or circuit breakers. The disconnecting means shall not be required to incorporate overcurrent protection. Where furnished as part of the machine, overcurrent protection shall consist of a single circuit breaker or set of fuse~~s,~~ and the machine shall bear the marking required in Section 670-3~~, and the supply conductors shall be considered either as feeders or taps as covered by Section 240-21.~~ Supplementary overcurrent protection shall not be permitted except as part of an identified component assembly.
SUBSTANTIATION: "The" changed to "This" in the second sentence to clarify this applies to the machine disconnecting means being supplied by a branch circuit. Supply conductors to machines meet the definition of branch-circuits in Article 100, as supplying power to an outlet as it is defined in Article 100. These loads may be further subdivided within or on the machine and at that point provided with additional overcurrent protection as provided for in Section 240-10 that is unique for proper machine operation.
The additional sentence will prohibit using supplementary overcurrent protection, and is general enough to address the stated concern of the panel and also acknowledges that vendor components do contain supplementary protection (e.g., electronic power modules for specialized machine functions, critical items that use current differential or special thermal detection) based upon manufacturer's design limits as covered in Section 240-10 (1999 Edition).
The use of taps within and on a machine is addressed within NFPA 79 in Clause 8.4 (1997 Edition) based on machine activities and mimics the rules in NEC Section 240-21 (1999 Edition).
PANEL ACTION: Reject.
PANEL STATEMENT: The supply to a machine may be a branch circuit, a feeder, or a tap.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

ARTICLE 680 — SWIMMING POOLS, FOUNTAINS, AND SIMILAR INSTALLATIONS

(Log #227)

20- 9 - (680): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 20-30
RECOMMENDATION: It was the action of the Technical Correlating Committee that this Proposal be reported as "Accept" to correlate with the action on Proposal 1-222. This action will be considered by the Panel as a Public Comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #2064)

20- 10 - (680): Accept in Principle in Part
SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc.
COMMENT ON PROPOSAL NO: 20-30a
RECOMMENDATION: Make the following changes in the rewritten Article 680:
680.6. In 680.6(2), (3), and (7), change "pool or fountain" to "artificially contained body of water".
680.8 (Table). The 0-750V clearance should be increased to 6.9 m (22.5 ft) for the water surface and the structural clearances should go to 4.4 m (14.5 ft).
680.8(B). (B) Communications Systems. Communication, radio, and television coaxial cables ~~covered by~~ within the scope of Articles 800 through 820 shall be permitted at a height of not less than 3.0 m (10 ft) above swimming and wading pools, diving structures, and observation stands, towers, or platforms.
680.22(A)(3). Add (s) to "receptacle" and "branch circuit" to correlate with "no fewer than". Change the clearance to 3.0 m (10 ft).
680.22(A)(5). Modify the second sentence, as follows: "Receptacles that supply pool pump motors and that are rated 15 or 20 amperes ..."
680.23(F)(1) FPN. Delete this note.
680.23(F)(1) Ex. Reword as follows:
Exception: Where connecting to transformers for pool lights, liquidtight flexible metal conduit or liquidtight flexible nonmetallic conduit shall be permitted ~~to be used when installed in accordance with Article 351~~. The length shall not exceed 6 ft (1.83 m) for any one length, nor exceed 10 ft (3.05 m) in total length used.
680.25(A-B). Revise as follows:
(A) Wiring Methods. Feeders shall be installed in rigid metal

conduit, intermediate metal conduit, liquidtight flexible nonmetallic conduit, or rigid nonmetallic conduit. Electrical metallic tubing shall be permitted where installed on or within a building, and electrical nonmetallic tubing shall be permitted where installed within a building.

Exception: An existing feeder between an existing remote panelboard and service equipment shall be permitted to run in flexible metal conduit, or in an approved cable assembly that includes an equipment grounding conductor within its outer sheath ~~with an insulated or covered equipment grounding conductor.~~ The equipment grounding conductor shall comply with 250.24(A)(5).

(B) Grounding. An ~~insulated~~ equipment grounding conductor shall be installed with the feeder conductors between the grounding terminal of the pool equipment panelboard and the grounding terminal of the applicable service equipment or source of a separately derived system. For other than (1) existing feeders covered in 680.25(A) Exception, or (2) feeders to separate buildings that do not utilize an insulated equipment grounding conductor in accordance with 680.25(B)(2), this equipment grounding conductor shall be insulated.

(1) Size. This conductor shall be sized in accordance with 250.122 but not smaller than No. 12. On separately derived systems, this conductor shall be sized in accordance with Table 250.66 but not smaller than No. 8.

(2) Separate Buildings. A ~~panelboard at~~ feeder to a separate building shall be permitted to supply swimming pool equipment branch circuits, or feeders supplying swimming pool equipment branch circuits, if the ~~feeder meets~~ grounding arrangements in the separate building meet the requirements ~~for grounding~~ in 250.32. ~~Where installed, a separate equipment grounding conductor shall be an insulated conductor.~~

680.42(C). Amend the new paragraph as follows:

(C) Interior Wiring to Outdoor Installations. In the interior of a one-family dwelling or in the interior of another building or structure associated with a one-family dwelling, any of the wiring methods recognized in Chapter 3 of this Code that contain a copper equipment grounding conductor that is insulated or enclosed within the outer sheath of the wiring method and not smaller than No. 12 shall be permitted to be used for the connection to motor, heating, and control loads that are part of a self-contained spa or hot tub, or a packaged spa or hot tub equipment assembly. Wiring to an underwater light shall comply with 680.23 or 680.33.

680.43(D)(5). Revise as follows: (5) Electrical devices and controls that are not associated with the spa or hot tub ~~and that are~~ but located ~~not less than~~ within 1.5 m (5 ft) from such units~~; otherwise they shall be bonded to the spa or hot tub system~~.

680.43(E)(3). Revise as follows: "A solid copper conductor, insulated, covered, or bare, not smaller than No. 8."

680.44. Insert the words "shall be" ahead of "protected."

680.57(D) and (E). Delete the word "Section" (three times).

680.62(B)(5): Revise as follows: (5) Electrical devices and controls that are not associated with the therapeutic tub ~~and that are~~ but located ~~a minimum of~~ within 1.5 m (5 ft) from such units~~; otherwise they shall be bonded to the therapeutic tub system~~.

SUBSTANTIATION: This comment reacts to comments in the voting, and a further review of the article rewrite, as follows:

680.2. Do not change from the panel action. The terms "fixed" "portable" and "stationary" are used all over Article 680 and should be defined for the purposes of the article, for clarity. If the panel wishes to further refine the definitions, it may do so in the comment period, but the definitions are certainly appropriate. Proposal 20-5 applied to a Chapter 4 article, and need not necessarily serve as a precedent in Chapter 6. In fact Chapter 5 articles also define these terms for their own purposes. (See Sections 550-2, 551-2, and 552-2 which references the other two.)

680.6. The panel didn't want to use the phrase "contained body of water" in the original proposal, justifiably, due to the possibility of confusion with natural bodies of water that are nonetheless "contained." The problem is that this general part of the article must be written to encompass all the parts that follow. The grounding provisions must apply to spas, hot tubs, therapeutic tubs, and hydromassage bathtubs. None of these items are pools or fountains, which is why the original proposal referred to "contained body of water." Adding the word "artificially" addresses the panel's concerns, while making the rules properly generic.

680.7. Do not change the panel action. Lifting the 20 ampere limitation was substantiated in the proposal. There are larger (2 hp) swimming pool pumps on the market that may nuisance trip a 20 ampere circuit, and for which Article 430 would allow far larger branch-circuit short-circuit and ground-fault protective devices. Section 305-6(A) now requires GFCI protection on 125-volt 30-ampere temporary wiring outlets, indicating a market for larger equipment. Restricting these applications to 20 amperes is no longer warranted technically, and will provoke countless local amendments, particularly in northern states where this equipment is routinely removed for the cold season. This section has never limited voltage to 240 volts.

680.8. Do not change the general wording. The words should remain as the panel accepted them. If the service point is the point of attachment on the building, then the drop is beyond the scope of the NEC, and the NESC applies. However, there are instances where the service point on an overhead service is at the pole or property line. In such cases the NEC applies to the service drop conductors, and if the rule were changed to only cover feeders and branch circuits the result would be a gap in coverage.

680.8 (Table). The previous comments notwithstanding, there isn't any reason to maintain a conflict between the NESC and NEC over clearances, as suggested in the voting.

680.8(B). Since "within the scope of" effectively refers to only single sections, the first sections of those three articles, the submitter assumes this wording complies with 4.1.1 of the Style Manual. It flows much better than individual section notation, while getting away from the panel action that directly referenced the entire articles.

680.22(A)(3). The use of potential plural construction is a grammatical correction. The reference to a fountain is out of the scope of this part of the article, and is not included in the 1999 source material. The 5-ft distance was erroneously reduced from the original 10-ft without substantiation and is not correlated with 680.22(A)(4) following, and needs to return to the original 3 m (10 ft).

680.22(A)(5). Editorial clarification to indicate that the rating applies to the receptacles and not the motors.

680.22(C). Note that the panel action on Proposal 20-44 potentially moots old FI 87-4 re 15V and 5 mA max devices. NFPA staff should process this FI for withdrawal.

680.23(F)(1) FPN. It contains a reference to an entire article, and adds so little that it isn't worth deciding which parts ought to remain in the note.

680.23(F)(1) Ex. Eliminates a whole article reference problem, one which will be exacerbated by the pending split of Article 351. Section 90-3 already covers the mandatory application of Chapter 3 requirements in this case.

680.25(A-B). This comment changes 680.25(A) Exception to clarify that the allowance for an existing feeder has different aspects depending on whether the issue is flexible metal conduit or a cable assembly. In the case of flexible metal conduit, the exception is for the wiring method only; the insulated equipment grounding conductor rule continues to apply. In the case of a cable assembly, the exception for existing installations does allow a Type SER feeder. The comment wording is based on the revision for romex on motor circuits in Section 680.21(A)(4), which was changed in recognition that a bare EGC under a cable sheath does not meet the definition for a covered conductor in Article 100. This wording and 680.21(A)(4) must line up. In addition, there is an additional sentence to assure compliance with 250.24(A)(5). This lines up with the wording in the next subsection [680.25(B)(2)] to assure compliance with 250.32 in the case of second buildings. Pool equipment with conductive surfaces connected to a panel supplied with a feeder utilizing a common grounded and grounding conductor will be subjected to continual surface voltage fluctuations depending on voltage drop stemming from the varying amount of neutral current flowing through the grounded conductor. These fluctuations pose a safety problem in a pool environment.

This comment also changes 680.25(B) to remove a conflict between its language and 680.25(A) Exception and 680.25(B)(2), neither of which require insulated equipment grounding conductors in all instances. The final change in 680.25(B)(2) addresses the fact that feeders are far from the only required elements of compliance with 250.32 and the wording must be broadened to clarify that all elements of 250.32 must be met in order for this allowance to be safe. In addition, separate buildings may themselves contain feeders running from their main distribution to subpanels supplying swimming pool equipment. This comment clarifies that the allowance is only for the main supply feeder to the separate building, and not a subfeeder within the building which should follow the same rules as for a feeder in the main building. Only on the main supply feeder, which will have a grounding electrode connected at the load end in the separate building, is there equivalent safety to that afforded at the service entrance.

680.26(B)(2). Do not change the panel action. The extension of the bonding requirement to a metallic forming shell of low voltage equipment was substantiated. The panel should reflect on the fact that the bonding philosophy underlying Article 680 provisions relates to UL research in the early 1960s, when UL volunteers actually subjected themselves to pool ambients. That research showed a drowning hazard due to disorientation, particularly with the head submerged and water in the ear canal. Those effects became noticeable at about 4 volts, well below present low-voltage lighting designs. If the present code text is being used to justify low-voltage fixtures with unbonded metallic forming shells, then this change is indeed timely. Note that the proposal never asked that these fixtures be grounded per se, which means that no equipment grounding conductor need be run in the supply to the fixtures. However, if they incorporate a metal forming shell (it was the submitter's understanding that they do not customarily do so), then that forming shell should be incorporated into the bonding grid.

680.42(C). Proposal 20-118 was sold on the basis that any Chapter 3 wiring can be used in tre interior of a single family dwelling for these units if installed indoors. That was correct on the 1996 NEC, but not so on the 1999 NEC, which requires adherence to Parts A and B except as modified in Section 680.41. No provision in Section 680-41 (1999 NEC) modifies the raceway requirements for underwater lights. This comment restores the 1999 requirement, which was removed without proper benefit of technical substantiation.

680-43(D)(5). This corrects an error in the original proposal that was overlooked in processing. The intent was to recast the present code language as positive, and using consistent syntax with other items on the list, as required by the new Style Manual. The submitted language inadvertently came from a file in progress and was never completed, resulting in contradictory wording.

680.43(E)(3). This makes the wording consistent with 680.26(C) and 680.62(C).

680.44. These words are in both the Proposal 20-31 and the panel action on Proposal 20-31. In translating the legislative format of the panel action on the proposal into the normal text of Panel Proposal 20-30a, these words were inadvertently dropped.

680.57(D) and (E). Style.

680.62(B)(5). This corrects an error in the original proposal that was overlooked in processing. The intent was to recast the present code language as positive, and using consistent syntax with other items on the list, as required by the new Style Manual. The submitted language inadvertently came from a file in progress and was never completed, resulting in contradictory wording.

PANEL ACTION: Accept in Principle in Part.

After the last sentence to 680-1 add to read as follows "The term "body of water" used throughout Part I applies to all bodies of water covered in this scope unless otherwise amended."

In Section 680.6(2),(3) and (7) change the term "pool or fountain" to "specified body of water".

Revise 680.8 (Table) to read as follows. "The 0-750V clearance should be increased to 6.9 m (22.5 ft) for the water surface and the structural clearances should go to 4.4 m (14.5 ft)."

Revise 680.8(B) to read as follows: "(B) Communications Systems. Communication, radio, and television coaxial cables within the scope of Articles 800 through 820 shall be permitted at a height of not less than 3.0 m (10 ft) above swimming and wading pools, diving structures, and observation stands, towers, or platforms."

In 680.22(A)(3) change the clearance from 1.5m (5 Ft) to 3.0 m (10 ft).

In the draft of the 2002 NEC revise the second sentence of Section 680.22(A)(5) to read as follows: "Receptacles that supply pool pump motors and that are rated 15 or 20 amperes , 120 volt through 240 volt, single phase, shall be provided with GFCI protection."

In Section 680.23(F)(1) FPN. Delete this note.

In Section 680.23(F)(1) exception Reword as follows: "Exception: Where connecting to transformers for pool lights, liquidtight flexible metal conduit or liquidtight flexible nonmetallic conduit shall be permitted. The length shall not exceed 6 ft (1.83 m) for any one length, nor exceed 10 ft (3.05 m) in total length used."

Revise Section 680.25(A) and (B) to read as follows: "(A) Wiring Methods. Feeders shall be installed in rigid metal conduit, intermediate metal conduit, liquidtight flexible nonmetallic conduit, or rigid nonmetallic conduit. Electrical metallic tubing shall be permitted where installed on or within a building, and electrical nonmetallic tubing shall be permitted where installed within a building.

Exception: An existing feeder between an existing remote panelboard and service equipment shall be permitted to run in flexible metal conduit or an approved cable assembly that includes an equipment grounding conductor within its outer sheath. The equipment grounding conductor shall comply with 250.24(A)(5).

(B) Grounding. An equipment grounding conductor shall be installed with the feeder conductors between the grounding terminal of the pool equipment panelboard and the grounding terminal of the applicable service equipment or source of a separately derived system. For other than (1) existing feeders covered in 680.25(A) Exception, or (2) feeders to separate buildings that do not utilize an insulated equipment grounding conductor in accordance with 680.25(B)(2), this equipment grounding conductor shall be insulated.

(1) Size. This conductor shall be sized in accordance with 250.122 but not smaller than No. 12. On separately derived systems, this conductor shall be sized in accordance with Table 250.66 but not smaller than No. 8.

(2) Separate Buildings. A feeder to a separate building shall be permitted to supply swimming pool equipment branch circuits, or feeders supplying swimming pool equipment branch circuits, if the grounding arrangements in the separate building meet the requirements in 250.32. Where installed, a separate equipment grounding conductor shall be an insulated conductor."

Revise Section 680.42(C) to read as follows:

"(C) Interior Wiring to Outdoor Installations. In the interior of a one-family dwelling or in the interior of another building or structure associated with a one-family dwelling, any of the wiring methods recognized in Chapter 3 of this Code that contain a copper equipment grounding conductor that is insulated or enclosed within the outer sheath of the wiring method and not smaller than No. 12 shall be permitted to be used for the connection to motor, heating, and control loads that are part of a self-contained spa or hot tub, or a packaged spa or hot tub equipment assembly. Wiring to an underwater light shall comply with 680.23 or 680.33."

Revise Section 680.43(D)(5) to read as follows:"(5) Electrical devices and controls that are not associated with the spa or hot tub but located within 1.5 m (5 ft) from such units.

Revise Section 680.43(E)(3) to read as follows: "A solid copper conductor, insulated, covered, or bare, not smaller than No. 8."

In Section 680.44 insert the words "shall be" ahead of "protected."

In Section 680.57(D) and (E). Delete the word "Section" (three times).

In Section 680.62(B)(5) revise as follows: "(5) Electrical devices and controls that are not associated with the therapeutic tub but located within 1.5 m (5 ft) from such unit."

PANEL STATEMENT: In Section 680-6 the panel accepted in principle and changed the term pool or fountain to specified body of water which meets the intent of the submitters concerns.

In Section 680-22(A)(3) the panel did not add the (s) to receptacle and branch circuit as it would not clarify the current text.

In Section 680-25 (B)(2) the panel accepted this change but retained the last sentence for new installations as the need still exists.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #671)

20- 11 - (680-1 (New)): Reject

SUBMITTER: Gary Boughton, Town of Ridgefield, CT

COMMENT ON PROPOSAL NO: 20-29

RECOMMENDATION: Change 1.0m (42 in.) to 1.07m (42 in.).

SUBSTANTIATION: 42 in. is 1.07m.

PANEL ACTION: Reject.

PANEL STATEMENT: Proposal 20-29 provided the committee with the proper hard conversions as per NFPA No. 1M Manual of Style Section 4.1 with respect to the placement of units and values of measurement, i.e., show SI units as the preferred and inch-pound units immediately following.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

COMMENT ON AFFIRMATIVE:

LABRAKE: The Metrication Task Group of the Technical Correlating Committee agreed on the general SI unit of 1.0 m to represent existing U.S. Customary units of 40 in. and 42 in. throughout the NEC as a hard conversion. This information was used in Proposal 20-29 where the existing 42 in. conversion to SI units was not deemed to be "extracted material" and hard conversion from the Task Group's results was determined as 1.0 m. The panel has not determined that a soft conversion is necessary to maintain the 1999 NEC value for a higher level of safety.

(Log #765)

20- 12 - (680-3(a)): Accept
SUBMITTER: Richard E. Loyd, Perryville, AR
COMMENT ON PROPOSAL NO: 20-34
RECOMMENDATION: Reconsider this proposal and hold for further study, appoint a committee to investigate the need for expanding Article 680 to cover these installations or create a new article for the 2005 NEC cycle.
SUBSTANTIATION: See my Comment on Proposal 20-32.
PANEL ACTION: Accept.
PANEL STATEMENT: The panel has formed a task group to investigate the need of a new article to cover these type of installations. This includes bodies of water that involve electrical equipment that is not covered by Article 680.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #767)

20- 13 - (680-3(a)): Accept
SUBMITTER: Richard E. Loyd, Perryville, AR
COMMENT ON PROPOSAL NO: 20-32
RECOMMENDATION: Reconsider this proposal and hold for further study, appoint a committee to investigate the need for expanding Article 680 to cover these installations or create a new article for the 2005 NEC cycle.
SUBSTANTIATION: I disagree with Code-Making Panel 20 and the NEC Technical Correlating Committee, in rejecting this proposal which points out a serious safety concern.
Fish Farms have been a controversy for many years and have similar safety concerns to pools since harvesting the fish often requires the farmers to enter the water regularly. IAEI meetings in the south have reported electrocutions many times in the past in these facilities. Many of the aerators and pumps in the lakes-ponds-water containment areas listed by the proponents of Proposals 20-32 and 20-34 are powered by 480 volt motors. Many have lighting. Golf course streams, lakes, etc., are also a serious concern.
PANEL ACTION: Accept.
PANEL STATEMENT: The panel has formed a task group to investigate the need of a new article to cover these type of installations. This includes bodies of water that involve electrical equipment that is not covered by Article 680.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #903)

20- 14 - (680-6(a)(1)): Reject
SUBMITTER: Art Cummins, City of Decatur
COMMENT ON PROPOSAL NO: 20-38
RECOMMENDATION: Revise as follows:
A receptacle(s) that provides power for a water-pump motor(s) for, or other loads directly related to the circulation and sanitation system, a permanently installed pool or fountain, as permitted in Section 680-7, shall be permitted to be at least 10 feet from the inside walls of the pool or fountain and be protected by a ground fault circuit interrupter.
SUBSTANTIATION: The 10 ft area around a pool or fountain is usually wet and would be hazardous for persons to plug or unplug cords and relying on the integrity of the GFCI as the sole means of protection.
PANEL ACTION: Reject.
PANEL STATEMENT: Section 680-22(A)(5) of the rewrite contains the requirements that address his concerns.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #2209)

20- 15 - (680-6(a)(2)): Accept
SUBMITTER: Robert H. Keis, Dover, DE
COMMENT ON PROPOSAL NO: 20-30a
RECOMMENDATION: Change 1.5 m (5 ft) to 3 m (10 ft).
SUBSTANTIATION: With the long rewrite text it is hard to find the correct section numbers and proposals. The requirements for receptacle locations around swimming pools have always been 10 to 20 feet.
680-22(A)(2) Other receptacles, Location. Other receptacles shall be not less than 3.0 m (10 ft) from the inside walls of a pool.
In the draft copy (shown below and also in this Proposal 20-30a, this distance has been changed to require a receptacle within 5 to 20 feet. I think the confusion was caused by modifying a proposal and then some renumbering. In Proposal 20-29 (ROP Page 1124) under recommendation for Section 680-6(a)(2) item No. 4, the distance remained the same, (10 ft) only the metric and feet dimensions are reversed. In Proposal 20-39 (ROP page 1165) where the recommendation was made to add an exception to permit a receptacle within 5 feet the "panel action was to "Revise 680-6(a) by adding a new item (3) to read: – In the draft copy from the ROP CD for this section, this proposal became item (4). See below.
Item (4) should take care of the submitter's problem of 5 feet and the general rule in new 680-22 (A)(3) should read 3 m (10 ft) instead of 1.5 m (5 ft).
Otherwise, the rule for locations receptacles grounding swimming pools will be a minimum of 5 ft instead of 10 ft. The new (4) will act as the exception for those areas that do not have enough distance to make the 10 foot rule.
Text should read:
(3) Dwelling Unit(s). If a permanently installed pool is installed at a dwelling unit(s), no fewer than one 125-volt, 15- or 20-ampere receptacle on a general-purpose branch circuit shall be located not less than ~~1.5 m (5 ft)~~ 3 m (10 ft) from and not more than 6.0 m (20 ft) from the inside wall of the pool. This receptacle shall be located not more than 2.0 m (6 ft 6 in.) above the floor, platform, or grade level serving the pool.
(ROP 20-29)
(4) Restricted Space. Where a pool is within 3.0 m (10 ft) of a dwelling and the dimension of the lot preclude meeting the required clearances, not more than one receptacle outlet shall be permitted if not less than 1.5 m (5 ft) measured horizontally from the inside wall of the pool. (ROP 20-29, 20-39) DRAFT
PANEL ACTION: Accept.
PANEL STATEMENT: See panel action on comment 20-10.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

ARTICLE 680 — SWIMMING POOLS, FOUNTAINS, AND SIMILAR INSTALLATIONS

(Log #228)

20- 16 - (680-6(d)): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 20-50
RECOMMENDATION: The Technical Correlating Committee directs the Panel to clarify the Panel Action and Statement on this Proposal, specific to the proposed addition of "One and Two Family" to the section title. It is not clear where this action is covered by the rewrite of Article 680 in Proposal 20-30a. This action will be considered by the Panel as a Public Comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
The panel accepts the Technical Correlating Committee comment to reconsider this proposal. The panel accepts in principle in part Proposal 20-50. The panel reaffirms its rejection of adding the title "One and Two family" in the Section title of 680-21.
PANEL STATEMENT: The panel action on Proposal 20-50 was to accept in principle. The principle that the panel agreed with was that motors, regardless of where they are installed should be treated the same. The panel has accomplished this in Section 680-21. Therefore, there is no need to include the phrase "One and Two family" in the Section title of 680-21.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1366)

20- 17 - (Table 680-8): Accept in Principle
SUBMITTER: David P. Brown, Baltimore Gas and Electric Co/EEI
COMMENT ON PROPOSAL NO: 20-30a
RECOMMENDATION: This proposal should be accept in principle.

1. Corrections should be made to change the words in the column descriptions of Table 680.8 as follows:
Delete "supply or" and after "service drop", add "feeder or branch circuit or supply lines associated with separately derived systems."

2. In addition, the first column of the '0 to 750V-Ground cables' clearances needs to be changed to 6.9m (22.5 ft) for "a" and 4.4m (14.5 ft) for "B" in Table 680.8.

SUBSTANTIATION: 1. Code-Making Panel 4's actions taken on this NEC cycle's Proposals 4-13 (re: Section 225-21), 4-63 (re: Section 230-21), and 4-98 (re: Section 230-51) to distinguish between utility services and customer-installed outside feeders and branch circuits. Code-Making Panel 4's intent on these is that the service drop to the meter is not always under NESC jurisdiction. When this section was originally developed, the discrepancy between the NEC and NESC was noted and understood. However, it was considered as the best at that time to be able to differentiate between utility services and outdoor feeders and branch circuits installed by others that later has become the issue. Also, refer to the panel's action taken on NFPA 70 A98 ROP Proposal 20-103.

2. In addition, the first column of the '0 to 750V-Ground cables' clearances needs to be harmonized with the 1997 NESC values. The description of cables in the first column of Table 680.8 corresponds to Rule 230C2 of the 1997 NESC. Please note that in using these values directly from the NESC table that adjustments are not factored for the sag of overhead conductors due to the effects of temperature, wind, and ice loading. These factors need to be considered in these NEC clearances as they are in the NESC through its rules and it is suggested that the Technical Correlating Committee's task group on harmonization with the NESC evaluate this issue for resolution.
PANEL ACTION: Accept in Principle.
Correct the words in the column descriptions of Table 680.8 as follows:
Delete "supply or service drop " from both columns.

In addition, the first column of the '0 to 750V-Ground cables' clearances needs to be changed from (22 ft.) to 6.9m (22.5 ft) for "a" and (14 ft.) to 4.4m (14.5 ft) for "B" in Table 680.8.
PANEL STATEMENT: The elimination of the words "supply or service drop" will address the submitter's intent.

The panel accepts the second part of the submitter's comment.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1367)

20- 18 - (680-8(a), FPN): Accept in Principle
SUBMITTER: David P. Brown, Baltimore Gas and Electric Co/EEI
COMMENT ON PROPOSAL NO: 20-30a
RECOMMENDATION: This proposal should be accept in principle. Corrections should be made to 680.8(A) to add a Fine Print Note to describe what is meant by "open overhead wiring" after the words "service drop" as follows:

"FPN: Open overhead wiring typically refers to feeder or branch circuit or supply lines associated with separately derived systems."
SUBSTANTIATION: Code-Making Panel 4's actions taken on this NEC cycle's Proposal 4-13 (re: Section 225-21), 4-63 (re: Section 230-21), and 4-98 (re: Section 230-51) to distinguish between utility services and customer-installed outside feeders and branch circuits. Code-Making Panel 4's intent on these is that the service drop to the meter is not always under NESC jurisdiction. Also, refer to the panel's action taken on NFPA 70 A98 ROP Proposal 20-103.
PANEL ACTION: Accept in Principle.
In the draft for the 2002 NEC add a Fine Print Note after Section 680-8(A) to read as follows: "FPN: Open overhead wiring as used in this article typically refers to conductor(s) not in an enclosed raceway."
PANEL STATEMENT: The panel addressed the concern of the submitter and reworded the fine print note to accurately clarify the meaning of open overhead wiring as used in this article.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
COMMENT ON AFFIRMATIVE:
LABRAKE: The new FPN will help distinguish that the clearances of overhead conductors in Article 680 only apply to those that are related to premises wiring and not of those under the jurisdiction of the supplying utility as regulated through the states and the National Electrical Safety Code (NESC). The NESC establishes minimum clearances of utility overhead conductors near pools.

(Log #591)

20- 19 - (680-9, Exception (New)): Hold
SUBMITTER: Thomas L. Harman, Univ. of Houston Cleark Lake
COMMENT ON PROPOSAL NO: 20-29
RECOMMENDATION: Added text:

Exception: Listed instantaneous electric water heaters shall have their loads subdivided as defined in Article 422.

Panel 20 accepted Proposal 20-6 for Article 422-11 and allowed "listed instantaneous electric water heaters" to have their heating elements subdivided into circuits not exceeding 120 amperes and protected at not more than 150 amperes. This exception should also apply to electric pool water heaters.
SUBSTANTIATION: Due to the technological advances in tankless (instantaneous) water heater design, I believe that Section 680-9 should not apply as presently written to water heaters that are protected within their rating. If an instantaneous water heater is a listed (UL) product that has been field tested with a variety of supply circuits, there is no technical or safety reason to limit the branch circuit protection to 60 amperes or cause the loads to be subdivided to 48 amperes.

This requirement for water heaters was introduced in the 1975 code with the justification that heaters with "small internal conductors" might be protected by unspecified sizes of overcurrent devices.

The restrictions on overcurrent protection of water heaters in the present code are unnecessarily restrictive for the new types of instantaneous water heaters. No technical justification has been given to limit the loads to 48 amperes. Field experience and testing has indicated that the design and control of today's instantaneous water heaters allows for their safe installation as described in the proposal (20-6) accepted for Article 422-11.

For example, an instantaneous water heater with four elements drawing a maximum of 25 amperes each would require four 30-ampere branch circuits by the present wording of the NEC. A safer alternative would be to subdivide the loads using two elements each on a 60-ampere circuit as allowed by the exception that will be incorporated in Article 422-1. Then, only two circuit breakers need be turned off to disconnect the unit. Since the heater must be a listed appliance, the internal wiring would be sufficient for the 60-ampere circuits.
PANEL ACTION: Hold.
PANEL STATEMENT: This comment introduces new material and should be held until the next cycle as per Section 4-4.6.2.2 of the NFPA Regulations Governing Committee Projects.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #424)

20- 20 - (680-10): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
COMMENT ON PROPOSAL NO: 20-59
RECOMMENDATION: Accept proposal.
SUBSTANTIATION: Where metal conduit not supplying pool equipment cannot be routed 5 ft or more from the pool it should be required to be bonded to the common bonding grid. The panel states that earth cover is not a barrier (arguable) and bonding is required by the Code. Section 680-22(a)(4) does not cover such conduits nor does 680-22(a)(5) since underground conduits within 5 ft horizontally are not likely to be within 12 ft above maximum pool water level. Section 680-22(a)(5) appears directed to metal that is exposed and subject to contact by persons.
PANEL ACTION: Reject.
PANEL STATEMENT: The NEC now requires that conduit to be bonded. The panel does not consider earth to be a barrier.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #826)

20- 21 - (680-12): Accept in Principle
SUBMITTER: Mike Theisen, St. Cloud, MN
COMMENT ON PROPOSAL NO: 20-62a
RECOMMENDATION: Editorial changes to first sentence to read as follows:

One or more disconnecting means, for disconnecting ~~from~~ all ungrounded conductors, shall be provided for all utilization equipment other than lighting.

SUBSTANTIATION: The current sentence structure is confusing and difficult to read.
PANEL ACTION: Accept in Principle.
Revise first sentence to read as follows:
"One or more means to disconnect all ungrounded conductors shall be provided for all utilization equipment other than lighting."
PANEL STATEMENT: The panel accepts the submitters comment in principle and has made editorial changes for clarity.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #902)

20- 22 - (680-12):

Note: It was the action of the Technical Correlating Committee that this comment be reported as "Hold" because the panel states that the comment introdces new material that has not had public review.

SUBMITTER: Art Cummins, City of Decatur
COMMENT ON PROPOSAL NO: 20-62a
RECOMMENDATION: Add new text:

Safety Disconnecting Means. One or more disconnecting means from all ungrounded conductors shall be provided for all utilization equipment other than lighting. Each means shall be accessible and within sight from persons using the pool, spa or hot tubs, and shall be at least 5 ft from nearest edge of water.

SUBSTANTIATION: The original proposal (20-75) for the 1996 code was intended to be used for the safety of people using the various utilization equipment. The disconnecting means for motors - pumps are already covered in Article 430 and water heating equipment is covered in Article 422. The IAEI Analysis of the 1999 NEC also states the case for emergency use for the disconnects.
PANEL ACTION: Reject.
PANEL STATEMENT: This comment introduces new text material and should be rejected in accordance with the Regulations Governing Committee Projects Section 4-4.6.2.2
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #2113)

20- 23 - (680-22(a)(1)): Accept in Principle
SUBMITTER: Dennis L. Rowe, NY Board of Fire Underwriters
COMMENT ON PROPOSAL NO: 20-82
RECOMMENDATION: Revise text as follows:

"...Where reinforcing steel is effectively insulted by a listed encapsulating...".

SUBSTANTIATION: The Panel erred in removeing the listing requirement for a product that is intended to serve as an insulating material.

The National Electrical Code requirements for providing an adequate surface for proper bonding of metal, that may become electrically energized, is time honored and should not be abandoned without technical substantiation.

The practices of installing epoxy or plastic coated rebar in the structure and deck of swimming pools, without adequate bonding of the rebar, has proven to be hazardous in at least two documented cases in California.

Note: Supporting material available for review upon request at NFPA headquarters.

PANEL ACTION: Accept in Principle.
In Section 680.26(B)(1) of the Draft of the 2002 after the last sentence add a sentence to read as follows: "Where reinforcing steel is encapsulated with a non-conductive compound, provisions shall be made for an alternate means to eliminate voltage gradients which would otherwise be provided by unencapsulated, bonded reinforcing steel."
PANEL STATEMENT: The panel recognized the potential hazard and the additional text will address the commenters concerns.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
COMMENT ON AFFIRMATIVE:
LABRAKE: The panel assigned a Task Group to research this encapsulated reinforcing steel situation further and the need for an equipotential plane as was suggested in Proposal 20-87. There is a need to substantiate evidence that an equipotential plane should be required for pools. This can be an intricate design issue to maintain safe step and touch voltages and requiring a minimum loop conductive element may either not be sufficient or could present greater risk to an individual's step or touch shock hazard within reach of the pool while standing outside the loop. As a minimum, the Task Group needs to consider varying soil resistivities, maximum equipotential plane resistance, and maximum tolerable voltage rise for possible maximum phase to ground fault current situations. IEEE Standard No. 80 can be a source reference to begin engineering studies.

(Log #1368)

20- 24 - (680-22(a)(4)): Reject
SUBMITTER: David P. Brown, Baltimore Gas and Electric Co/EEI
COMMENT ON PROPOSAL NO: 20-84
RECOMMENDATION: This proposal to add the following second paragraph should be rejected and the following wording should be deleted:

"Where a double insulated water pump motor is installed under the provisions of this exception, a solid No. 8 copper conductor that is of sufficient length to make a bonding connection to a replacement motor shall be extended from the bonding grid to an accessible point in the motor vicinity. Where there is no connectionsbetween the swimming pool bonding grid and the equipment grounding system for the premises, this bonding conductor shall be connected to the equipment grounding conductor of the motor circuit."

SUBSTANTIATION: The proponent has not submitted evidence or supporting documentation that this issue is creating a safety hazard. It appears to be more of a design preference. While the Code does contain some design specifications, they are there to address a specific safety issue. This is not a safety issue and should not be included in the Code.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel understands the concerns of the submitter but recognizes the need to minimize the difference of potential between the bonding grid and the equipment grounding system.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
LABRAKE: The decision by Panel 20 to require the installation of a No. 8 AWG solid copper bonding conductor for use with double insulated motors is both unnecessary and arbitrary. The proposal 20-84 submitted no substantiation justifying this requirement. Its installation "for future use" may never be necessary. Any suggestion that future motor replacements would not be done according to NEC requirements is an unsubstantiated assumption. A requirement as such for possible "future use only" adds both unnecessary costs and construction effort to the initial installation and can be viewed as an attempt by the panel to discredit the benefits of double insulated motors.

(Log #2208)

20- 25 - (680-22(b)(1)): Reject
SUBMITTER: Robert H. Keis, Dover, DE
COMMENT ON PROPOSAL NO: 20-85
RECOMMENDATION: This proposal should be accepted.
SUBSTANTIATION: I don't know what the panel wants in the way of substantiation. But I will try again. Section 680-22(a) requires the bonding together of all metal parts. Section 680-22(b) tells us how to accomplish this required bonding. This section also tells the "common bonding grid" shall be permitted to be any of the following: THIS IS WHERE THE PROBLEM IS.

(1) "The structural reinforcing steel of a concrete pool where the reinforcing rods are bonded together by the usual steel tie wires or the equivalent."

All homeowners and most electricians feel that "wire mesh" is part of the reinforcing steel of the pool. Wire mesh is made up of thin steel (think of heavy coat hangers) that are welded together in 4 inch squares and is usually 4 feet wide and comes in rolls as a rule. It is laid down in the deck concrete to add strength to the concrete. It is also sometimes used in the walls of pools instead of re-bar. The difference is that the reinforcing rods (re-bar) are usually 3/8 or 1/2 inch steel bars up to 20 feet long. The bars are tied tightly to each other, and all others usually at 9 to 10 inch intervals. Each piece of re-bar may be tied to as many as 15 or 20 other pieces. This makes a very good electrically tight mat. In fact, this assembly can be climbed on getting into and out of the pool.

Now, wire mesh as I said is nothing more than heavy coat hangers welded together. The "usual steel tie wires" mentioned in the (1) above, can never be tied tight enough on the material to make it electrically safe. It is usually just tied helter-skelter to keep it in place while the concrete is being poured. In fact, a lot of times, the mesh has one end of wire looped over a piece in the adjoining section with not even a thin piece of wire to hold them together. To the concrete man, this is all that is needed to hold it in place until the concrete is poured.

Section 680-22 - Bonding. This section tells us why we are required to bond the metal parts of a pool.

In part this section says this;... but only that it shall be employed to eliminate voltage gradients in the pool areas as prescribed.

How can we eliminate voltage gradients if we do not properly bond this material into the pool structure?

Try wrapping a piece of copper or steel wire around two coat hangers and see if they are tight. By tight, I mean electrically tight. If these two coat hangers were two pieces of wire mesh in a concrete pool or deck they would only be tight enough to hold the material together while the concrete is being poured.

Code Making Panel 19 recognized the hazard for livestock confinement areas and inserted this text concerning the bonding of wire mesh in the concrete to protect cows:

547-9. Bonding and Equipotential Plane.

(a) Definition of Equipotential Plane. An area accessible to livestock where a wire mesh or other conductive elements are embedded in concrete, are bonded to all metal structures and fixed nonelectrical metal equipment that may become energized and are connected to the electrical grounding system to prevent a difference in voltage from developing within the plane. For this section, livestock does not include poultry.

(b) General. Wire mesh or other conductive elements shall be installed in the concrete floor of livestock confinement areas and be bonded to the building grounding electrode system to provide an equipotential plane that may have voltage gradient ramps at entrances and exits that are traversed daily by the same livestock. The bonding conductor shall be copper, insulated, covered or bare, and not smaller than No. 8. The means of bonding to wire mesh or conductive elements shall be by pressure connectors or clamps of brass, copper, copper alloy or an equally substantial approved means.

Not all swimming pools use wire mesh in the deck or in the pool walls. This would be a design consideration. But, if it is used, it should be properly bonded into the pool. I guess it is kind of like "unit equipments" in Article 700. The code doesn't say where we need them, but is is very explicit on how they are to be connected, IF they are installed.

It seems that we should at least give the swimming public the same protection that is required for cows.

PANEL ACTION: Reject.

PANEL STATEMENT: Section 680-26(c)(1) of Proposal 20-30a requires bonding the mesh to the grounding grid by suitable means. The issue of bonding the wire mesh to wire mesh using usual steel tie wires is acceptable when made tight.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 10

NEGATIVE: 1

EXPLANATION OF NEGATIVE:

EGAN: Section 680-22(B) of the 1999 code was changed to recognize exothermic welding as a means of connecting to a common bonding grid. This change also recognizes pressure connections and clamps that are specifically listed for the purpose. Since wire mesh is a metallic part of the pool structure, it should be required to be bonded. The submitter has presented a valid recommendation to require adequate bonding.

(Log #1627)

20- 26 - (680-25): Reject

SUBMITTER: Gilbert L. Thompson, MEIA Codes and Standards

COMMENT ON PROPOSAL NO: 20-30a

RECOMMENDATION: 680-25 - feeders part (b)2 separate buildings in the last sentence remove the period and add the words "unless run in an approved cable assembly".

SUBSTANTIATION: Many separate buildings are adjacent to the pool itself, but are far enough away from the treated water that the feeder conductors would not be involved in the deteriorating effect when covered by a corrosive resistance outer cover.

PANEL ACTION: Reject.

PANEL STATEMENT: It is the panels intent to install an insulated ground wire whether run in cable or otherwise. Refer to panel action and statement on Comment 20-10.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #2364)

20- 27 - (680-25(a)):

Note: It was the action of the Technical Correlating Committee that this comment be reported as "Hold" because the panel states that the comment introduces new material that has not had public review.

SUBMITTER: Monte R. Ewing, State of Wisconsin

COMMENT ON PROPOSAL NO: 20-30a

RECOMMENDATION: Revise as follows:

Feeders shall be installed in rigid metal conduit, intermediate metal conduit, rigid nonmetallic conduit, liquidtight flexible metallic conduit, or liquidtight flexible nonmetallic conduit. Electrical metallic tubing shall be permitted where installed on or within a building or structure. Electrical nonmetallic tubing and listed metal-clad cable containing an insulated equipment grounding conductor shall be permitted where installed within a building.

SUBSTANTIATION: I thought the panel may have overlooked the use of flexible metallic liquidtight conduit and the wood decking below a hot tub may be called a structure rather than a building by some states. The MC cable with an insulated equipment grounding conductor will provide the panel's intent of providing an insulated equipment grounding conductor and a physical protective covering. Sometimes nonflexible piping is difficult to install (such as where fished) and another option to liquidtight conduit (which is difficult to pull conductors through on long rungs) would help.

PANEL ACTION: Reject.

PANEL STATEMENT: The original requirement in Section 680-25(d) of the 1999 NEC and rewritten as Section 680-25(A) of the draft of the 2002 NEC did not include liquidtight metal flexible conduit or type MC cable. To introduce wiring methods at this stage of the process would be introducing new material that has not received public review or comment.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #804)

20- 28 - (680-25(b)(3), Exception): Accept

Note: The Technical Correlating Committee understands that the accepted revision is to 680.23(F)(1), Exception of the Proposal 20-30a Rewrite of Article 680.

SUBMITTER: David H. Kendall, Carlon

COMMENT ON PROPOSAL NO: 20-97

RECOMMENDATION: This proposal should be accepted with the revised wording. This revision should be added to the end of the exception as a last sentence:

Liquidtight Flexible Nonmetallic Conduit, Type B (LFNC-B), shall be permitted in lengths longer than 1.8 m (6 ft).

SUBSTANTIATION: The original proposal was to clarify that Liquidtight Flexible Nonmetallic Conduit, Type B (LFNC-B) is allowed to be used in lengths longer than 1.8 m per Section 351-23(a)(5).

It was not intended to introduce the 3/8 in. Trade Size. The comment omits the reference to any trade sizes. All conduit sizing shall be determined per Table 1 of Chapter 9.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
EGAN: Proposal 20-97 was rejected in the ROP segment of the code cycle. Previously, the restrictions limited liquidtight flexible nonmetallic conduit to lengths no longer than 1.8 m (6 ft). The acceptance of this comment removes all restrictions on the length allowed whether it be 1.8 m (6 ft); 2.7 m (9 ft); 18 m (60 ft), etc.

(Log #229)

20- 29 - (680-26): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 20-103
RECOMMENDATION: It was the action of the Technical Correlating Committee that the Panel reconsider this Proposal as it is within the Scope of the NEC. This action will be considered by the Panel as a Public Comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
The panel accepts the Tecnical Correlating Committee comment to reconsider this proposal. The panel reaffirms its rejection of Proposal 20-103.
PANEL STATEMENT: The submitter does not cite any incidents where failure to power a pool cover to open or close caused injury. His proposal would require a GFCI itself to be physically located within five feet of the controller, and subjected to a harsher environment than if it were remotely located. The tripping of a GFCI is an indication of a ground fault problem which requires further evaluation than simply resetting the GFCI. The problem is best addressed through installing pool covers that can be manually operated in an emergency rather than mandating GFCI location.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #230)

20- 30 - (680-26): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 20-105
RECOMMENDATION: It was the action of the Technical Correlating Committee that the Panel reconsider this Proposal as it is within the Scope of the NEC. This action will be considered by the Panel as a Public Comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
The panel accepts the Technical Correlating Committee comment to reconsider this proposal. The panel reaffirms its rejection of Proposal 20-105.
PANEL STATEMENT: The proposed requirement is arbitrary. The present wording of Section 680-27(B) of Proposal 20-30a requires a permanent cover.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #231)

20- 31 - (680-26): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 20-106
RECOMMENDATION: It was the action of the Technical Correlating Committee that the Panel reconsider this Proposal as it is within the Scope of the NEC. This action will be considered by the Panel as a Public Comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
The panel accepts the Technical Correlating Committee comment to reconsider this proposal. The panel accepts in principal in part Proposal 20-106. Add after the last sentence of Section 680-27(B)(1) to read as follows:
"The device which controls the operation of the motor for an electrically operated pool cover shall be located so the operator has full view of the pool."
The panel rejects the 35 foot requirement that was in the Proposal 20-106.
PANEL STATEMENT: The panel accepted Proposal 20-106 in principal in part. No substantiation was provided for the 35 foot requirement.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #425)

20- 32 - (680-41(d)(3)e): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
COMMENT ON PROPOSAL NO: 20-122
RECOMMENDATION: Accept proposal.
SUBSTANTIATION: There is no proposed change to allow any wiring method as indicated by the panel statement. Wiring methods shall comply with 680-40 or 680-41, as applicable. The proposal is intended to cover raceways which are not "conduit", and metal-covered cables. Type AC, MI, MC cables and EMT are not presently included.
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter's concerns are already addressed Section 680-43(D)(4) of Proposal 20-30a .
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #827)

20- 33 - (680-42(a)): Reject
SUBMITTER: Mike Theisen, St. Cloud, MN
COMMENT ON PROPOSAL NO: 20-30a
RECOMMENDATION: Relocate the phrase "where protected by a ground-fault circuit interrupter" from the end of section 680.42(A)(2) to the end of section 680.42(A), which would then apply the GFCI requirement to both "flexible conduit" and "cord- and plug-connections".
That section would then read:
(A) Flexible Connections. Listed packaged spa or hot tub equipment assemblies or self-contained spas or hot tubs utilizing a factory installed or assembled control panel or panelboard shall be permitted to use flexible connections, where protected by a ground-fault circuit interrupter, as covered in (1) and (2):
(1) Flexible Conduit. (no changes)
(2) Cord-and Plug-Connections. Cord and plug connections with a cord not longer than 4.6 m (15 ft) shall be permitted ~~where protected by a ground-fault circuit interrupter.~~
SUBSTANTIATION: The rewrite of this section seams to have lost the GFCI requirement for the flexible conduit connections, when the two wiring methods were separated. In the 1999 edition NEC; Section 680-40(a) indicated that GFCI protection is required for all flexible connections.
PANEL ACTION: Reject.
PANEL STATEMENT: Section 680-44 of Proposal 20-30a addresses the submitter's concerns.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1986)

20- 34 - (680-44(b)): Accept in Principle
SUBMITTER: Robert E. Wisenburg, Coates Heater Co., Inc./Rep. National Spa & Pool Institute
COMMENT ON PROPOSAL NO: 20-30a
RECOMMENDATION: Delete subdivided loads. Return to the wording of 680-42 in the 1999 National Electrical Code.
(B) An outlet that supplies a self-contained spa or hot tub, or a packaged spa or hot tub equipment assembly, shall be protected by a ground-fault circuit interrupter.

SUBSTANTIATION: Ground-Fault Circuit Protection of subdivided circuits in large pool and spa water heaters is without justification. Heaters of this size are not installed by homeowners but are installed, grounded and bonded by licensed electricians. Coates Heater Co., Inc. is not aware of any shock injury to a swimmer or spa/hot-tub user caused by one of its pool and spa water heaters. GFCI protection for these heaters will cause an estimated increase up to double the cost to the consumer. Some heaters could require as many as 12 individual GFCI units making installation cumbersome and prohibitively expensive; legislating the residential electric pool and spa heater out of business. A field assembled spa or hot-tub is different than a selfcontained or packaged unit. It is very similar to a swimming pool.
PANEL ACTION: Accept in Principle.
In proposal 20-30a Section 680-44(B) is to be deleted and renumber (C) to (B) and (D) to (C).
Add text in renumbered Section 680-44(B) to read as follows: "(B) Other Units. A field assembled spa or hot tub rated 3 phase or rated over 250 volts or with a heater load of more than 50 amperes shall not require the supply to be protected by a ground-fault circuit interrupter."
PANEL STATEMENT: It is the panel intention to retain the editorial rewrite of Proposal 20-30a without changing the requirements of the 1999 NEC.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1985)

20- 35 - (680-51): Hold
SUBMITTER: Robert E. Wisenburg, Coates Heater Co., Inc./Rep. National Spa & Pool Institute
COMMENT ON PROPOSAL NO: 20-30a
RECOMMENDATION: Revise text as follows:
(A) Ground-Fault Circuit Interrupters. Fountain equipment unless listed for operation at 15 volts or less and supplied by a transformer that complies with 680.25(A)(2), shall be protected by a ground-fault circuit interrupter except as noted.
Electric heaters used for freeze protection shall meet the requirements of 680.9 and 680.26(E).
SUBSTANTIATION: Electric swimming pool heaters are often used to provide freeze protection for fountains. These heaters may be as large as 100 kW or more and are most often three phase and may be 480 volt. GFCI protection is not available for these units and they should be treated like swimming pool heaters.
PANEL ACTION: Hold.
PANEL STATEMENT: The submitter has introduced new material and the panel has placed this comment on hold until the next code cycle in accordance with Regulation Governing Committee Projects Section 4-4.6.2.2
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #866)

20- 36 - (680-56(b)): Accept
SUBMITTER: Larry F. Miller, National Electrical Manufacturers Association (NEMA)
COMMENT ON PROPOSAL NO: 20-129a
RECOMMENDATION: The Panel should Accept n Principal in Part and revise 680-56(b) to read:
(b) Cord Type. Flexible cord immersed in or exposed to water shall be of a type for extra hard usage, as designated in Table 400-4, and shall be a listed type with a "W" suffix.
SUBSTANTIATION: The "W" suffix is the proper designator for water resistant cords. "Marked for the purpose" is ambiguous.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1987)

20- 37 - (680-62(a)(2)): Accept in Principle
SUBMITTER: Robert E. Wisenburg, Coates Heater Co., Inc./Rep. National Spa & Pool Institute
COMMENT ON PROPOSAL NO: 20-30a
RECOMMENDATION: Delete subdivided loads. Return to the wording of 680-62(a) in the 1999 National Electrical Code.
SUBSTANTIATION: Ground-Fault Circuit Protection of subdivided circuits in large pool and spa water heaters is without justification. Heaters of this size are not installed by homeowners but are installed, grounded and bonded by licensed electricians. Coates Heater Co., Inc. is not aware of any shock injury to a swimmer or spa/hot-tub user caused by one of its pool and spa water heaters. GFCI protection for these heaters will cause an estimated increase up to double the cost to the purchaser. Some heaters could require as many as 12 individual GFCI units making installation cumbersome and prohibitively expensive. A field assembled Therapeutic pool and tubs is different then a selfcontained or packaged unit. It is very similar to a swimming pool.
PANEL ACTION: Accept in Principle.
In proposal 20-30a delete Section 680-62(A)(2) and renumber Section 680-62(A)(3) to be Section 680- 62(A)(2).
Add text in renumbered Section 680-62(A)(2) to read as follows:"(2) Other Units. A therapeutic tub or hydrotherapeutic tank rated 3 phase or rated over 250 volts or with a heater load of more than 50 amperes shall not require the supply to be protected by a ground-fault circuit interrupter."
PANEL STATEMENT: It is the panel intention to retain the editorial rewrite of Proposal 20-30a without changing the requirements of the 1999 NEC.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

ARTICLE 690 — SOLAR PHOTOVOLTAIC SYSTEMS

(Log #979)

3- 85 - (Figure 690-1): Accept in Principle
Note: The Technical Correlating Committee directs that the first sentence of the Panel Action text be moved into the Panel Statement.
SUBMITTER: John C. Wiles, Jr., Southwest Tech. Development Inst.
COMMENT ON PROPOSAL NO: 3-144
RECOMMENDATION: In the Draft of Proposed NFPA 70, 2002 Edition, National Electrical Code, the diode symbols have not been revised per the original submission.
SUBSTANTIATION: None.
PANEL ACTION: Accept in Principle.
The comment does not comply with the requirement of Section 4-4.5(c) of the NFPA Regulations Governing Committee Projects by including the proposed revision. NFPA Staff should verify the symbol is correct by using the IEEE symbol for a diode. The symbol in the NEC Draft needs to be further revised to reflect the recognized symbol for a diode with the base triangle being as wide as the bar on the top.
PANEL STATEMENT: The panel action meets the intent of the submitter and clarifies the diagram symbol.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #33)

3- 86 - (690-2-System Voltage, Photovoltaic Systems Voltage (New)): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 3-149
RECOMMENDATION: The Technical Correlating Committee directs the Panel to revise the definition to remove the requirement in accordance with the NEC Style Manual. This action will be considered by the Panel as a Public Comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
Accept the direction of the Technical Correlating Committee and change the definition to read as follows:
Photovoltaic Systems Voltage. The direct current (dc) voltage of

any photovoltaic source or photovoltaic output circuit. For bipolar or multiwire installations, the photovoltaic systems voltage is the highest voltage between any two dc conductors.
PANEL STATEMENT: By removing the phrase "shall be" and replacing it with the word "is", the panel has removed the requirement aspect of the definition while retaining the definition in its entirety.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #1351)

3- 87 - (690-3): Accept in Principle
SUBMITTER: David P. Brown, Baltimore Gas and Electric Co/EEI
COMMENT ON PROPOSAL NO: 3-150
RECOMMENDATION: This proposal should be accepted in principle.
SUBSTANTIATION: The EEI Electric Light and Power Group is concerned about assuring the safety of utility workers when working on systems supplied by both utility and distributed generation sources. Also, output characteristics of distributed generation equipment must be controlled so as not to cause objectionable effects on the electric supply to other users.
The requirements of Article 705 should apply to installations of interconnected solar power production systems installed under the provisions of Article 690 and intended to be operated in parallel with the supply to the premises wiring. Specifically, the requirements of Section 705-12 Point of Connection, Section 705-14 Output Characteristics, Section 705-22 Disconnect Device, and Section 705-40 Loss of Primary Source need to be incorporated into Article 690, Part G.
Section 705-12 Point of Connection is necessary to ensure that interconnected power production systems are connected to the premises wiring system at the service rather than on a feeder or a branch circuit as permitted by 690-64(b).
Section 705-14 Output Characteristics is necessary to ensure that interconnected power production systems do not adversely affect the supply system by outputting power with improper wave shape, voltage, or frequency. This requirement is necessary to limit harmonic distortion on supply voltage for other customers served from the electric utility supply system.
Section 705-22 Disconnect Device is necessary to provide a method of disconnecting the interconnected power production system from the electric supply system when the solar photovoltaic system malfunctions or requires maintenance.
Section 705-40 Loss of Primary Source and Section 690-61 should be identical. Upon loss of primary source, all electric power production sources shall be automatically disconnected from all ungrounded conductors of the primary source and shall not be reconnected until the primary source is restored.
Considering the application of Article 705 rules within Article 690, provides for the safety of the premises wiring system, the utility supply system, and anyone working on those systems when photovoltaic systems are operated in parallel with the utility supply.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Comment 3-88.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #1866)

3- 88 - (690-3): Accept in Principle
SUBMITTER: Timothy M. Croushore, Allegheny Power
COMMENT ON PROPOSAL NO: 3-150
RECOMMENDATION: Code Making Panel 3 should accept Proposal 3-150.
SUBSTANTIATION: The panel should have accepted this proposal or included the language in Article 690 as indicated by Mr. Horman. The Article should govern the general requirements of Interconnected Electric Power Production Sources including solar and photovoltaic sources. I disagree with the panel statement. This was not a 6 cycle issue as indicated in the panel statement. These systems have not been installed without Article 705 for the last 15 years. And the requirements of Article 705 are for both rotary and inverter type technology.
As a former member of Code Making Panel 3, I must report that this was not an issue until the 1999 NEC. In fact, the Article 705 requirements were removed with very little technical substantiation for the change. Please review the old ROP page 1018, Proposal 3-213 and the old ROC page 695, Comment 3-173.
As indicated by Mr. Horman the requirements in Sections 705-12 - Point of Connection, 705-14 - Output Characteristics, 705-22 - Disconnect Device, and 705-40 - Loss of Primary Source are absolutely essential for safety for all interconnected parallel power production equipment regardless of the technology. These requirements apply to both rotating and inverter technology.
Based on this information, the NEC language should go back to the language of 1996 text or this proposal should be accepted.
PANEL ACTION: Accept in Principle.
Change the proposed text in Proposal 3-150 to read as follows:
690.3 Other Articles. Wherever the requirements of other articles of this Code and Article 690 differ, the requirements of Article 690 shall apply and, if the system is operated in parallel with a primary source(s) of electricity, the requirements in 705-14, 705-16, 705-32, and 705-43 shall apply.
PANEL STATEMENT: The text was revised to more adequately cover the interconnection between the photovoltaic power system and a utility supply, an on-site electric power source, or some other type of electric power source. By including compliance with the applicable requirements in Article 705, the PV system can remain under the installation requirements of Article 690 and, at the same time, comply with the interconnection requirements necessary for safety where dealing with a parallel power installation.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
COMMENT ON AFFIRMATIVE:
HORMAN: The EEI Utility Task Force commends the panel on their efforts to address these important performance and safety issues. The utilities still feel 705-12 should apply to solar photovoltaic systems when operated in parallel with a primary source of electricity. Having the interconnection for parallel operation with a utility delivery system located at the premises service disconnecting means would make these systems safer for utility workers.

(Log #2161)

3- 89 - (690-4(b)): Reject
SUBMITTER: Patrick B. Kiernan, Eco Electric, Inc.
COMMENT ON PROPOSAL NO: 3-151
RECOMMENDATION: This proposal should be accepted, to retain consistency with the rest of the NEC.
SUBSTANTIATION: Section 300-3(c)(1) allows conductors of different systems in the same enclosure, cable, or raceway. Solar photovoltacs are the only noted exception. What technical substantiation supports this exception?
PANEL ACTION: Reject.
PANEL STATEMENT: The primary reason for not allowing PV source and PV output circuits to be installed in the same raceway, cable tray, cable outlet box, junction box, or similar fitting with feeders or branch circuits of other systems is to keep these systems totally separate to ensure the two systems are not inadvertently interconnected. The PV system should not be installed with telecommunications circuits or radio frequency circuits as stated in the substantiation for the proposal since this would be in violation of Sections 800-52(a)(1)(c) and 820-52(a)(1)(b) unless a barrier or some other separator was used.
The use of a disconnecting means does not have anything to do with the mixing and possible interconnection of PV power system conductors and other power source wiring systems. The PV power systems are unique enough to require separation from other power source conductors. Section 90-3 permits Article 690 to modify the requirements in Chapters 1 through 4.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #2159)

3- 90 - (690-4(c)): Reject
SUBMITTER: Patrick B. Kiernan, Eco Electric, Inc.
COMMENT ON PROPOSAL NO: 3-153
RECOMMENDATION: Clarification of my Proposal 3-153.
SUBSTANTIATION: The intent of this proposal is to allow a single conduit run to serve two or more 48 volt nominal series strings ('daisy chaining'). If shock hazard during module replacement is a hazard, the modules can be covered with an opaque material (tarp) to de-energize them.

PANEL ACTION: Reject.
PANEL STATEMENT: This comment does not comply with Section 4-4.5(c) of the NFPA Regulations Governing Committee Projects to supply a recommendation of action. The substantiation does not clarify to the panel any reason to justify accepting the change proposed in Proposal 3-153.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #2165)

3- 91 - (690-4(c)): Accept
SUBMITTER: Patrick B. Kiernan, Eco Electric, Inc.
COMMENT ON PROPOSAL NO: 3-152
RECOMMENDATION: Reject this proposal as worded.
SUBSTANTIATION: The sentences to be deleted by this proposal define a source circuit for the purposes of module connection. If this proposal is approved, each 12V or 24V string will need to be run individually to a combiner box. Practice has demonstrated that 'daisy chaining' conduit runs is safe at these voltages.
PANEL ACTION: Accept.
PANEL STATEMENT:
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #2157)

3- 92 - (690-4(e)): Reject
SUBMITTER: Patrick B. Kiernan, Eco Electric, Inc.
COMMENT ON PROPOSAL NO: 3-154
RECOMMENDATION: This proposal addresses an important issue that reserves mention either in an article or FPN.
SUBSTANTIATION: The panel action on Proposal 3-190 provides helpful references. This proposal deserves similar attention.
PANEL ACTION: Reject.
PANEL STATEMENT: This comment does not comply with Section 4-4.5(c) of the NFPA Regulations Governing Committee Projects to supply a recommendation of action. The proposal was rejected since Section 110-26 does apply to this equipment, unless amended or modified by Article 690.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #980)

3- 93 - (690-6(d)): Reject
SUBMITTER: John C. Wiles, Jr., Southwest Tech. Development Inst.
COMMENT ON PROPOSAL NO: 3-165 and 3-168
RECOMMENDATION: This section should be removed from the 2002 Code.
SUBSTANTIATION: Some authorities having jurisdiction are interpreting this section as mandatory or are requiring that the permissive requirements be met. PV designers and installers are unable to find any listed equipment that is specifically identified for this application and they are using receptacle-type ground-fault circuit interrupters (GFCIs), circuit breaker GFCIs, and Equipment Protection Ground Fault Circuit Breakers in an attempt to meet the authorities having jurisdiction requirements. The use of this equipment creates a possibly hazardous and unsafe situation.

Research and testing by Sandia National Laboratories and The Southwest Technology Development Institute at New Mexico State University have established conclusively that these devices should not be used for this application. When improperly used as required by this application, these devices can and do create hazardous conditions as well as destroy themselves. I have provided an IEE paper that provides full details.

Section 690.6(D) should be removed from the 2002 NEC and not reentered into the Code until a class of devices can be developed that will safely meet this requirement. To keep the section in the code, will continue to cause confusion among the authorities having jurisdiction and PV designers and installers and endanger the public.

Note: Supporting material available for review upon request at NFPA headquarters.
PANEL ACTION: Reject.
PANEL STATEMENT: There is no technical justification given to delete this section and the reasons given revolve around the misuse of the terms ground-fault protection of equipment versus ground-fault circuit-interrupter protection. Ground-fault protection of equipment is designed to protect equipment from damaging line to ground faults. The IEEE paper submitted as technical substantiation appeared to mix both categories of GFP and GFCI devices and was not conclusive in its differentiation between the two very different systems.

There are also several different methods to provide ground-fault protection of equipment, with circuit breakers being just one of the methods. Differential transformers connected to relays and other similar equipment could provide protection for the system. The text is permissive, not mandatory, so the installer would not be required to supply GFP of equipment.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #981)

3- 94 - (690-9(c)): Accept
SUBMITTER: John C. Wiles, Jr., Southwest Tech. Development Inst.
COMMENT ON PROPOSAL NO: 3-177
RECOMMENDATION: In the first sentence of the second paragraph, the words "fuse-type" should be removed.
SUBSTANTIATION: Supplementary circuit breakers are also available in these incremental 1-amp sizes from 1 amp to 15 amps and are fully suitable for the use.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #2154)

3- 95 - (690-14(c)): Reject
SUBMITTER: Patrick B. Kiernan, Eco Electric, Inc.
COMMENT ON PROPOSAL NO: 3-182
RECOMMENDATION: Accept proposal 3-182 as submitted.
SUBSTANTIATION: The text proposed by panel action could require a PV disconnect where the conductors enter the structure and where the other system disconnects are grouped.
PANEL ACTION: Reject.
PANEL STATEMENT: The text in Section 690-14 in the 1999 NEC required compliance with Article 230 Part F. The panel action in Proposal 3-182 provided the required text to ensure that the disconnecting means for PV systems would be located as required for a standard service disconnecting means, except as modified by Article 690. The required disconnecting means provides a location where the building or structure could be disconnected from power during an emergency or other similar situation.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #2160)

3- 96 - (690-14(c)): Reject
SUBMITTER: Patrick B. Kiernan, Eco Electric, Inc.
COMMENT ON PROPOSAL NO: 3-182
RECOMMENDATION: Accept the original proposal as written.
SUBSTANTIATION: The adaptation of Part F of Article 230 is inappropriate. The photovoltaic disconnecting means should not be treated as service equipment. (See substantiation for Proposal 3-181.)
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter did not provide any technical substantiation that the photovoltaic system should not be required to comply with the added requirements similar to services, such as grouping, marking, location of the disconnect, maximum number of disconnects permitted in one location, and suitability of use. The substantiation in Proposal 3-181 did not provide technical substantiation either.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #982)

3- 97 - (690-31(b)): Accept
SUBMITTER: John C. Wiles, Jr., Southwest Tech. Development Inst.
COMMENT ON PROPOSAL NO: 3-184
RECOMMENDATION: In the last sentence, delete the words "USE, and USE-2".
SUBSTANTIATION: Like type SE cable, USE and USE-2 cables are listed as being inherently sunlight resistant and are not normally marked as such. It is difficult (special orders only) to get such cables marked sunlight resistant.
Note: Supporting material available for review upon request at NFPA headquarters.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #2023)

3- 98 - (690-41): Accept in Principle
Note: The Technical Correlating Committee understands that in the Panel Action the revised text of 695-41 begins with "For photovoltaic" and ends with "identified for the use." In addition, the reference to 690-41 Exception in Section 690-71(A) will appear as 690-41.
SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc.
COMMENT ON PROPOSAL NO: 3-187
RECOMMENDATION: Restore the listing requirement, as follows:
"... other listed methods that accomplish equivalent system protection ..."
SUBSTANTIATION: The statement in the proposal substantiation, unchallenged by the panel, that all equipment in the Code is required to be listed is news to this member of the NEC Committee. Every cycle we have robust discussions as to when a listing requirement is excessive in Code-Making Panel 9. Equipment used for this procedure, however, should be listed because the authority having jurisdiction won't be able to determine suitability in the field. The listing requirement proposed by this comment is comparable to 250.164(B)(3).
PANEL ACTION: Accept in Principle.
Add the phrase "and that utilize equipment listed and identified for the use" at the end of the recommended text in the proposal to read as follows:
For a photovoltaic power source, one conductor of a two-wire system with a system voltage over 50 volts and the reference (center tap) conductor of a bipolar system shall be solidly grounded or shall use other methods that accomplish equivalent system protection in accordance with 250-2(a) and that utilize equipment listed and identified for the use. The panel notes that there is a reference in 690-71 to an exception in 690-41. This exception has been integrated into the text of 690-41 and the reference to the exception should be deleted.
PANEL STATEMENT: Adding the phrase "and that utilize equipment listed and identified for the use" meets the intent of the comment submitter while making it clear that equivalent system protection must be listed and identified for that use.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
COMMENT ON AFFIRMATIVE:
KREINER: The recommended text in the Panel Action is complete at the end of the phrase "... that utilize equipment listed and identified for the use."
The last two sentences in the Panel Action should be a separate action to remove the reference to "Section 690-41, Exception" in Section 690-71(a) and change the reference in Section 690-71(a) to "690-41."

(Log #2158)

3- 99 - (690-43): Accept in Principle in Part
SUBMITTER: Patrick B. Kiernan, Eco Electric, Inc.
COMMENT ON PROPOSAL NO: 3-188
RECOMMENDATION: Clarification of my Proposal 3-188.
SUBSTANTIATION: Article 250-136(a) implies that metal framed photovoltaic modules secured to and in electrical contact with a grounded metal support rack, shall be considered effectively grounded. There is no mention of separate bonding jumpers between each piece of equipment.
PANEL ACTION: Accept in Principle in Part.
Change the existing text in the 1999 NEC by adding the specific references in Article 250 to better comply with the NEC Style Manual to read as follows:
690-43. Equipment Grounding
Exposed noncurrent-carrying metal parts of module frames, equipment, and conductor enclosures shall be grounded in accordance with Section 250-134 or 250-136(a) regardless of voltage.
Reject the remainder of the recommended text in the proposal.
PANEL STATEMENT: This comment does not comply with Section 4-4.5(c) of the NFPA Regulations Governing Committee Projects requiring comments to provide a recommendation. The panel changed the existing text in the 1999 NEC by adding the specific references in Article 250 to better comply with the NEC Style Manual and by making this change satisfied the submitter's concern. By adding the reference to 250-136(a), the last sentence in the recommended text in the proposal becomes redundant and not necessary.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #983)

3- 100 - (690-45): Accept
SUBMITTER: John C. Wiles, Jr., Southwest Tech. Development Inst.
COMMENT ON PROPOSAL NO: 3-189
RECOMMENDATION: Suggest the section be reworded as originally submitted.
SUBSTANTIATION: Part 1 - Delete the first sentence of Section 690-45. The following sentence should be deleted:
"The equipment grounding conductor shall not be smaller than the required size of the circuit conducts in systems where the available photovoltaic power source short-circuit current is less than twice the current rating of the overcurrent device."
1. Overcurrent devices (and conductor ampacity) in circuits carrying currents from PV modules are generally sized at least at 156 percent (1.25 x 1.25) of the circuit short-circuit available from the PV arrays. (690-8(a)(1) and 690-8(b). This guarantees that the overcurrent device will not open due to currents from the PV source that normally flow through that overcurrent device. The overcurrent device in a PV source circuit is required to be rated at least at 1.56 times the short-circuit current from that PV source (690-8). In other words, the short-circuit current is less than or equal to 0.64 times (1/1.56) the overcurrent device rating. This short-circuit current from the PV source will always be less than twice the rating of the overcurrent device for source circuit.
2. Overcurrent devices must be located in a circuit at the source of possible overcurrents. (240-3, 240-21)
a. From 1, above, the PV module or modules on a given PV source circuit cannot be a source of overcurrents for any overcurrent device on that same circuit and therefore overcurrent devices for these circuits are not located at the module end of the circuits.
b. Parrallel-connected modules, backfeed from batteries and backfeed from utility-interactive inverters are the sources of potential overcurrents that will open overcurrent devices under PV source fault conditions.
c. Items 2a and 2b dictate that the overcurrent device for PV source circuits be located at the end of the circuit (away from the PV modules) where these potential overcurrents originate.
3. Potential overcurrents from the sources are usually far in excess of the rating of the PV overcurrent device in question which is rated at least 1.56 Isc for the circuit.
a. Potential overcurrents from batteries are in the thousands of amps range, far higher that any short-circuit current possible from the PV module or PV array, but may be limited by any additional overcurrent device(s) between the battery and PV circuits.
b. Potential backfeed from utility interactive inverters will be limited to any overcurrent devices in either the ac or dc line to the inverter but in general will be significantly higher than Isc of the PV circuit.
c. Potential backfeed currents from parallel-connected modules will increase at the rate of 1.25 Isc for each separate parallel connected circuit and even two parallel strings will provide 2.5 times the rated short-circuit current (Isc).
4. Because of the above considerations, the first sentence in Section 690-45 does not make sense and will be true in very, very few cases, if ever. The revised proposal will cover this case since it

requires that the equipment-grounding conductor always be as large as the circuit conductors except under special circumstances.

Part 2 Make the equipment-grounding conductors as large as the circuit conductors in PV source and output conductors.

1. In Part 1, we have established that overcurrent devices in PV circuits are located, not at the PV modules, but at the other end of the circuit, some distance away.

2. Now consider a ground-fault on the PV side of the overcurrent device such as the positive module conductor of the PV module coming into contact with the grounded PV array frame. This is Ground Fault A in Figure 1 and the fault currents are shown as straight arrows. The overcurrent device in the circuit will open if there are sufficient sources of backfeed current (shown as the wide based arrow). However, no matter whether the overcurrent device opens or not, the PV source will continue to feed energy into the fault as long as the sun shines. From Figure 1, we can see that the PV fault currents leave the positive terminal of the module, travel into the frame through the fault path, flow down the equipment grounding conductor to the negative conductor-to-ground bond, through the bond, and then back to the negative terminal of the module.

3. This fault current may be a continuous current at 1.25 Isc. To avoid hazards associated with overheating of the equipment-grounding conductor, it should be able to handle this current which requires that it be sized the same as the circuit conductors. This is why Underwriters Laboratories requires that recently-listed PV Source-Circuit Combiner Boxes have equipment grounding terminal provisions that can accept conductors as large as the largest circuit conductor.

4. The same argument applies to PV output circuits that are the combined output of PV source circuits. In this case, ground faults in the circuit between the Source Circuit Combiner Box (Ground Fault B) and the last overcurrent device (nearest the load) will cause circulating continuous currents (shown as wavy arrows) in the equipment-grounding conductor.

Part 3 The requirements dictated by Article 690-5 for ground-fault protection for PV systems mounted on the roofs of dwellings modify the basic requirement proposed above.

1. If the PV system meets the 690-5 requirements, then any ground-fault in the PV circuits will result in an interruption of the fault currents and the equipment-grounding conductor will not have to carry continuous fault currents. In these cases, the equipment-grounding conductors should be sized according to Section 250-122.

NOTE: Supporting Material is available for review at NFPA Headquarters.

PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #2155)

3- 101 - (690-47): Reject
SUBMITTER: Patrick B. Kiernan, Eco Electric, Inc.
COMMENT ON PROPOSAL NO: 3-190
RECOMMENDATION: I am requesting clarification.
SUBSTANTIATION: Is a grid tied photovoltaic system with multiple DC source circuits, no batteries, and an inverter considered DC, AC or both?

Is a stand alone photovoltaic system with batteries, inverter and AC and DC loads considered an AC system, DC system, or both?
PANEL ACTION: Reject.
PANEL STATEMENT: The comment was rejected since it did not comply with Section 4-4.5 of the NFPA Regulations Governing Committee Projects requiring the comment to provide a recommendation of action. The comment on proposals is not the proper format for asking for clarification on a particular issue within the Code. There are formal and informal interpretation request forms that may be filled out and submitted either to the panel or to NFPA Staff to provide answers to questions, such as the ones sent in with this comment.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #2156)

3- 102 - (690-56): Reject
SUBMITTER: Patrick B. Kiernan, Eco Electric, Inc.
COMMENT ON PROPOSAL NO: 3-194
RECOMMENDATION: Reject Proposal 3-194.
SUBSTANTIATION: This sounds like a reasonable idea to improve safety. But several issues need to be resolved before it is committed to code. For example, how large is the required plaque? Can the Authority Having Jurisdiction require it to be on your front door?
PANEL ACTION: Reject.
PANEL STATEMENT: The recommended text in the panel action for Proposal 3-194 places the responsibility on the authority having jurisdiction (AHJ) for determining the location of the plaque or directory. The purpose for having the AHJ determine the location of the plaque or directory is to allow it to placed at the location where emergency crews will be accessing the building, thus warning them that a separate power source is in the building or structure and providing information to them on disconnect locations and other pertinent information on the system.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #984)

3- 103 - (690-64(b)(5)): Reject
SUBMITTER: John C. Wiles, Jr., Southwest Tech. Development Inst.
COMMENT ON PROPOSAL NO: 3-195
RECOMMENDATION: This section should be deleted as originally submitted.
SUBSTANTIATION: Background. Some sort of disconnect and overcurrent device must be provided on the dedicated output circuit of a utility-interactive inverter where that circuit connects to the utility line to meet the requirements of Article 690 and other NEC requirements. While a fused disconnect may be used, it is far more common to use a circuit breaker to meet these requirements.

This section in Article 690 was placed in the code in the early days of PV systems to ensure proper operation of circuit breakers under all conditions of operation and fault interruption. The internal construction of some circuit breaker trip mechanisms and arc-suppression devices is designed so that the circuit breaker can meet listing standards only when interrupting fault currents flowing in a certain direction. Such circuit breakers have terminals marked "load" and "line" or may be marked "Not suitable for backfeeding" [UL Standard 489].

In the ac output circuit of a utility-interactive PV inverter, power flow through the final dedicated circuit-breaker contained in a service entrance panel is normally backward through the breaker at maximum current levels of 80 percent of the circuit breaker rating or less. These utility-interactive inverters are typically power-limited devices and cannot supply high surge currents such as those that might be available from a voltage-sourced, rotating ac generator. Under normal operation, opening and closing the breaker will subject it to currents that are no more than 80 percent of the breaker rating.

When a fault (line-to-ground or line-to-line) of sufficiently low impedance occurs in the ac output circuit of the utility-interactive inverter, two things occur. The inverter senses a loss of nominal utility voltage and starts to shut down due to its internal safety circuits. Current flows through the circuit breaker in the forward direction from the utility toward the fault, and those faults cause the breaker to trip in the normal manner. There can be no back feeding of fault currents through the circuit breaker.

In the case where the circuit breaker is a separate unit and not part of a service entrance panel, a fault between the breaker and the service entrance will only cause the inverter to shut down and the breaker will not even sense currents in excess of its rating.

To summarize: A circuit breaker, where used, as an overcurrent device in the output of a utility-interactive inverter operates in a normal manner and cannot be subjected to backfeed fault currents. This was not true in the early days of PV systems when this code section was added because utility-interactive inverters were neither listed nor identified for the use and could operate in island situations backfeeding the service entrance for long periods of time like voltage-sourced rotating generators.

This section is no longer needed in the code and causes confusion among PV designers and installers as well as authorities having jurisdiction.

PANEL ACTION: Reject.
PANEL STATEMENT: One of the reasons for requiring the identification of backfed breakers is to warn the operator/maintainer that the circuit breaker may be receiving energy as a result of being backfed from a source of power. It is a safety requirement for the maintainer more than it is a function of how and whether the device will operate in a fault situation. Section 110-22 requires identification of disconnecting means and Section 384-16(g) requires backfed circuit breakers to be secured in place.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #34)

3- 104 - (690-71(b)): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 3-195a
RECOMMENDATION: The Technical Correlating Committee directs the Panel to correlate the action on this Proposal with the action on Proposal 3-196. This action will be considered by the Panel as a Public Comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
The panel accepts the Technical Correlating Committee direction and directs that the panel action to Proposal 3-195a include the addition of the word "nominal" at the end of the first sentence in Section 690-71(b)(1).
PANEL STATEMENT: The panel accepted the Technical Correlating Committee direction and directed that the panel action to Proposal 3-195a include the addition of the word "nominal" at the end of the first sentence in Section 690-71(b)(1). Proposal 3-196 should have been accepted in principle with the text changed to indicate the first sentence was to be changed in the panel action for Proposal 3-195a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #985)

3- 105 - (690-71(b)(1)): Reject
SUBMITTER: John C. Wiles, Jr., Southwest Tech. Development Inst.
COMMENT ON PROPOSAL NO: 3-196
RECOMMENDATION: Suggest rewording:
(1) Operating Voltage. Storage batteries where used in dwellings and having series strings of cells shall have no more than twenty-four, 2-volt cells connected in series (48 volts, nominal).
SUBSTANTIATION: This suggested rewording removes the ambiguity as proposed and rephrases the section in a manner similar to the phrasing in other sections dealing with battery banks. See 690.71 (D), (E), (F), (G).
PANEL ACTION: Reject.
PANEL STATEMENT: The text as accepted in the panel action for Proposal 3-195a does not seem ambiguous and would allow different systems to be installed as long as the voltage does not exceed 50 volts nominal.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #35)

3- 106 - (690-71(d) (New)): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 3-197
RECOMMENDATION: The Technical Correlating Committee directs the Panel to revise the FPN to remove the statement of intent or to move the statement into the mandatory code text. This action will be considered by the Panel as a Public Comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
The panel accepts the direction of the Technical Correlating Committee and change the FPN into mandatory text and inserted as a final paragraph to the recommended text as follows:
This requirement shall not apply to any type of valve regulated lead-acid battery (VRLA) or any other types of sealed batteries that may require steel cases for proper operation.
PANEL STATEMENT: The panel converted the FPN into mandatory text to comply with the NEC Style Manual.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #986)

3- 107 - (690-71(g)): Accept in Principle
SUBMITTER: John C. Wiles, Jr., Southwest Tech. Development Inst.
COMMENT ON PROPOSAL NO: 3-199
RECOMMENDATION: Suggest rewording the first sentence by changing the word "grounds" to "grounded circuit conductor or conductors".
SUBSTANTIATION: The word "grounds" is confusing and may be interpreted as meaning all grounded conductors including the equipment-grounding conductors. There is no intent to ungrounded equipment grounding conductors, which is neither a safe nor easy operation in a grounded battery bank where metal racks and cases rest on a concrete floor.
PANEL ACTION: Accept in Principle.
Change the word "grounds" in the first sentence and the word "ground" in the second sentence to "grounded circuit conductor(s)" to read as follows:
(f) Battery Maintenance Disconnecting Means. Battery installations, where there are more than twenty four (24), 2-volt cells connected in series (48 volts nominal), shall have a disconnecting means, accessible only to qualified persons, that disconnects the grounded circuit conductor(s) in the battery electrical system for maintenance. This disconnecting means shall not disconnect the grounded circuit conductor(s) for the remainder of the photovoltaic electrical system. A non-load-break rated switch shall be permitted to be used as the disconnecting means.
PANEL STATEMENT: There were two locations within that section that needed clarification for the word "ground."
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #987)

3- 108 - (690-85): Accept
SUBMITTER: John C. Wiles, Jr., Southwest Tech. Development Inst.
COMMENT ON PROPOSAL NO: 3-205
RECOMMENDATION: In the sentence after Battery Circuits, add the words "or equalizing" between "charging" and "conditions".
SUBSTANTIATION: Although equalizing is a form of charging, equalizing is usually used as a separate term and in fact results in higher battery voltages than normal charging.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #988)

3- 109 - (690-85): Reject
SUBMITTER: John C. Wiles, Jr., Southwest Tech. Development Inst.
COMMENT ON PROPOSAL NO: 3-205
RECOMMENDATION: The proposed definitions Section 690.85 now creates two Definitions Sections in Article 690, 690.85 and 690.2.
Suggest that the two paragraphs, Battery Circuits and Photovoltaic Source Circuits be moved to Section 690.7 as 690.7(F), and 690.7(G).
SUBSTANTIATION: This removes the redundant Definitions Section. It also puts the voltage definitions in Section 690.7 where voltage is addressed.
Furthermore, these voltage definitions, apply to all PV systems having PV modules and/or batteries and may have implications in other than Part 1 of Article 690. It does not seem proper to restrict the definitions to Part 1 only.

PANEL ACTION: Reject.
PANEL STATEMENT: Since these definitions apply specifically to those installations that are over 600 volts, it is perfectly acceptable and, in fact, desirable to have them at the location where they will be used.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #1481)

3- 110 - (690 Part I):
Note: The Technical Correlating Committee directs that this Comment be reported as "Reject" since in the 2002 NEC, Part Numbers will be indicated by Roman Numerals.
SUBMITTER: Ivan DeWitt, Holland, MI
COMMENT ON PROPOSAL NO: 3-204
RECOMMENDATION: Change Part "I" to Part "J". (No other changes in heading)
SUBSTANTIATION: The letters I and O have been omitted as identification of the headings in the format of the articles of the NEC to eliminate any possible confusion with the numbers one and zero. Article 690, Part I is not consistent with this format and the style manual of the NEC.
Reference: Articles 250, 410, 424, 430 and 620 (1999 Edition)
Proposal 10-76 (240 Part I) May 2001 ROP.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #36)

3- 111 - (691 (New)): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 3-206
RECOMMENDATION: The Technical Correlating Committee advises that Article Scope statements are the responsibility of the Technical Correlating Committee. The Technical Correlating Committee directs that the second sentence of the proposed Scope be deleted and considered for inclusion in a definition.
The Technical Correlating Committee directs that a new title "Fuel Cell Systems" be used and the Article be renumbered as Article 692.
The Technical Correlating Committee further directs the panel to remove the term "nationally recognized testing laboratory" from 691-6 since this term is specific to OSHA approval and the definition of listing in Article 100 is sufficient to describe the requirements for a laboratory. The Technical Correlating Committee directs that the Panel review the proposed text to eliminate the references to complete Articles in 691-3, 691-10(b), 691-14, and 691-80, in accordance with the NEC Style Manual. This action will be considered by the Panel as a Public Comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
In 692-6 delete the phrase "by a nationally recognized testing laboratory".
Amend 692-3 to read:
692-3 Other Articles. Wherever the requirements of other articles of this Code and Article 692 differ, the requirements of Article 692 shall apply and, if the system is operated in parallel with a primary source(s) of electricity, the requirements in 705-14, 705-16, 705-32, and 705-43 shall apply.
In 692-10(b) change reference to "Article 240" to "240-3".
Revise the first sentence of Section 692-14 to read:
The provisions of Sections 225-31, and 225-33 through 225-40 shall apply to the fuel cell source disconnecting means.
In 692-80 delete the words "Article 490 and".
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #1352)

3- 112 - (691 (New)): Accept
SUBMITTER: David P. Brown, Baltimore Gas and Electric Co/EEI
COMMENT ON PROPOSAL NO: 3-206
RECOMMENDATION: Accept in principle new Article 691 "Fuel Cells" as rewritten by the Panel.
SUBSTANTIATION: The EEI Electric Light and Power Group is concerned about assuring the safety of utility workers when working on systems supplied by both utility and distributed generation sources. We are also concerned that output characteristics of distributed generation equipment, if not properly controlled, may cause objectionable effects on the electric supply to other users.
The requirements of Article 705 should apply to installations of interconnected fuel cell production systems installed under the provisions of Article 691, and intended to be operated in parallel with the supply to the premises wiring.
PANEL ACTION: Accept.
PANEL STATEMENT: See panel action on Comment 3-111.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #2345)

3- 113 - (691-3): Reject
SUBMITTER: Kenneth Krastins, Plug Power, Inc.
COMMENT ON PROPOSAL NO: 3-206
RECOMMENDATION: Add the words "one or more" after the words "Fuel cell systems are ~~typically~~ packaged in..." and add the following to the end of 691-3: "Other external connections, such as a deionized water source may also be included."
SUBSTANTIATION: PEM fuel cells systems typically need deionized water. It is not necessary, and not appropriate, that the deionization system be housed inside the fuel system enclosures.
PANEL ACTION: Reject.
PANEL STATEMENT: The proposed text is not necessary based on the action of the Technical Correlating Committee in Comment 3-111.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #2347)

3- 114 - (691-4): Accept in Principle
SUBMITTER: Kenneth Krastins, Plug Power, Inc.
COMMENT ON PROPOSAL NO: 3-206
RECOMMENDATION: In the second sentence under "Output Circuit" add the words "or serial" after the word "paralleled".
SUBSTANTIATION: Fuel cells can be connected in parallel or serially depending upon the overall voltage and output configuration that's desired.
PANEL ACTION: Accept in Principle.
In Section 692-2, change the definition of "output circuit" to read: The conductors used to connect the fuel cell system to its electrical point of delivery. In the case of sites that have series- or parallel-connected multiple units, the term output circuit also refers to the conductors used to electrically interconnect the fuel cell system(s).
PANEL STATEMENT: The text was changed to enhance clarity.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #2346)

3- 115 - (691-6(b)): Accept in Part
SUBMITTER: Kenneth Krastins, Plug Power, Inc.
COMMENT ON PROPOSAL NO: 3-206
RECOMMENDATION: Revise the second and third sentence of 691-6(b) to read:
691-6. Listing Requirement. The fuel cell system shall be evaluated and listed (as defined in Article 100).
SUBSTANTIATION: The existing proposed wording is too vague. By referencing Article 100, the definition of listed is made more clear. Also, "nationally recognized testing laboratory" typically refers to government agencies like Sandia Labs rather than independent, third-party listing organizations, such as UL.
PANEL ACTION: Accept in Part.
The panel accepts the deletion of "nationally recognized testing laboratory", and rejects the addition of "(as defined in Article

100)". The wording shall read:
692.6 Listing Requirement. The fuel cell system shall be evaluated and listed for its intended application prior to installation.
PANEL STATEMENT: This section was revised in Comment 3-111 based on direction from the Technical Correlating Committee. The reference to Article 100 was deleted to eliminate a redundant reference.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

ARTICLE 695 — FIRE PUMPS

(Log #855)

15- 70 - (695-2, Fault Tolerant External Control Conductors): Accept
SUBMITTER: Larry F. Miller, National Electrical Manufacturers Association (NEMA)
COMMENT ON PROPOSAL NO: 15-78
RECOMMENDATION: The Panel should continue to accept the proposal in principal in part with the addition of the phrase "from all other internal or external means" so that it reads:
Fault Tolerant External Control Conductors: Those control conductors entering and/or leaving the fire pump control enclosure which if broken, disconnected, or shorted will not prevent the controller from starting the fire pump <u>from all other internal or external means</u> and may cause the controller to start the pump under these conditions.
SUBSTANTIATION: To make it clear that all OTHER starting means remain in effect; the emergency run mechanical control is always effective. Example: a remote deluge value circuit faults; remote push button starts (if provided), automatic pressure start, local push button start, and emergency mechanical start must remain effective.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 18
VOTE ON PANEL ACTION:
AFFIRMATIVE: 18

(Log #310)

15- 71 - (695-4(b)(1)): Accept
SUBMITTER: R. Schneider, Joslyn Clark Controls, Inc.
COMMENT ON PROPOSAL NO: 15-88
RECOMMENDATION: CMP 15 action should be changed from "Accept" to "Reject."
SUBSTANTIATION: a) This is extracted material which can only be revised by the NFPA 20 committee.
b) No such listed product exists. Instantaneous trip circuit breakers have never been used as a service because they do not comply with Article 230. Feeders under 695-6(b) need not be encased in concrete thus, in absence of overload protection, can become incendiary source.
c) Adj. trips makes compliance with 240-12 subject to tampering, difficult to design and inspect.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 18
VOTE ON PANEL ACTION:
AFFIRMATIVE: 18

(Log #854)

15- 72 - (695-4(b)(1)): Accept
SUBMITTER: Larry F. Miller, National Electrical Manufacturers Association (NEMA)
COMMENT ON PROPOSAL NO: 15-88
RECOMMENDATION: The panel should reject this proposal.
SUBSTANTIATION: 1. Instantaneous trip circuit breakers are component recognized, which means that they are incomplete in one or more features and that the evaluators must examine each device for completeness in its equipment and application. The major points on which instantaneous trip circuit breakers are incomplete is that (a) they have no overload protection and (b) they have no marked interrupting rating. There may be other points in the recognition report covering the device on which they would need to be evaluated.
2. Since the instantaneous trip circuit breaker does not have an interrupting rating it, cannot be evaluated for compliance with 110-9 and 110-10 without additional testing.
3. An instantaneous trip circuit breaker is permitted under 430-52(c)(3) and 430-109 only when it is a part of a listed combination motor controller. Product standard requirements for listing of the combustion motor controller cover coordinated overload protection, short circuit testing and other requirements for appropriate use of the instantaneous trip circuit breaker. This proposal does not provide for this additional evaluation except by the authority having jurisdiction.
4. Specific requirements for fire pump controllers devices appear in NFPA 20.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 18
VOTE ON PANEL ACTION:
AFFIRMATIVE: 18

(Log #1473)

15- 73 - (695-4(b)(1)): Accept
SUBMITTER: Vincent J. Saporita, Cooper Bussmann
COMMENT ON PROPOSAL NO: 15-88
RECOMMENDATION: This proposal should be rejected.
SUBSTANTIATION: Instantaneous trip circuit breakers are UL recognized devices, and as such, are not suitable for use as stand-alone products for field installation. These devices do not have a marked interrupting rating, which would make it extremely difficult to comply with Section 110-9.
The word "overcurrent" as used in the proposal is incorrect. See the definition in Article 100. An instantaneous trip circuit breaker provides short circuit protection only.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 18
VOTE ON PANEL ACTION:
AFFIRMATIVE: 18

(Log #1779)

15- 74 - (695-4(b)(1)): Accept
SUBMITTER: Jim Pauley, Square D Company
COMMENT ON PROPOSAL NO: 15-88
RECOMMENDATION: The panel should reconsider and reject the proposal.
SUBSTANTIATION: Although the proposal has a good intent, the use of an instantaneous trip circuit breaker in this application would be contrary to the listing of the breaker. Instantaneous trip breakers are permitted by Article 430 only when part of a combination motor controller. The reason for this restriction in Article 430 is that these breakers are component recognized (meaning they have limitations of use that must be considered in their final application in equipment) and they have no marked interrupting rating (because this rating is established based on the application in the equipment).
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 18
VOTE ON PANEL ACTION:
AFFIRMATIVE: 18

(Log #2144)

15- 75 - (695-4(b)(1)): Accept
SUBMITTER: James S. Nasby, Master Control Systems, Inc.
COMMENT ON PROPOSAL NO: 15-88
RECOMMENDATION: Reject the proposal.
SUBSTANTIATION: This proposal suggests dramatic changes (reduction) to long standing coordination ratings of a device in the so-called Critical Starting Path of an Electric Motor Driven Fire Pump.
It would reduce the extant Locked Rotor (typically 600 percent) thermal and hold (no trip) current ratings down to 125 percent or less. No minimums are given.
1) The proposal addresses an Overcurrent Device when used up stream of a Fire Pump Controller or Fire Pump Power Transfer Switch or a Combination Fire Pump Controller and Power Transfer Switch. Presently, when such a device is used, it must be "sized to carry indefinitely the sum of the locked-rotor current of the fire pump motor(s) and" other connected loads. This leaves

the overcurrent protection of the wiring in the downstream Fire Pump Controller. This protection is set to hold (not trip) 300 percent, as a minimum, of the motor FLA. The proposed device reduces the 600 percent requirement to as little as 125 percent of the motor FLA. This is a 480 percent reduction of the thermal and trip capability of the device in line with the power source. This would not be coordinated with the Fire Pump Controller mandated overcurrent protection (300 percent). It would move overcurrent responsibility outside of the Listed Fire Pump Controller and place it into undefined and unknown hands.

2) The subject paragraph is extract material. See Appendix A, 695-4 (NFPA-20-1999 paragraph 6-2.4.3 and 6-3.2.2).

3) When such an upstream device is allowed and used, it is almost always the Service Entrance device. I believe that most jurisdictions (electrical inspectors or utility installers) require the Service Entrance device to be a UL Listed Service Entrance device or a Listed Service Entrance rated device.

PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 18
VOTE ON PANEL ACTION:
AFFIRMATIVE: 18

(Log #2142)

15- 76 - (695-6): Reject
SUBMITTER: James S. Nasby, Master Control Systems, Inc.
COMMENT ON PROPOSAL NO: 15-93
RECOMMENDATION: Change the proposal to add a new sentence to 695-6(b) to read:

These fire pump supply conductors include wiring from the on-site stand-by generator to the alternate source side of a fire pump controller or fire pump power switch or a combination fire pump controller and power transfer switch.

SUBSTANTIATION: It was the impression of the submitter, me, that the 2 in. concrete (or one hour fire resistance rating) did <u>not</u> apply to the feeders from the stand-by (alternate, emergency) generator. Moreover, I believe that it isn't common practice at this time. Hence, the Code-Making Panel-15 Panel Statement in the Proposal 15-93 rejection states that 695-6(b) <u>is</u>, indeed, "intended to apply to feeder conductors from a generator".

If so, I don't think it's common knowledge and has not been common practice in the past. I don't know if this requirement (fire protection of the alternate side power wiring) has ever been subjected to comments or votes. It may be new business, which is why I have suggestrd the rewording of my proposals 15-93 and 15-96.

In any case, the above revised proposal attempts to add text to clearly state the Panel's stated intention.

The submitter still receives numerous questions from the field on the question of protection of the alternate source side wiring.

PANEL ACTION: Reject.
PANEL STATEMENT: The proposed new sentence is not necessary and does not provide any clarification. The existing text is clear in its intent.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 18
VOTE ON PANEL ACTION:
AFFIRMATIVE: 18

(Log #2143)

15- 77 - (695-6 Exception No. 2 (New)): Reject
SUBMITTER: James S. Nasby, Master Control Systems, Inc.
COMMENT ON PROPOSAL NO: 15-96
RECOMMENDATION: Accept in Principle the proposal by changing the proposed two proposed exceptions to one newly worded exception.

Add a second exception to 695-6(b) and number the existing one as Exception No. 2:

Exception No 2: Where the installation does not fall under the requirements of Section 700-9d(1), the conductors from a generator to the alternate source terminals of a fire pump controller or fire pump power transfer switch or a combination fire pump controller and power transfer switch need not meet the above one hour fire resistance when these conductors meet all of the following requirements: 1) they are protected by a branch circuit breaker complying with Section 240-3 (and 310-15); 2) they supply loads that are directly associated with the fire pump system; 3) they are protected to resist potential damage by fire, structural failure or operational accident; and 4) they are <u>not</u> routed through a building(s).

SUBSTANTIATION: The purpose is to clarify the protection required for the conductors from a generator to the alternate source terminals for a fire pump.

The submitter realized that this proposal and comment need to coordinate with the submitter's Proposal 15-93 and with Accepted Proposal 15-97 and with Sections 695-3(b)(1) and Section 700-9(d)(1).

Definitive language is needed on the 2 in. concrete requirements for engineering, installation and inspection personnel.

PANEL ACTION: Reject.
PANEL STATEMENT: The conductors need the necessary protection.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 18
VOTE ON PANEL ACTION:
AFFIRMATIVE: 18

(Log #2286)

15- 78 - (695-6(b)): Accept in Principle in Part
SUBMITTER: James M. Daly, BICC General
COMMENT ON PROPOSAL NO: 15-94
RECOMMENDATION: The Proposal should continue to be Accepted in Principle in Part.

The Panel Action should be revised as follows:

Fire pump supply conductors on the load side of the final disconnecting means and overcurrent device(s) permitted by Section 695-4(b) shall be kept entirely independent of all other wiring. They shall only supply loads that are directly associated with the fire pump system, and they shall be protected to resist potential damage by fire, structural failure, or operational accident. They shall be permitted to be routed through a building(s) using one of the following ~~conditions~~ <u>methods</u>:

(1) Be encased in a minimum 50 mm (2 in.) of concrete

(2) Be within an enclosed construction dedicated to the fire pump circuit(s) and having a minimum of a 1-hour fire resistive rating

(3) Be a listed cable or listed electrical circuit protection system with a minimum of 1-hour fire rating. <u>Flammable products of combustion shall not be permitted to enter enclosures containing arcing or sparking devices.</u>

Exception: The supply conductors located in the electrical equipment room where they originate and in the fire pump room shall not be required to have the minimum 1-hour fire separation or fire resistance rating, unless otherwise required by Section 700-9(d) of this Code.

SUBSTANTIATION: Changing "conditions" to "methods" is more consistent with the example in Section 2.1.5.3 of the NEC Style Manual and is more descriptive of the list following.

Insulated conductors in raceways and multiconductor cables may qualify as a fire resistive wiring method; however, some of the new polymeric insulations and jackets produce flammable gases during decomposition under fire conditions. The insulation, and jacket where used, is actually designed to burn with the resulting residue providing electrical insulation.

UL2196, Standards for Tests for Fire Resistive Labels, only measures the fire resistance properties and does not measure combustible smoke/gases generated during decomposition.

These flammable gases can travel through the cable and, even more readily, through a conduit and enter enclosures that contain arcing or sparking devices resulting in an explosion. Provisions must be made to prevent the entrance of these combustible gases into the enclosures.

The additional text is only required in method (3) since methods (1) and (2) prevent the conductor insulation from being exposed for at least 1 hour to temperatures that could cause combustion of the insulation. Concrete encasement of conduit containing insulated conductors or cable, gypsum board enclosures around conduit containing insulated conductors or cable, and any of the intumescent wraps used on cable or conduit, all function to keep the temperature low enough at the conductor insulation so it will not burn. Type MI cable when exposed directly to a fire will continue to operate, will not burn, decompose, or generate any combustible gases or smoke.

The proposed new wording also incorporates revisions made by the Panel in Proposals 15-91 and 15-94.

PANEL ACTION: Accept in Principle in Part.
The panel accepts the revision of "conditions" to "methods."
The panel rejects the new sentence in item (3).
In addition, in item (3) delete "listed cable or".

PANEL STATEMENT: With regard to the rejected sentence, the method by which flammable products of combustion are prevented from entering enclosures has not been described. More information about the quantities of flammable gases and the conductor's insulation that create these gases is needed.

The panel has deleted "listed cable or" because a standard does not yet exist for listed cable. The panel considered Dr. Hirschler's negative comment on Proposal 15-94.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 18

VOTE ON PANEL ACTION:

AFFIRMATIVE: 18

(Log #2146)

15- 79 - (695-6(b)3): Accept in Part

SUBMITTER: James Conrad, Rockbestos-Surprenant Cable Corp.

COMMENT ON PROPOSAL NO: 15-94

RECOMMENDATION: Accept proposal as first submitted in 15-94 ROP but revise text in item (3) as follows:

(3) Be a listed electrical circuit ~~protection~~ protective system with a minimum 1-hour fire rating where installed in accordance with the listing requirements.

SUBSTANTIATION: (The panel's statement is to be noted: "No listing presently exists for item 4"). I would like to offer valid technical substantiation that item (4) does indeed exist and why it should be included as a separate item.

There are presently 4 listed manufacturers with such cables found in the UL Building Material Directory under the heading of Fire Resistive Cables. The test methods UL uses to qualify fire resistive cables is either subject 1724 or 2196. Both 1724 and 2196 requires that the circuit integrity of the electrical cables be maintained during a period of fire exposure, and afterwards during exposure to a hose stream.

Although these cables are listed as "Fire Resistive Cables" it's important to have the wording "Be a listed cable to maintain circuit integrity..." as part of their description. The words "fires resistive" are used differently throughout the industry and can be confused with "fire resistant" which are used in the NEC. For example, both plenum and riser cables are described as "having adequate fire-resistant characteristics" but do not maintain circuit integrity.

I would also ask the Code Panel to support a companion comment to Code-Making Panel 1 to accept Proposal 1-113 ROP for the definition of "Circuit Integrity Cable".

The above revision to change the word "protection" to "protective" the way it is listed in the UL Building Material Directory and the added text is needed to make sure the installer is aware of the listing requirements.

PANEL ACTION: Accept in Part.

The panel accepts only the change from "protection" to "protective".

The panel rejects the remainder of the recommendation.

PANEL STATEMENT: Refer to the panel statement on Comment 15-78. Section 110.3(B) requires that listed products be installed and used according to the listing requirements.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 18

VOTE ON PANEL ACTION:

AFFIRMATIVE: 18

(Log #757)

15- 80 - (695-6(d), Exception): Reject

SUBMITTER: Lawrence A. Bey, Onan Corp.

COMMENT ON PROPOSAL NO: 15-97

RECOMMENDATION: Reject the proposal.

SUBSTANTIATION: Protection of the conductors has nothing to do with the capacity of the generator set. Conductors are sized and protected according to the load current, in this case a fire pump(s). With regard to short circuit protection of equipment, it is not necessary to repeat, using different words, what is already required by Article 110. The intent of this proposal was more appropriately addressed by the panel action on Proposal 15-87.

PANEL ACTION: Reject.

PANEL STATEMENT: The existing text discusses the protection of the conductors at the load of the motor. The conductors do not need to be overloaded without any protection to the point of unnecessary and premature failure.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 18

VOTE ON PANEL ACTION:

AFFIRMATIVE: 18

(Log #187)

15- 81 - (695-6(e)): Accept

SUBMITTER: Technical Correlating Committee National Electrical Code

COMMENT ON PROPOSAL NO: 15-98

RECOMMENDATION: It was the action of the Technical Correlating Committee that further consideration be given to the comments expressed in the voting. This action will be considered by the panel as a public comment.

SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.

PANEL ACTION: Accept.

PANEL STATEMENT: Refer to the panel action on Comment 15-82.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 18

VOTE ON PANEL ACTION:

AFFIRMATIVE: 16

NEGATIVE: 2

EXPLANATION OF NEGATIVE:

GLENN: See my explanation of negative vote on Comment 15-82.

HIRSCHLER: I oppose the action by the panel. This comment should have referred to action on accept of comment 15-82. See comments on 15-82.

(Log #805)

15- 82 - (695-6(e)): Reject

SUBMITTER: David H. Kendall, Carlon

COMMENT ON PROPOSAL NO: 15-98

RECOMMENDATION: This proposal to add Schedule 80 Rigid Nonmetallic Conduit should be accepted.

SUBSTANTIATION: It would have been very easy to test and compare Schedule 80 PVC conduit against Type MI Cable in the Fact Finding Report. That Fact Finding Report would have easily shown the superior physical characteristic of the heavy wall conduit compared to the cable. MI Cable is currently and has been an acceptable wiring method for fire pumps.

The Fact Finding Report utilized the comparison of Schedule of 80 PVC Conduit to a raceway (GRC) with similar superior physical properties. This Fact Finding report was not an attempt to show that Schedule 80 PVC was superior to GRC but to show that it would protect the wiring of a fire pump as well as those wiring methods currently allowed.

PANEL ACTION: Reject.

PANEL STATEMENT: The tests performed have shown the differences between aluminum RMC and RNMC under specific conditions. The proponents of this product have not shown sufficient substantiation to indicate RNMC to be equal or superior to wiring methods that are already permitted. Furthermore the submitter mistakenly refers to the fact finding report as comparing schedule 80 PVC to GRC when in fact it compared Schedule 80 PVC to aluminum RMC.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 18

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

NEGATIVE: 5

ABSTENTION: 1

EXPLANATION OF NEGATIVE:

AMOS: I'm voting against the panel action to reject this proposal. The UL fact-finding report submitted with the proposal provides the entire technical substantiation necessary to support the acceptance of schedule 80 rigid nonmetallic conduit. RMC has, according to the UL fact-finding report; to have appropriate performance for the application, in terms of impact resistance, crush resistance as well as flammability. Aside from being a UL listed product it also provides additional thermal protection to the conductors by preventing heat transmission.

JOHNSON: Tests show that Schedule 80 PVC conduit will protect fire pump wiring as well as currently allowed methods.

GLENN: I am voting against the panel action to reject this comment and the original proposal. The submitter provided adequate documentation with his original proposal in the form of a UL Fact-Finding Report that supports the acceptance of schedule

80 rigid nonmetallic conduit to be installed from the controllers to the pump motors. The panel is still hung up on the physical strength of this material. UL lists Schedule 80 RNMC as being resistant to physical damage and as being acceptable for electrical conduit installations. There is no sound reason for not including schedule 80 rigid nonmetallic conduit for this application.

HIRSCHLER: I oppose the action by the panel. This comment should have been accepted. I reproduce the comments I made at the proposal stage, and which the Technical Correlating Committee considered to be worthy of further consideration as a public comment, together with the comments of Peter Amos, Michael Glenn and John Kovacik).

"The UL fact finding report accompanying the proposal indicates that schedule 80 rigid nonmetallic conduit (RNMC) has appropriate performance for the application, in terms of impact resistance, crush resistance and flammability. The Fact-Finding report compared schedule 80 with rigid metallic conduit (i.e. aluminum conduit), and compares equivalent systems. The added use of grounding conductors in RNMC (not needed for the aluminum conduit) means that a larger outer diameter pipe is required to contain 3 circuit conductors of 1/0 AWG size; thus 40% conductor fill means a 1 1/2 inch diameter RMC conduit and a 2 inch diameter RNMC conduit. See details of results:

Impact test: for both RMC and RNMC the conduit protected the conductors from shorts when a 75 pound weight was dropped from up to a 6 ft height (with the larger diameter, compared to a listing requirement of 4 ft for RNMC) or when the weight was dropped from up to 1.5 ft (with the smaller diameter, compared to a listing requirement of 1.25 ft for RNMC).

Crush test: both RMC and RNMC the conduit protected the conductors from shorts when a crushing force was applied, with the crushing force required to cause a short being higher for the smaller size of RNMC than for that of RMC, while the opposite was true for the larger diameters, indicating comparable results..

Flammability: the smaller sizes of RMC and RNMC protected the conductors to exactly the same time, ca. 3 min. The flammability test on the larger diameter conduit was the single test for which there was a significant difference in circuit protection, with RMC being superior, but even there RNMC gave 5-12 min circuit integrity, while 4 of the 6 RMC tests gave 10-16 min circuit integrity, on exposure to a 60 kW gas burner flame.

Thus, schedule 80 rigid nonmetallic conduit is a UL-listed product, which has been shown in tests to be sufficiently resistant to physical damage for the application. It is also capable of preventing the heat transmission which occurs with metal conduit and which can destroy the conductors. The material used for schedule 80 rigid nonmetallic conduit is PVC, which has excellent fire performance, including low propensity for ignition and very low heat release once ignited. Moreover, supply conductors are required to be routed outside the buildings, or behind 2 inches of concrete or behind a fire rated wall, with a 1 hour rating."

The panel statement is another example of a decision made without considering the facts: it states that "The proponents of this product have not shown sufficient substantiation to indicate RNMC to be equal or superior to wiring methods that are already permitted", when the fact finding report (and my comment) both showed that RNMC is equivalent or superior in all aspects to the permitted RMC or aluminum conduit. Moreover, as the submitter explains, the RNMC has significantly superior physical characteristics to another permitted wiring method, namely MI cable. Also, as stated by both Michael Glenn and John Kovacik in their negative comments at the proposal stage, the question is not whether RNMC is equal or superior to GRC, since most other accepted wiring methods are also not equal or superior to GRC, but whether it is equal to at least one of the acceptable wiring methods, and the information presented shows that to be the case. Finally, as stated by Peter Amos in his negative comments at the proposal stage, "there is no reason to continue suppressing the use of a proven product, simply because it's new."

KOVACIK: I am voting against the panel action to reject proposal 15-98. As stated in my negative ballot for 15-98 in the ROP, the submitter has demonstrated that Schedule 80 RNMC is equivalent to at least one of the raceways presently allowed by 695-6(e). The submitter has provided adequate documentation to support acceptance of his proposal. The panel statement lacks adequate technical substantiation to justify rejection of the proposal.

EXPLANATION OF ABSTENTION:

BOYER: See my Explanation of Abstention on Comment 15-25.

(Log #806)

15- 83 - (695-14(e)): Reject

SUBMITTER: David H. Kendall, Carlon

COMMENT ON PROPOSAL NO: 15-111

RECOMMENDATION: This proposal to add Schedule 80 Rigid PVC Conduit should be accepted.

SUBSTANTIATION: It would have been very easy to test and compare Schedule 80 PVC conduit against Type MI Cable in the Fact Finding Report. That Fact Finding Report would of easily shown the superior physical characteristic of the heavy wall conduit compared to the cable. MI Cable is currently and has been an acceptable wiring method for fire pumps.

The Fact Finding Report utilized the comparison of Schedule of 80 PVC Conduit to a raceway (GRC) with similar superior physical properties. This Fact Finding report was not an attempt to show that Schedule 80 PVC was superior to GRC but to show that it would protect the wiring of a fire pump as well as those wiring methods currently allowed.

PANEL ACTION: Reject.

PANEL STATEMENT: The tests performed have shown the differences between aluminum RMC and RNMC under specific conditions. The proponents of this product have not shown sufficient substantiation to indicate RNMC to be equal or superior to wiring methods that are already permitted. Furthermore the submitter mistakenly refers to the fact finding report as comparing schedule 80 PVC to GRC when in fact it compared Schedule 80 PVC to aluminum RMC.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 18

VOTE ON PANEL ACTION:

AFFIRMATIVE: 13
NEGATIVE: 4
ABSTENTION: 1

EXPLANATION OF NEGATIVE:

AMOS: See my Explanation of Negative Vote on Comment 15-82.

HIRSCHLER: I oppose the action by the panel. This comment should have been accepted. See my comments on 15-82.

JOHNSON: See my Explanation of Negative Vote on Comment 15-82.

KOVACIK: See my Explanation of Negative Vote on Comment 15-82.

EXPLANATION OF ABSTENTION:

BOYER: See my Explanation of Abstention on Comment 15-25.

(Log #2145)

15- 84 - (695-14(f) (New)): Reject

SUBMITTER: James Conrad, Rockbestos-Surprenant Cable Corp.

COMMENT ON PROPOSAL NO: 15-114

RECOMMENDATION: Accept Proposal 15-114 ROP but revise text as follows:

(f) Generator Control Wiring Methods. Control conductors installed between the fire pump transfer Switch and the ~~Back up~~ standby generator supplying the fire pump during normal loss shall be kept entirely independent of all other wiring. The wiring shall be stranded wire only and be protected to resist potential damage by fire or structural failure. They shall be permitted to be routed through a building(s) using one of the following:

1) Be encased in a minimum of 50 mm (2 in.) of concrete

2) Be an electrical circuit protective system with a minimum 1-hour fire rating where installed in accordance with the listing requirements

3) Be a listed "CI" cable installed in a metal raceway

SUBSTANTIATION: The above format is easier to read and in Section 695-14(d) the wiring between the controller and a diesel engine are required to be stranded. The same conditions exist between the transfer switch and a standby generator thus requiring stranded conductors.

Type "CI" cable is currently being used in Article 760 to meet the survivability requirements for fire alarm cable. The "CI" marking is a suffix that is attached to a cable after it has passed the UL 2196, "Standard for Tests of Fire Resistive Cables". (See companion comment on 1-114 ROP for definition of "CI" cable).

An electrical circuit protective system is tested to the same UL fire test with the exception of the water exposure portion of the test. The electrical circuit protective system is subjected to a hose stream test and the "CI" cable is subjected to a fog nozzle spray.

Both wiring methods meet the requirements of survivability when exposed to fire, but the electrical circuit protective system must be installed with the systems listing requirements that can be very difficult to meet. On the other hand, the "CI" cable was tested as a stand-alone product thus not having the same restrictions as a

system listing. This alone would make meeting the survivability requirements much easier and much more affordable.
PANEL ACTION: Reject.
PANEL STATEMENT: The word "standby" is already part of the text.

There has not been any technical substantiation to require stranded wire or for the addition of item 3).

There has been no substantiation to delete some of the requirements of the wiring methods now allowed.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 18
VOTE ON PANEL ACTION:
AFFIRMATIVE: 18

ARTICLE 700 — EMERGENCY SYSTEMS

(Log #2398a)

15- 85 - (700(xx)): Reject
SUBMITTER: Jan Zemplenyi, Bel Red Amulatory Surgical Center
COMMENT ON PROPOSAL NO: 15-115
RECOMMENDATION: All facilities which provide sedation or general anesthesia shall be equipped with a back-up power mechanical generator or high-grade battery system with sufficient power and duration to assure the ability to conclude any operative procedure safely.
SUBSTANTIATION: The following is the contents of a letter I sent to Mr. Mayer Zimmerman of the Health Care Financing Administration on September 8, 2000:

It is clear to me that the amount of necessary kilowatts of back-up power depends on the size of the facility, and also on the time necessary for the completion of any procedures in progress when the black-out occurs. In our facility, we do not need large amounts of back-up power supplied for many hours in order to complete safely any of my operations. Our patient monitors are equipped with two-hour internal battery backup. Thus, in the first two hours of a blackout, we only need continuous power for the operating room lights and brief bursts of interrupted power for the electrocautery. Furthermore, the requirements are not different whether we use general or I.V. sedation anesthesia because the anesthesia machine does not use electrical power. The power system we have provides more than two hours of backup power so that I am not limited to only a two-hour duration. In my eleven years of performing office-based ambulatory surgery, I needed back-up power only once, and the Sola battery system we currently have worked out very well. We also test our battery system monthly. It functions instantaneously, and it provides us with the supply of clean current needed for our equipment.

In my recent research into the subject of backup power, I came across several battery systems including the Concorde batteries, which are used by the military and civil aviation industry for emergency power for their critical systems. Clearly, I think that my critical power requirements do not exceed those of F/A-18 or an F-117 Stealth fighter aircraft. In fact, as compared to a gasoline or diesel generator, and appropriately sized battery/inverter system provides a source of quiet, clean, reliable, and instantaneous power. Modern batteries are extremely reliable and maintenance free, whereas a generator needs to be "exercised and loaded" about once per month in order to be reliable. With a generator, there are other issues related to noise, storage and flammability of fuel. In addition, the quality of the electrical current generated can be deleterious to the electronic equipment since the waveform is not uniformly sinusoidal. In contrast, modern high-quality batteries and inverter systems provide clean sine wave, constant instantaneous current.

In summary, I feel that the requirement to retrofit my small ambulatory surgical center with a mechanical generator (prime mover) equipped with a transfer switch, is an expensive, burdensome requirement and a hardship. In my opinion, it will not add in any way to the safety of my surgical patients. I also know that, in general, certain modern battery/inverter systems can provide a superior alternative to generators, especially in instances when the total power requirements are relatively small and rather clearly defined. I strongly believe that further rational modification to the current rules is in order, especially within view of new developments in battery power technology.
PANEL ACTION: Reject.
PANEL STATEMENT: The requirements proposed do not belong in Article 700. These requirements of emergency power are appropriate in Article 517 and are already covered in NFPA 99.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19
VOTE ON PANEL ACTION:
AFFIRMATIVE: 18
NOT RETURNED: 1 Kakalec

(Log #758)

15- 86 - (700-1(b), FPN No. 3): Reject
SUBMITTER: Lawrence A. Bey, Onan Corp.
COMMENT ON PROPOSAL NO: 15-115
RECOMMENDATION: Delete ~~fire pumps~~ from FPN No. 3 of 700-1 add fire pumps to FPN of 701-2.
SUBSTANTIATION: If the committee statement is correct, to be consistent at least the fine print notes of the scope statements in Article 700 and 701 should be changed.
PANEL ACTION: Reject.
PANEL STATEMENT: Fire pumps need to remain in the FPN of 700.1 since it is a good example of the requirement of a needed emergency power system as opposed to a legally required standby system.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19
VOTE ON PANEL ACTION:
AFFIRMATIVE: 18
NOT RETURNED: 1 Kakalec
COMMENT ON AFFIRMATIVE:
KOVACIK: In further support of the panel statement, I would like to add that the text of FPN No. 3 of 700-1 is correctly worded in that emergency systems may provide power to a fire pump but are not required to.

(Log #1714)

15- 87 - (700-4): Accept in Principle
SUBMITTER: Dan Chisholm, Healthcare Circuit News
COMMENT ON PROPOSAL NO: 15-120
RECOMMENDATION: I urge the Panel to accept the original proposal without any changes
SUBSTANTIATION: The committee stated in their rejection that "... not all jurisdictions have adopted NFPA 110 and that not all requirements are applicable." I do not think this is true by virtue of the chart I have provided that shows NFPA 70 (Article 517), NFPA 99, NFPA 101 and the Joint Commission on Accreditation of Healthcare Organizations have directly or indirectly referred to NFPA 110 by reference for all maintenance procedures. In addition, all authorities having jurisdiction should be using one of these standards, even if by default, because these are the only existing standards that specifically address generator maintenance.

I am a little confused by the Panel's reaction to this proposal. In rejecting another of my proposals (15-116, Log #1705) it was stated that, "The proposed exception would circumvent the approval/listing process accepted universally." How can you approve a "universal" listing standard for the manufacture of generator sets, and yet give each authority having jurisdiction the ability to use any standard they choose for the maintenance of these same sets?

I urge you to vote to accept my original proposal, as this would eliminate a lot of confusion and "folk lore" presently being used for the maintenance of sets, which is the cause of the majority of EPS failures. Having been a generator set contractor for many years, I know this to be a fact, and not one generator maintenance contractor in the country would disagree. We have seen cases where NFPA 110 was not followed and people lost their lives.

Note: Supporting material available for review at NFPA Headquarters.
PANEL ACTION: Accept in Principle.
At the end of 700.4, add the following FPN: "For testing and maintenance procedures of Emergency Power Supply Systems (EPSSs), see NFPA 110, Standard for Emergency and Standby Power Systems".
PANEL STATEMENT: The panel agrees with the submitter that this information would be helpful in directing users to the appropriate standard for testing and maintenance. The panel feels this information is better served as a FPN.

In order to be enforceable, the particular code has to be adopted by the local jurisdiction.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19
VOTE ON PANEL ACTION:
AFFIRMATIVE: 18
NOT RETURNED: 1 Kakalec

(Log #188)

15- 88 - (700-6(a)): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 15-123
RECOMMENDATION: The Technical Correlating Committee directs that the Action on this Proposal be rewritten to comply with the NEC Style Manual to remove the statement of intent from the Fine Print Note. It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 4 for information. This action will be considered by the Panel as a Public Comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
Delete the FPN.
PANEL STATEMENT: Article 705 addresses the same information as the proposed FPN. **NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE:** 19
VOTE ON PANEL ACTION:
AFFIRMATIVE: 18
NOT RETURNED: 1 Kakalec

(Log #814)

15- 89 - (700-6(a)): Reject
SUBMITTER: Bruce Reynolds, State of Washington
COMMENT ON PROPOSAL NO: 15-123
RECOMMENDATION: Delete following text:
Transfer equipment and electric power production systems installed to permit operation in parallel with the normal source shall meet the requirements of Article 705.
SUBSTANTIATION: This text should appear only in Article 702. The transfer equipment for Emergency Systems Article 700 and Legally Required Standby Systems Article 701 needs to be kept simple and pure and dedicated for just these systems. As working in electrical plan review, we are seeing Emergency Systems becoming more and more complex. This has created several situations when maintenance personnel have brought entire electrical systems off line and could not figure out how to bring them back. In one case, this was a hospital with a co-generation system. Not only did the co-generation system go down but also the emergency system. This was while surgeries where taking place. Luckily ,no loss of life occurred. Let the Optional Standby Systems be used for all other uses and leave the transfer equipment for required systems remain dedicated for just these uses.
PANEL ACTION: Reject.
PANEL STATEMENT: There is no way to prevent unqualified personnel from removing electrical power from a facility. The statement needs to remain for the safety of the public and line workers.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19
VOTE ON PANEL ACTION:
AFFIRMATIVE: 18
NOT RETURNED: 1 Kakalec

(Log #2293)

15- 90 - (700-9(d)(1), Exception): Reject
SUBMITTER: Jim Milne, General Cable Pytrotenax
COMMENT ON PROPOSAL NO: 15-128
RECOMMENDATION: This Proposal should be Accepted in Principle.
Add the following Exception following Section 700-9(d)(1)(f). This Exception applies to 700-9(d)(1).
Exception: Where an internal combustion engine is used as the prime mover of a generator set in accordance with 700-12(b)(2), the feeder-circuit wiring shall meet one of the following conditions:
(a) Be installed within buildings that are fully protected by an approved automatic fire suppression system
(b) Be a listed electrical circuit protective system with a minimum 2-hour fire rating
(c) Be protected by a listed thermal barrier system for electrical system components with a minimum 2-hour fire rating
(d) Be protected by a fire-rated assembly listed to achieve a minimum fire rating of 2 hours
(e) Be embedded in not less than 125 mm (5 in.) of concrete
(f) Be a cable listed to maintain circuit integrity for not less than 2 hours when installed in accordance with the listing requirements
SUBSTANTIATION: NEC Section 700-12(b)(2) requires that "Where internal combustion engines are used as the prime mover, an on-site fuel supply shall be provided with an on-premises fuel supply sufficient for not less than 2 hours full-demand operation of the system. Where power is needed for the operation of the fuel transfer pumps to deliver fuel to a generator set day tank, this pump shall be connected to the emergency power system."
Since the fuel transfer pumps are required to be connected to the emergency power system, then the emergency power system must be capable of operating for 2 hours to comply with the requirement "for not less than 2 hours full-demand operation of the system." A 1 hour rating on the emergency system does not comply.
Addition of this exception will eliminate the conflict that currently exists between Sections 700-9(d)(1) and 700-12(b)(2).
The Exception shown above also incorporates revisions made by the Panel in Proposals 15-124a and 15-125.
The International Building Code, 403.10.1.1 also requires sufficient fuel to keep the generator operational for 2 hours.
NFPA 110, 5-2.1 and the International Building Code, 403.10.1 both require that the generator must be installed in a separate room and this "room shall have a minimum 2-hour fire rating".
The emergency system consists of hundreds or, in many cases, thousands of feet of wiring routed through a building, so the potential exposure to fire is much greater than that of the emergency generator. If the wiring is lost, the entire emergency system is rendered worthless.
Note: Supporting material is available for review at NFPA Headquarters.
PANEL ACTION: Reject.
PANEL STATEMENT: The substantiation of increasing the feeder circuit wiring to two hours has nothing to do with the requirement of the fuel supply of the prime mover when it is a generator.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19
VOTE ON PANEL ACTION:
AFFIRMATIVE: 18
NOT RETURNED: 1 Kakalec

(Log #1780)

15- 91 - (700-12(b)(6)and 701-11(b) (5)): Accept in Principle
SUBMITTER: Jim Pauley, Square D Company
COMMENT ON PROPOSAL NO: 15-135
RECOMMENDATION: The panel should reconsider and reject the proposal.
SUBSTANTIATION: As written, the new language would allow a disconnect for a power supply to a building to be located at the generator, but places no restrictions on where the generator is in relation to the building. The generator could be a significant distance away, blocked by obstructions between in and the building (like a fence) or otherwise located in a manner not obvious to occupants of the building. Although the proposer attempted to reduce perceived redundancy in disconnecting means, the language introduces significant safety issues for complete disconnection of power from a building.
Furthermore, the new language is not needed. Since CMP 4 has taken action in 225.31(A) to establish that a building disconnect can be on or within sight of a building, the permission to have a disconnect at/on a properly located generator is already handled.
Although there are special concerns for Article 700 and 701 systems, relaxing the building disconnecting rules and introducing other safety issues is not the direction that should be taken.
PANEL ACTION: Accept in Principle.
Revise the panel action of Proposal 15-135 to read as follows: "Where an outdoor housed generator set is equipped with a readily accessible disconnecting means located within sight of the building or structure supplied, an additional disconnecting means shall not be required where ungrounded conductors pass through the building or structure."
PANEL STATEMENT: This added verbiage will address the submitter's concern and still provide the safety needed.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19
VOTE ON PANEL ACTION:
AFFIRMATIVE: 18
NOT RETURNED: 1 Kakalec

COMMENT ON AFFIRMATIVE:
FLACH: I voted affirmative with the addition of these words: "Where an outdoor housed generator set is equipped with a readily accessible disconnecting means located within 50 feet and visible from the building or structure supplied, an additional disconnecting means is not required.
Substantiation: To clarify the intent.

(Log #853)

15- 92 - (700-25 Coordination): Accept
SUBMITTER: Larry F. Miller, National Electrical Manufacturers Association (NEMA)
COMMENT ON PROPOSAL NO: 15-136
RECOMMENDATION: The Panel should reject this proposal.
SUBSTANTIATION: The current fine print note in 700-25 was never intended to be enforced. It is design information and not a safety requirement. Section 90-1(a) states that the purpose of this code is the practical safeguarding of persons and property from hazards arising from the use of electricity. Selective coordination of the overcurrent device is not a hazard arising from the use of electricity, it is a design issue to be decided by the engineer.
The panel action on comment 15-122 during the 1999 NEC rejected a similar proposal. The submitter has not presented any new safety information or documentation that would support changing the fine print note to a mandatory requirement.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15
NEGATIVE: 3
NOT RETURNED: 1 Kakalec
EXPLANATION OF NEGATIVE:
FLACH: Proposal 15-136 should not be rejected. This is a safety issue, not a design consideration. The code requires emergency feeder wiring to be protected by a circuit protective system with a minimum 1-hour fire rating, or other protective systems, to enhance the reliability of the emergency system in some assembly occupancies or in buildings that exceed 75 feet in height. These requirements are found in Section 700-9(d).
To improve the reliability of these emergency feeders, coordinated protection of the branch circuit and feeder overcurrent devices should be mandatory. Therefore, I propose the following: New "700-26 Overcurrent Protection Coordination. Fuses and Circuit breakers for emergency circuit overcurrent protection shall be coordinated to ensure selective clearing of fault currents where installed in assembly occupancies of greater than 1000 persons or in buildings above 75 feet in height with any of the following occupancy classes: assembly, educational, residential, detention and correctional, business and mercantile."
(Note: Part of this comment is extracted from Section 700-9(d)).
JOHNSON: The substantiation in the comment is not correct. Coordination is a safety requirement. Without it a fire in an isolated area can cause a fault that will trip the main breaker on the emergency generator and put the entire building in darkness, handicapping evacuation. If coordination is not required, a shunt excited generator can be used without series boost and a fault anywhere in the system will cause the generator voltage to collapse. The generator is not damaged but the building does not have emergency power. Every effort should be made to isolate faulted circuits and keep emergency power on to essential loads. The panel has done exactly the same thing they did in 1997, reversed their position without thinking through the importance of maintaining emergency power as long as possible. They give no reason for changing their position.
KLEIN: 1. I agree with the submitter of Proposal 15-36. Selective coordination of overcurrent devices should be a mandatory code requirement.
2. This issue is related to practical safeguarding more than it is related to design.

(Log #1788)

15- 93 - (700-25): Accept
SUBMITTER: Alan Manche, Square D Co.
COMMENT ON PROPOSAL NO: 15-136
RECOMMENDATION: The panel should reconsider and reject this proposal.
SUBSTANTIATION: The FPN should not be changed to a mandatory requirement. During the 1999 NEC cycle, the panel rejected proposal 15-122, which is nearly identical to this proposal. No further safety concerns are provided in the substantiation only a "customer expectation" concern.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16
NEGATIVE: 2
NOT RETURNED: 1 Kakalec
EXPLANATION OF NEGATIVE:
FLACH: I vote to reject the panel action. See my Explanation of negative vote on Comment 15-92.
JOHNSON: See my Explanation of Negative Vote on Comment 15-92.
COMMENT ON AFFIRMATIVE:
KOVACIK: Although I am voting to support the panel action, I do not agree with the submitter's comment in the substantiation that Proposal 15-136 is nearly identical to rejected Proposal 15-122. Proposal 15-122 was a recommendation to add a requirement for load calculation to 700-5(a). This was considered unnecessary and redundant since this requirement is already located in Chapter 2. Proposal 15-136 recommended that current code text that is informative be changed to mandatory.

(Log #1787)

15- 94 - (700-26): Reject
SUBMITTER: Alan Manche, Square D Co.
COMMENT ON PROPOSAL NO: 15-136
RECOMMENDATION: Revise the panel action in the ROP as follows:
700-26 Coordination. Fuses and circuit breakers for emergency circuit overcurrent protection shall be coordinated to selectively clear fault currents, <u>including ground-faults.</u>
SUBSTANTIATION: I have another comment requesting the original proposal be rejected because this is a design consideration, which I believe is the proper course of action. However, if the panel disagrees and believes there is an electrical safety implication then this comment should be accepted to ensure that all fault conditions are covered.
The submitter's concern of a "built-in blackout" or "insignificant short in the branch circuit" is not addressed by this proposal. A ground-fault is a more likely occurrence than the selective coordination concern of the overcurrent devices. Therefore, if the panel insists this is a safety concern then selective coordination of ground-fault protection must also be required and the panel action would need to be revised to read:
"Without this revision the panel will have added a selectivity requirement and not obtained selectivity under the most likely fault occurrence."
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter's concerns have been resolved by panel action on Comment 15-93.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16
NEGATIVE: 2
NOT RETURNED: 1 Kakalec
EXPLANATION OF NEGATIVE:
FLACH: I vote against the panel action. See my Explanation of negative vote on Comment 15-92.
JOHNSON: The author is correct. If coordination is required it should also be necessary to coordinate ground fault protection if used. However, only ground fault indication is required and that only on systems over 1000 amperes, see 700-6(d).

ARTICLE 701 — LEGALLY REQUIRED STANDBY SYSTEMS

(Log #1715)

15- 95 - (701-5): Accept in Principle
SUBMITTER: Dan Chisholm, Healthcare Circuit News
COMMENT ON PROPOSAL NO: 15-137
RECOMMENDATION: I urge the panel to accept the original proposal without any changes
SUBSTANTIATION: The committee stated in their rejection that "... not all jurisdictions have adopted NFPA 110 and that not all requirements are applicable." I do not think this is true by virtue of the chart I have provided that shows NFPA 70 (Article 517), NFPA 99, NFPA 101 and the Joint Commission on Accreditation of Healthcare Organizations have directly or indirectly referred to NFPA 110 by reference for all maintenance procedures. In addition, all authorities having jurisdiction should be using one of these standards, even if by default, because these are the only existing standards that specifically address generator maintenance.
I am a little confused by the panel's reaction to this proposal. In rejecting another of my proposals (15-116, Log #1705) it was stated that, "The proposed exception would circumvent the approval/listing process accepted universally." How can you approve a "universal" listing standard for the manufacture of generator sets, and yet give each authority having jurisdiction the ability to use any standard they choose for the maintenance of these same sets?
I urge you to vote to accept my original proposal, as this would eliminate a lot of confusion and "folk lore" presently being used for the maintenance of sets, which is the cause of the majority of EPS failures. Having been a generator set contractor for many ,years I know this to be a fact, and not one generator maintenance contractor in the country would disagree. We have seen cases where NFPA 110 was not followed and people lost their lives.
Note: Supporting material available for review at NFPA Headquarters.
PANEL ACTION: Accept in Principle.
At the end of Section 701.5, add the following FPN: "For testing and maintenance procedures of Emergency Power Supply Systems (EPSSs), see NFPA 110, Standard for Emergency and Standby Power Systems".
PANEL STATEMENT: The panel agrees with the submitter that this information would be helpful in directing users to the appropriate standard for testing and maintenance. The panel feels this information is better served as a FPN.
In order to be enforceable, the particular code has to be adopted by the local jurisdiction.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19
VOTE ON PANEL ACTION:
AFFIRMATIVE: 18
NOT RETURNED: 1 Kakalec

(Log #189)

15- 96 - (701-7(a)): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 15-139
RECOMMENDATION: The Technical Correlating Committee directs that the Action on this Proposal be rewritten to comply with the NEC Style Manual to remove the statement of intent from the Fine Print Note. It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 4 for information. This action will be considered by the Panel as a Public Comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
Delete the FPN.
PANEL STATEMENT: Article 705 addresses the same information as the proposed FPN.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19
VOTE ON PANEL ACTION:
AFFIRMATIVE: 18
NOT RETURNED: 1 Kakalec

(Log #815)

15- 97 - (701-7(a)): Reject
SUBMITTER: Bruce Reynolds, State of Washington
COMMENT ON PROPOSAL NO: 15-139
RECOMMENDATION: Delete following text:
Transfer equipment and electric power production systems installed to permit operation in parallel with the normal source shall meet the requirements of Article 705.
SUBSTANTIATION: This text should appear only in Article 702. The transfer equipment for Emergency Systems Article 700 and Legally Required Standby Systems Article 701 needs to be kept simple and pure and dedicated for just these systems. As working in electrical plan review ,we are seeing Emergency Systems becoming more and more complex. This has created several situations when maintenance personnel have brought entire electrical systems off line and could not figure out how to bring them back. In one case, this was a hospital with a co-generation system. Not only did the co-generation system go down but also the emergency system. This was while surgeries where taking place. Luckily, no loss of life occurred. Let the Optional Standby Systems be used for all other uses and leave the transfer equipment for required systems remain dedicated for just these uses.
PANEL ACTION: Reject.
PANEL STATEMENT: There is no way to prevent unqualified personnel from removing electrical power from a facility. The statement needs to remain for the safety of the public and line workers.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19
VOTE ON PANEL ACTION:
AFFIRMATIVE: 18
NOT RETURNED: 1 Kakalec

ARTICLE 702 — OPTIONAL STANDBY SYSTEMS

(Log #1201)

15- 98 - (702-1): Reject
SUBMITTER: Neil A. Czarnecki, Reliance Controls Corporation
COMMENT ON PROPOSAL NO: 15-146
RECOMMENDATION: Do not change any of the wording in 702-1 from the text as it exists in the 1999 NEC. Specifically, do not delete the word "only", and do not add the words, "and those that include portable generators that are intended to be connected to permanent wiring."
SUBSTANTIATION: Article 702 was written with large permanently-installed systems in mind. As such, it is inappropriate to apply these same requirements, without consideration or review, to small manual systems for emergency backup. This amendment will result in wording so vague as to place 100,000 watt diesel powered backup generators, 5000 watt home emergency generators, 1000 watt hand-portable generators, and 250 watt UPS units in the same category. Clearly, this is unreasonable. We strongly urge code-making panel 15 to rewrite Article 702 to accommodate the wide disparity in "optional standby systems", in like fashion as the NEC addresses the disparity between 13,000 volt, 120 volt, and 12 volt circuits with Article 720 and others.
PANEL ACTION: Reject.
PANEL STATEMENT: Refer to the panel action and statement on Comments 15-99 and 15-109.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19
VOTE ON PANEL ACTION:
AFFIRMATIVE: 18
NOT RETURNED: 1 Kakalec

(Log #1202)

15- 99 - (702-1): Reject
SUBMITTER: Neil A. Czarnecki, Reliance Controls Corporation
COMMENT ON PROPOSAL NO: 15-147
RECOMMENDATION: Do not change any of the wording in 702-1 from the text as it exists in the 1999 NEC. Specifically, do not delete the word "only", and do not add the words, "and those that include portable generators that are intended to be connected to permanent wiring."
SUBSTANTIATION: Article 702 was written with large permanently-installed systems in mind. As such, it is inappropriate to apply these same requirements, without consideration or review, to small manual systems for emergency backup. This amendment will result in wording so vague as to place 100,000 watt diesel powered backup generators, 5000 watt home emergency generators, 1000 watt hand-portable generators, and 250 watt UPS units in the same category. Clearly, this is unreasonable. We strongly urge

code-making panel 15 to rewrite Article 702 to accommodate the wide disparity in "optional standby systems", in like fashion as the NEC addresses the disparity between 13,000 volt, 120 volt, and 12 volt circuits with Article 720 and others.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel disagrees with the submitter's substantiation. The scope of Article 702 does apply to application of small portable generators that supply premises wiring systems. Refer also to the panel action and statement on Comment 15-109.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19
VOTE ON PANEL ACTION:
AFFIRMATIVE: 18
NOT RETURNED: 1 Kakalec

(Log #1203)

15- 100 - (702-1): Reject
SUBMITTER: Neil A. Czarnecki, Reliance Controls Corporation
COMMENT ON PROPOSAL NO: 15-148
RECOMMENDATION: Do not change any of the wording in 702-1 from the text as it exists in the 1999 NEC.
SUBSTANTIATION: Article 702 was written with large permanently-installed systems in mind. As such, it is inappropriate to apply these same requirements, without consideration or review, to small manual systems for emergency backup. This amendment will result in wording so vague as to place 100,000 watt diesel powered backup generators, 5000 watt home emergency generators, 1000 watt hand-portable generators, and 250 watt UPS units in the same category. Clearly, this is unreasonable. We strongly urge code-making panel 15 to rewrite Article 702 to accommodate the wide disparity in "optional standby systems", in like fashion as the NEC addresses the disparity between 13,000 volt, 120 volt, and 12 volt circuits with Article 720 and others.
PANEL ACTION: Reject.
PANEL STATEMENT: Refer to the panel action and statement on Comments 15-99 and 15-109.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19
VOTE ON PANEL ACTION:
AFFIRMATIVE: 18
NOT RETURNED: 1 Kakalec

(Log #1204)

15- 101 - (702-1): Reject
SUBMITTER: Neil A. Czarnecki, Reliance Controls Corporation
COMMENT ON PROPOSAL NO: 15-149
RECOMMENDATION: Do not change any of the wording in 702-1 from the text as it exists in the 1999 NEC.
SUBSTANTIATION: Article 702 was written with large permanently-installed systems in mind. As such, it is inappropriate to apply these same requirements, without consideration or review, to small manual systems for emergency backup. This amendment will result in wording so vague as to place 100,000 watt diesel powered backup generators, 5000 watt home emergency generators, 1000 watt hand-portable generators, and 250 watt UPS units in the same category. Clearly, this is unreasonable. We strongly urge code-making panel 15 to rewrite Article 702 to accommodate the wide disparity in "optional standby systems", in like fashion as the NEC addresses the disparity between 13,000 volt, 120 volt, and 12 volt circuits with Article 720 and others.
PANEL ACTION: Reject.
PANEL STATEMENT: Refer to the panel action and statement on Comments 15-99 and 15-109.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19
VOTE ON PANEL ACTION:
AFFIRMATIVE: 18
NOT RETURNED: 1 Kakalec

(Log #1205)

15- 102 - (702-1): Reject
SUBMITTER: Neil A. Czarnecki, Reliance Controls Corporation
COMMENT ON PROPOSAL NO: 15-150
RECOMMENDATION: Do not change any of the wording in 702-1 from the text as it exists in the 1999 NEC.
SUBSTANTIATION: Article 702 was written with large permanently-installed systems in mind. As such, it is inappropriate to apply these same requirements, without consideration or review, to small manual systems for emergency backup. This amendment will result in wording so vague as to place 100,000 watt diesel powered backup generators, 5000 watt home emergency generators, 1000 watt hand-portable generators, and 250 watt UPS units in the same category. Clearly, this is unreasonable. We strongly urge code-making panel 15 to rewrite Article 702 to accommodate the wide disparity in "optional standby systems", in like fashion as the NEC addresses the disparity between 13,000 volt, 120 volt, and 12 volt circuits with Article 720 and others.
PANEL ACTION: Reject.
PANEL STATEMENT: Refer to the panel action and statement on Comments 15-99 and 15-109.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19
VOTE ON PANEL ACTION:
AFFIRMATIVE: 18
NOT RETURNED: 1 Kakalec

(Log #1206)

15- 103 - (702-1): Reject
SUBMITTER: Neil A. Czarnecki, Reliance Controls Corporation
COMMENT ON PROPOSAL NO: 15-151
RECOMMENDATION: Do not change any of the wording in 702-1 from the text as it exists in the 1999 NEC.
SUBSTANTIATION: Article 702 was written with large permanently-installed systems in mind. As such, it is inappropriate to apply these same requirements, without consideration or review, to small manual systems for emergency backup. This amendment will result in wording so vague as to place 100,000 watt diesel powered backup generators, 5000 watt home emergency generators, 1000 watt hand-portable generators, and 250 watt UPS units in the same category. Clearly, this is unreasonable. We strongly urge code-making panel 15 to rewrite Article 702 to accommodate the wide disparity in "optional standby systems", in like fashion as the NEC addresses the disparity between 13,000 volt, 120 volt, and 12 volt circuits with Article 720 and others.
PANEL ACTION: Reject.
PANEL STATEMENT: Refer to the panel action and statement on Comments 15-99 and 15-109.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19
VOTE ON PANEL ACTION:
AFFIRMATIVE: 18
NOT RETURNED: 1 Kakalec

(Log #1207)

15- 104 - (702-1): Reject
SUBMITTER: Neil A. Czarnecki, Reliance Controls Corporation
COMMENT ON PROPOSAL NO: 15-152
RECOMMENDATION: Do not change any of the wording in 702-1 from the text as it exists in the 1999 NEC.
SUBSTANTIATION: Article 702 was written with large permanently-installed systems in mind. As such, it is inappropriate to apply these same requirements, without consideration or review, to small manual systems for emergency backup. This amendment will result in wording so vague as to place 100,000 watt diesel powered backup generators, 5000 watt home emergency generators, 1000 watt hand-portable generators, and 250 watt UPS units in the same category. Clearly, this is unreasonable. We strongly urge code-making panel 15 to rewrite Article 702 to accommodate the wide disparity in "optional standby systems", in like fashion as the NEC addresses the disparity between 13,000 volt, 120 volt, and 12 volt circuits with Article 720 and others.
PANEL ACTION: Reject.
PANEL STATEMENT: Refer to the panel action and statement on Comments 15-99 and 15-109.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19
VOTE ON PANEL ACTION:
AFFIRMATIVE: 18
NOT RETURNED: 1 Kakalec

(Log #1208)

15- 105 - (702-1): Reject
SUBMITTER: Neil A. Czarnecki, Reliance Controls Corporation
COMMENT ON PROPOSAL NO: 15-153
RECOMMENDATION: This specific recommendation to rewrite Article 702 to accommodate small portable backup power systems should be favorably considered. It meets the spirit and intent of the NFPA regulations on content of proposals.
SUBSTANTIATION: Article 702 was written with large permanently-installed systems in mind. As such, it is inappropriate to apply these same requirements, without consideration or review, to small manual systems for emergency backup. This amendment

will result in wording so vague as to place 100,000 watt diesel powered backup generators, 5000 watt home emergency generators, 1000 watt hand-portable generators, and 250 watt UPS units in the same category. Clearly, this is unreasonable. We strongly urge CMP15 to rewrite Article 702 to accommodate the wide disparity in "optional standby systems", in like fashion as the NEC addresses the disparity between 13,000 volt, 120 volt, and 12 volt circuits with Article 720 and others.
PANEL ACTION: Reject.
PANEL STATEMENT: There is not any specific text submitted. See the panel statement on Proposal 15-153 in the NEC ROP.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19
VOTE ON PANEL ACTION:
AFFIRMATIVE: 18
NOT RETURNED: 1 Kakalec
COMMENT ON AFFIRMATIVE:
KOVACIK: The substantiation of Proposal 15-153 itemized several issues that need to be considered for portable power systems. The submitter is encouraged to provide for the next cycle of the NEC, a proposal with specific text addressing these issues.
KRAMER: Editorial: The reference should be to proposal 15-153 in the ROP.

(Log #CC1500)

15- 105a - (702-3): Accept
SUBMITTER: CMP 15
COMMENT ON PROPOSAL NO: 15-147
RECOMMENDATION: Add a second sentence to Section 702.3 to read as follows:
"A temporary connection between any portable alternate power supply and the permanently installed premises wiring shall comply with 305-2(c)."
SUBSTANTIATION: The panel agrees with the Technical Correlating Committee that there was a potential conflict between the actions of Proposal 15-147 and Proposals 3-119 and 3-120. The code language added to Section 702.3 resolves this potential conflict. In this way the new language proposed by 3-119 and 3-120 can remain and will not cause inconsistency in the NEC text." The panel understands that Article 305 will become Article 527 and the reference added in the panel action must change to reflect this.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19
VOTE ON PANEL ACTION:
AFFIRMATIVE: 18
NOT RETURNED: 1 Kakalec

(Log #2132)

15- 106 - (702-5): Reject
SUBMITTER: Bob Herzig, Bob Herzig and Associates, Inc.
COMMENT ON PROPOSAL NO: 15-155
RECOMMENDATION: Revise text to read as follows:
702-5. Capacity and Rating
"...Optional standby system equipment shall be suitable for the maximum available fault current at its terminals. It shall also have the proper overload rating per the conductor it is protecting. This protection can be provided by branch circuit or supplementary overcurrent protection devices. The user of the optional standby system shall be permitted to select the load connected to the system."
SUBSTANTIATION: The available fault current associated with 7500 Watt generators and below is in the 300-500 ampere range. This much lower fault condition than would be experienced by a utility provided source allows an OCP device with a much lower interrupting rating. The requirement of only allowing branch circuit OCP devices would unnecessarily increase the cost of these devices without providing added safety.
PANEL ACTION: Reject.
PANEL STATEMENT: Proper conductor protection is already covered in Article 240.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19
VOTE ON PANEL ACTION:
AFFIRMATIVE: 18
NOT RETURNED: 1 Kakalec

(Log #190)

15- 107 - (702-6): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 15-157
RECOMMENDATION: The Technical Correlating Committee directs that the Action on this Proposal be rewritten to comply with the NEC Style Manual to remove the statement of intent from the Fine Print Note. It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 4 for information. This action will be considered by the Panel as a Public Comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
Delete the FPN.
PANEL STATEMENT: Article 705 addresses the same information as the proposed FPN.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19
VOTE ON PANEL ACTION:
AFFIRMATIVE: 18
NOT RETURNED: 1 Kakalec

(Log #1013)

15- 108 - (702-6): Accept in Principle
SUBMITTER: Paul Schnackenberg, Gen/Tran Corporation
COMMENT ON PROPOSAL NO: 15-155
RECOMMENDATION: I would like to request that the current wording for Article 702-6 in the 1999 code remain as is with no changes or deletions. 702-6 was written primarily for portable generators where 7500 watts is commonly the maximum size used.
SUBSTANTIATION: It is generally accepted by EGSA (Electrical Generating Systems Association), which Gordon Johnson represents, that generators cannot possibly deliver a fault current exceeding 12 times the output of the generator. For example, if a 7500 watt generator is rated at 30 amps at 250 volts, then 12 X 30 = 360 amps of maximum potential fault current. With this formula in mind, these supplemental breakers would even be capable of handling generators up to 12,500 watts rated at 50 amps at 250 volts. The type of supplementary overload protectors that Gen/Tran has included in its manual transfer switches for 18 years have a short circuit rating of 1000 amps, which is almost three times the available current that the average generator can produce.
UL has mandated, and Gen/Tran has complied, that our label on the product state that the transfer switch be "suitable for generators capable of delivering not more than 1000A rms symmetrical at 250 VAC."
If the phrase "that the generator can deliver" was deleted from Section 702-6, then the homeowner or installer could apply the switch to larger generators, such as 25 kW output, which could deliver more than 1000 A rms.
Mr. Johnson's substantiation states that the equipment must be capable of interrupting the fault current of either the normal or standby source. Our supplemental protective devices are only in the circuit in the "generator" mode. The customer's branch circuit protectors protect the equipment in the "normal" utility mode.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Refer to the panel action and statement on Comment 15-109.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19
VOTE ON PANEL ACTION:
AFFIRMATIVE: 18
NOT RETURNED: 1 Kakalec
COMMENT ON AFFIRMATIVE:
FLACH: See my Comment on Affirmative on Comment 15-109.

(Log #1014)

15- 109 - (702-6): Accept in Principle
SUBMITTER: Paul Schnackenberg, Gen/Tran Corporation
COMMENT ON PROPOSAL NO: 15-156
RECOMMENDATION: I would like to request that the current wording for Section 702-6 in the 1999 code remain as is, with no changes or deletions. Section 702-6 was written primarily for generators where 7500 watts is commonly the maximum size used in residential applications.
SUBSTANTIATION: Each portion of the submission will be addressed individually. However, first, I question the motive of the submitter and the ultimate reason for submitting the

recommendation in the first place. As you may know, Square D Company is a competitor of Gen/Tran Corporation in the transfer switch market, and it is obvious that Square D has a vested interest in discrediting products that compete with their offering. If Square D is effective at its strategy of trying to eliminate Gen/Tran® products (which, mind you, have been the #1 brand of transfer switches for 18 years) from the market, then they will have succeeded at their mission. However, it is my mission to clarify the meaning of the code to interested parties so as to keep current wording for Section 702-6 in tact.

To provide you with some background, the original compact manual transfer switch design (developed by Gen/Tran Corporation) has been generally available since 1982. Today, two UL listed products that share the same or similar basic design are also available - and incorporate the same types of components in the same type of scheme or arrangement as our products. To date, there are approximately 500,000 Gen/Tran® manual transfer switches that contain roughly 4,000,000 supplemental overcurrent protective devices installed in thousands of homes and businesses throughout the US and Canada. And to date, no complaints about our products have been filed with UL, and we have not had any calls from lawyers or insurance companies claiming that our products were found to be unsafe. Since the company that the submitter represents as well as other large switchgear manufacturers do not make transfer switches with the some scheme as Gen/Tran® products, by cleverly getting the code changed so as to disallow our products Gen/Tran would disappear from the market and the buying public would be forced to purchase only those products offered by the large switchgear manufacturers. With our 18-year track record and outstanding brand reputation, I can safely say that Gen/Tran provides products that the public wants. And if this change were implemented, not only would Gen/Tran lose its market share, but the buying public would lose the products favored by more consumers, more electricians and more inspectors because of its ease of installation and ease of use.

Regarding 240-10. The submitter interprets this article to mean that branch circuit devices should be the only types of circuit protective devices used for all applications and should cover the entire NEC. I will remind you that UL asked me personally to author the proposal to allow supplemental breakers for optional standby systems for the 1993 code. I submitted the substantiation with test records and documentation to show that the wiring scheme incorporated in Gen/Tran® manual transfer switches worked for more than eight years (at the time). As a result, the code panel approved my proposal, and the current version of 702-6 was adopted. Section 702-3 states that unless modified by this Article (702) other articles shall apply. Section 702-6 in its present form modifies the application of other sections (namely 240-10 and 210-20), thus the wording for Section 702-6 must remain in tact as is.

Regarding 210-20 and Overcurrent protection, branch circuit conductors and equipment shall be protected by overcurrent protective devices that have the proper rating. There is no specific mention of full-size branch circuit protective devices, just that the over current protection be adequate for the application in which they are used. In the wiring scheme utilized in Gen/Tran® transfer switches, the branch circuit breakers in the customer's load center provide 10,000 AIC from utility faults. The portable generators generally used in residential applications (typically only up to 7500 watts continuous) cannot produce more than 1000A fault current. Therefore, I question why a 10,000 AIC-rated device should be used when a 1000 AIC-rated device will work just as well?

Included in our submittal for the 1993 code were tests from a UL certified lab. In these tests, the supplemental circuit breakers were subjected to 360 amps of fault current which is 12 times the maximum current of a 7500 watt generator. In our results, all supplemental breakers tripped, and were resettable and reusable afterward.

As a side note, the submitter states some criticism about UL 489 vs. UL 1077, however, I was under the impression that the NEC committee's mission is not to judge what UL standards contain, but rather to write safety into the NEC. With this in mind, and in consideration of our 18-year perfect safety track record, it is evident that the existing Section 702-6 adopted in 1993 adequately allows for the wiring scheme and supplemental protection incorporated in our Gen/Tran® manual transfer switches. Therefore, no changes, deletions or modifications are needed for 702-6 at this time.

PANEL ACTION: Accept in Principle.

Revise the current second paragraph of Section 702-6 of the 1999 code to read as follows:

"Transfer equipment, located on the load side of branch circuit protection, shall be permitted to contain supplementary overcurrent protection having an interrupting rating sufficient for the available fault current that the generator can deliver. The supplementary overcurrent protection devices shall be part of a listed transfer equipment."

PANEL STATEMENT: The panel action addresses the submitter's intent while addressing the safety concern by adding the requirement for listing the equipment.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19

VOTE ON PANEL ACTION:

AFFIRMATIVE: 18

NOT RETURNED: 1 Kakalec

COMMENT ON AFFIRMATIVE:

BOYER: NEMA understands that the language accepted by the Panel requires the supplemental protection be on the load side of a branch circuit overcurrent device regardless of the source of supply.

FLACH: I vote for the panel action with the addition of this sentence at the end of the panel action statement: "Generators connected to this transfer equipment shall not exceed 7.5 kVA 120/240 volts single-phase."

Substantiation: It is necessary to limit the generator size because of the 10W interrupting capacity of supplemental overcurrent protection devices.

(Log #1209)

15- 110 - (702-6): Accept in Principle

SUBMITTER: Neil A. Czarnecki, Reliance Controls Corporation

COMMENT ON PROPOSAL NO: 15-155

RECOMMENDATION: Do not change any of the wording in 702-6 from the text as it exists in the 1999 NEC.

SUBSTANTIATION: Any system should and must be capable of interrupting the fault current supplied to it. Placing any further requirements on interrupting performance is unnecessarily restrictive. As small portable generators cannot produce more than 350 amps of fault current, UL 1077 supplemental protectors rated at 100 AIC are uniquely and exactly suitable. Requiring a UL 489 device rated at 10,000 AIC does not serve to further enhance the public safety, but rather is nothing more than "specmanship".

PANEL ACTION: Accept in Principle.

PANEL STATEMENT: Refer to the panel action and statement on Comment 15-109.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19

VOTE ON PANEL ACTION:

AFFIRMATIVE: 18

NOT RETURNED: 1 Kakalec

COMMENT ON AFFIRMATIVE:

FLACH: See my Comment on Affirmative on Comment 15-109.

(Log #1210)

15- 111 - (702-6): Accept in Principle

SUBMITTER: Neil A. Czarnecki, Reliance Controls Corporation

COMMENT ON PROPOSAL NO: 15-156

RECOMMENDATION: Do not change any of the wording in 702-6 from the text as it exists in the 1999 NEC.

SUBSTANTIATION: Any system should and must be capable of interrupting the fault current supplied to it. Placing any further requirements on interrupting performance is unnecessarily restrictive. As small portable generators cannot produce more than 350 amps of fault current, UL 1077 supplemental protectors rated at 1000 AIC are uniquely and exactly suitable. Requiring a UL 489 device rated at 10,000 AIC does not serve to further enhance the public safety, but rather is nothing more than "specmanship".

The substantiation cited in this proposal is in dispute in the following areas:

a. Section 702-5 states, "Optional standby system equipment shall be suitable for the maximum available fault current at its terminals." As small portable generators (<10,000 watt) cannot produce more than 350 amps of fault current, UL 1077 supplemental protectors rated at 1000 AIC are suitable. Requiring a UL 489 device rated at 10,000 AIC does not serve to further enhance the public safety, but rather is nothing more than "specsmanship".

b. Section 702-6 does not supercede Section 240-10, since the utility-derived circuits are still protected by branch-circuit protectors suitable for the maximum available fault current of the utility mains.

c. Utilizing supplemental protectors to protect circuits fed by a standby generator does not compromise protection. Mr. Manche's opinion of the existence of a safety hazard is just that, an unverified and unsubstantiated opinion. The verified fact is that Reliance Controls Corporation has built and sold over 1/4 million transfer switches with over 2 million generator-supplied circuits protected

by supplemental protectors. In the 18 years the product has been on the market, none of the supplemental protectors have failed to perform properly. There is no evidence to indicate that changing to UL 489 devices will enhance the public safety.

d. Mr. Manche infers that, because there is no UL follow-on testing required of UL 1077 supplemental protectors, they are of lesser quality than UL 489 breakers, yet there exists no factual evidence to support this claim. To suggest that all follow-on tested protectors are of good quality and all non-follow-on tested protectors are of poor quality is a classic error in logic. There are certainly poor quality UL 489 protectors, as is evidenced by the substantial number of times UL suspends the listings of UL 489 manufacturers. Similarly, personal injury and product liability claims would certainly eliminate any manufacture of poor quality UL 1077 devices.

e. Mr. Manche states that, because UL 1077 supplemental protectors are not required to perform within predetermined overload trip characteristics, they "may not properly protect the branch circuit conductors from an overload condition". In fact, the published trip-time curves of supplemental protectors show that, up to the available fault current of the generator, they actually trip much faster (2 to 3 times faster) than UL 489 breakers (See chart I have provided). This would indicate the UL 1077 devices actually protect better than UL 489 devices in generator-supplied app;locations, and thus, changing to UL 489 devices would serve to degrade, not enhance, the public safety.

f. Mr. Manche states that UL 1077 devices have smaller spacings than UL 489, but fails to state why. In fact, the spacings required in UL 1077 correspond to the spacings required for all other 120/240 volt residential and light commercial equipment. The reason for larger spacings on UL 489 devices is to prevent restrikes occurring when the device attempts to interrupt high fault currents. Since the generator cannot produce high fault currents, such a requirement is unnecessary. The reason for larger spacings has nothing to do with "pollution" levels, as Mr. Manche states. If it did, light switches and outlets would require UL 489 spacings as well.

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

PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Refer to the panel action and statement on Comment 15-109.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19
VOTE ON PANEL ACTION:
AFFIRMATIVE: 18
NOT RETURNED: 1 Kakalec
COMMENT ON AFFIRMATIVE:
FLACH: See my Comment on Affirmative on Comment 15-109.

(Log #1211)

15- 112 - (702-6): Reject
SUBMITTER: Neil A. Czarnecki, Reliance Controls Corporation
COMMENT ON PROPOSAL NO: 15-157
RECOMMENDATION: Do not change any of the wording in 702-6 from the test as it exists in the 1999 NEC.
SUBSTANTIATION: It is inappropriate to add the underlined paragraph to 702-6. The effect of doing so is to create a "circular logic trap", wherein 702-6 would require a standby backup generator and manual transfer switch to comply with 705 and 705-40 would require manual transfer switches to be automatic. Since Article 705 is intended for electrical power systems which operate in conjunction with the utility mains (known as "synchronous parallel or cogeneration"), and since the majority of backup power installations cannot run in synchronous parallel, amending 702-6 to also require compliance to 705 is simply incorrect.
PANEL ACTION: Reject.
PANEL STATEMENT: The requirements of Article 705 are specified so as to prevent mishap in the event the electrical backup power is wired in parallel.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19
VOTE ON PANEL ACTION:
AFFIRMATIVE: 18
NOT RETURNED: 1 Kakalec

(Log #1670)

15- 113 - (702-6): Accept
SUBMITTER: Jeffrey F. Morin, MBNA New England
COMMENT ON PROPOSAL NO: 15-158
RECOMMENDATION: Delete "permanently installed".
The change will read:
"Transfer equipment shall be required for all standby systems subject to the provisions of this article and for which an electric-utility supply is either the normal or standby source."
SUBSTANTIATION: As stated in Mr. Hartwell's substantiation of Proposal Number 15-158, an ever-increasing number of consumers are installing Optional Standby Systems. These standby systems consist of those that are permanently installed in their entirety, including prime movers, and those that are arranged for a portable alternate power supply (ROP 15-147).

Article 90, Section 90.1 states that "The purpose of this code is the practical safeguarding of persons and property from the hazards arising from the use of electricity."

Optional Standby Systems, in which portable prime movers are used, generally are installed in residential situations by untrained, unqualified persons. None the less, the same arguments that Mr. Hartwell cites for putting utility line crews at risk is even more significant where the prime mover is a portable alternate power supply.

Removing the words "permanently installed", also recommended by Mr. Flach in his "comment on affirmative" of ROP 15-158 will help 702.6 meet the intent of Article 90.

See supporting Utility Company documentation.

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

PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19
VOTE ON PANEL ACTION:
AFFIRMATIVE: 18
NOT RETURNED: 1 Kakalec

(Log #1789)

15- 114 - (702-6): Reject
SUBMITTER: Alan Manche, Square D Co.
COMMENT ON PROPOSAL NO: 15-156
RECOMMENDATION: The panel should continute to accept this proposal.
SUBSTANTIATION: Understanding the panel is likely to receive comments on this proposal, a few points should be reemphasized from the original substantiation. Utilizing supplementary protection as the branch circuit protector compromises the protection of the branch circuit and introduces an unnecessary safety hazard.

UL 1077 outlines the requirements applicable to supplementary protectors intended for use as overcurrent, or over- or under-voltage protection within an appliance or other electrical equipment where branch circuit overcurrent protection is already provided. Conditions of Acceptability are placed on supplementary protectors that must be considered for each appliance in which they are installed. Keep in mind supplemental protectors evaluated to UL 1077 are not required to perform within predetermined overload trip characteristics, which means a supplementary protector may not properly protect the branch circuit conductors from an overload condition.

UL has also issued a bulletin on August 18, 2000 for UL 1008, Transfer Switches, that recognizes the concern addressed in this proposal:

"20B Supplementary Overcurrent Protectors (Added Section 20B effective (24 months after date of publication) 20B.1. When a supplementary overcurrent protector is employed, it shall be located on the load side of the branch circuit overcurrent protector device."

Supplemental protectors installed in a panel as the branch circuit device compromises the safety of the branch circuit conductors and panelboard and is a violation of Section 240-10.
PANEL ACTION: Reject.
PANEL STATEMENT: Refer to the panel action on statement on Comment 15-109.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19
VOTE ON PANEL ACTION:
AFFIRMATIVE: 18
NOT RETURNED: 1 Kakalec

(Log #2271)

15- 115 - (702-6): Accept in Principle
SUBMITTER: James Allison, Mechanical Products Co.
COMMENT ON PROPOSAL NO: 15-155 and 15-156
RECOMMENDATION: Make no changes to Section 702-6, Transfer Equipment.
SUBSTANTIATION: The reasoning noted in Proposal 15-156 and implied by Proposal 15-155 against the use of supplementary protectors (UL 1077) in transfer equipment is not totally valid as noted below:

1. Conditions of acceptability and follow-up testing - The fact that there are associated conditions of acceptability for supplementary protectors does not mean they must be eliminated from applications. A condition of acceptability for a supplemental protector in a transfer system could be an established maximum fault current rating to be matched with generator capacity. While there is no follow-up testing, these devices are subjected to follow-up validation of construction by the agencies. The field experience of Mechanical Products, covering millions of units, indicate there are virtually no problems with supplementary protectors in these applications.

2. Calibration - It is suggested by proposal 15-156 that a UL489 device meets a precise trip curve. The 489 requirements of 100% hold, 135% trip and a 200% time of 30 seconds maximum are not extraordinarily precise. In fact, the performance of many UL1077 approved products surpasses these limitations. Again, if these limits are deemed necessary, only UL1077 devices meeting them could be used, but this should not eliminate all such devices from consideration.

3. Supplementary protector short circuit ratings - The short circuit ratings for a UL1077 device do not have the same meaning as a circuit breaker's AIC (amps interrupt capacity) both in ability to clear the circuit and in operational performance following a fault. But fault currents from standby power devices only range up to a few hundred amps and could be evaluated under such conditions for these applications. Under the definition of Section 702-2 where as "life safety does not depend on the performance of the system", an open, inoperable protector after short circuit should be acceptable.

4. Spacings - In general, spacing requirements for 1077 devices are lower than 489 products. Greater spacings are required in 489 devices mainly for two reasons - A) tracking and other problems associated with the high interrupts they are required to meet and B) high line transients that they may be subjected to. Neither of these conditions are associated with standby power systems. And UL1077 devices have proven in application to meet performance requirements for this category of industrial equipment.

Conclusions: Supplementary protectors have a proven track record of being capable of handling the protective functions related to both transfer systems and the generators of standby systems provided they are tested under applicable overload and short circuit conditions. The proposed changes (15-155 and 15-156) to Section 702-6 to require the use of UL489 protective devices will substantially impact prices consumers will pay for these end products, while offering no actual improvement to enhance public safety.

PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Refer to the panel action and statement on Comment 15-109.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19
VOTE ON PANEL ACTION:
AFFIRMATIVE: 18
NOT RETURNED: 1 Kakalec
COMMENT ON AFFIRMATIVE:
FLACH: See my Comment on Affirmative on Comment 15-109.

(Log #1212)

15- 116 - (702-7): Reject
SUBMITTER: Neil A. Czarnecki, Reliance Controls Corporation
COMMENT ON PROPOSAL NO: 15-159
RECOMMENDATION: The specific recommendation should be favorably considered.
SUBSTANTIATION: The additional text serves to clarify a continuing area of confusion, that being the permanency of prime mover installations in Article 702 - covered systems. It is not redundant.
PANEL ACTION: Reject.
PANEL STATEMENT: Whether the prime mover is permanent or portable, the signals of Section 702.7 are applicable.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19
VOTE ON PANEL ACTION:
AFFIRMATIVE: 18
NOT RETURNED: 1 Kakalec

(Log #1213)

15- 117 - (702-10 (New)): Accept
SUBMITTER: Neil A. Czarnecki, Reliance Controls Corporation
COMMENT ON PROPOSAL NO: 15-164
RECOMMENDATION: Do not add this proposed new section.
SUBSTANTIATION: Required ground fault protection on a nonrequired power source poses engineering challenges not yet addressed by the industry. Placing such a requirement without the full understanding of its ramifications is to open the door to solutions which could be potentially more hazardous than the situation against which one is attempting to protect.
PANEL ACTION: Accept.
PANEL STATEMENT: The panel continues to reject Proposal 15-164. The panel action on Proposal 15-165 is not rejected.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19
VOTE ON PANEL ACTION:
AFFIRMATIVE: 18
NOT RETURNED: 1 Kakalec

(Log #1214)

15- 118 - (702-10 (New)): Accept
SUBMITTER: Neil A. Czarnecki, Reliance Controls Corporation
COMMENT ON PROPOSAL NO: 15-166
RECOMMENDATION: Do not add this proposed new section.
SUBSTANTIATION: Required ground fault protection on a nonrequired power source poses engineering challenges not yet addressed by the industry. Placing such a requirement without the full understanding of its ramifications is to open the door to solutions which could be potentially more hazardous than the situation against which one is attempting to protect.
PANEL ACTION: Accept.
PANEL STATEMENT: The panel continues to reject Proposal 15-166. The panel action on Proposal 15-165 is not rejected.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19
VOTE ON PANEL ACTION:
AFFIRMATIVE: 18
NOT RETURNED: 1 Kakalec

(Log #438)

15- 119 - (702-10(c)): Accept
SUBMITTER: Dan Leaf, Palmdale, CA
COMMENT ON PROPOSAL NO: 15-165
RECOMMENDATION: Accept in principle revise panel action as follows:
Delete (c).
SUBSTANTIATION: "Ungrounded generator" is unclear as to intent. Does it refer to a system ground (250-30(a)(2)) as in (A) or enclosure ground (250-30(b)) as in (A)? It appears the requirements of (A) and (B) do not allow for ungrounded generators.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17
NEGATIVE: 1
NOT RETURNED: 1 Kakalec
EXPLANATION OF NEGATIVE:
JOHNSON: Section 250-34 referenced in the proposed (c) clearly describes an "ungrounded generator" and its use. The reference should be maintained as Section 250-34 is obscure and might not be known to the user. This is FPN material but was placed in the text to meet style manual requirements.

ARTICLE 705 — INTERCONNECTED ELECTRICAL POWER PRODUCTION SOURCES

(Log #37)

15- 120 - (705-3): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 3-207
RECOMMENDATION: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 15 for action. This action will be considered by the Panel as a Public Comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
PANEL STATEMENT: The panel agrees with the action of CMP 3 on Proposal 3-207.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19
VOTE ON PANEL ACTION:
AFFIRMATIVE: 18
NOT RETURNED: 1 Kakalec

(Log #38)

15- 121 - (705-30(d)): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 3-208
RECOMMENDATION: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 15 for action. This action will be considered by the Panel as a Public Comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
PANEL STATEMENT: The panel agrees with the action of CMP 3 on Proposal 3-208.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19
VOTE ON PANEL ACTION:
AFFIRMATIVE: 18
NOT RETURNED: 1 Kakalec

ARTICLE 720 — CIRCUITS AND EQUIPMENT OPERATING AT LESS THAN 50 VOLTS

(Log #264)

16- 12 - (720-1, Exception): Accept
Note: After further consideration, the Technical Correlating Committee directs that Proposal 16-24 be accepted in lieu of the action on this Comment.
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 16-24
RECOMMENDATION: The Technical Correlating Committee advises that Article Scope statements are the responsibility of the Technical Correlating Committee and the Technical Correlating Committee rejects the Panel Action. The Technical Correlating Committee directs that the Panel review the text of the present Exception and the proposed second sentence for inclusion elsewhere in the Article.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
Add new Section 720.2. as follows:
720.2. Locations and Other Articles. Installations operating at less than 50 volts, direct current or alternating current as covered in Articles 411, 551, 650, 669, 690, 725, and 760 shall not be required to comply to this Section.
Renumber existing sections appropriately.
PANEL STATEMENT: New text has been added to comply with the direction of the Technical Correlating Committee.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22
VOTE ON PANEL ACTION:
AFFIRMATIVE: 22

ARTICLE 725 — CLASS I, CLASS 2, AND CLASS 3 REMOTE-CONTROL SIGNALING, AND POWER-LIMITED CIRCUITS

(Log #461)

16- 13 - (725): Accept
SUBMITTER: Technical Correlating Committee on Signaling Systems for the Protection of Life and Property
COMMENT ON PROPOSAL NO: 16-31
RECOMMENDATION: The Technical Correlating Committee on the National Fire Alarm Code recommends that Code Panel 16 reject this proposal.
SUBSTANTIATION: Refer to the companion comment on Proposal 16-43.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22
VOTE ON PANEL ACTION:
AFFIRMATIVE: 22

(Log #595)

16- 14 - (725 Title): Accept
SUBMITTER: Irving Mande, Edwards Systems Technology
COMMENT ON PROPOSAL NO: 16-31
RECOMMENDATION: Reject the proposal.
SUBSTANTIATION: In his substantiation, the submitter of this proposal states that the recommended changes to the title are intended to coordinate with the deletion of power-limited sources from Section 725-21 (Proposal 16-43). If my comment on 16-43 is accepted, this comment should also be accepted.
Also, changing "circuits" to "systems" is not appropriate because the vast majority of Class 1, 2 and 3 applications do not include a listed system.
The submitter of this proposal makes no claim that Class 1 Power-limited Circuits are unsafe or present any type of hazard. His only reason for recommending that these types of circuits be deleted is that they are not needed because no one uses them. For evidence, he claims that there are no listed products that meet the requirements of Section 725-21(a). That is not true.
The only requirement for a Class 1 power-limited circuit in Section 725-21(a) is that they be supplied from a source that has a rated output of not more than 30 volts and 1000 volt-amperes. Unlike the requirements in Section 725-41(a) for Class 2 and 3 power sources, which are required to be listed as either Class 2 or Class 3, there is no such requirement for Class 1 power-sources. As a result, UL does not list them as Class 1 and would respond to an inquiry by saying that they have no Class 1 products listed. However, they do have listed products that meet the requirements for Class 1 products.
The decision whether to install these products as Class 1 power sources is not made by the manufacturer; it is made by the installer. Deleting Class 1 power-limited circuits from the code will unnecessarily deny them the option of taking advantage of the benefits provided by using Class 1 wiring methods.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22
VOTE ON PANEL ACTION:
AFFIRMATIVE: 22

(Log #731)

16- 15 - (725, 760, 800, 820 and 830): Reject
SUBMITTER: Irving Mande, Edwards Systems Technology
COMMENT ON PROPOSAL NO: 16-29
RECOMMENDATION: Reconsider the panel action and accept this proposal.
SUBSTANTIATION: The panel statement indicates that the panel did not fully understand the intent of this proposal. The panel is correct in stating that additional marking is not needed to achieve circuit identification. The cables identified in the panel statement can be used to achieve that purpose. The purpose of this proposal is to achieve cable identification and not circuit identification.
Since it is the intent of this code to permit communication cables (CM) to be used as a substitute for CL2, CL3, FPL, CATV and BL cables in addition to its use for communications circuits, the proposed additional marking is needed to make installers and inspectors aware of the cable's permitted multiple uses.
PANEL ACTION: Reject.
PANEL STATEMENT: Changing the marking on communications cables without any changes in use requirements is a burdensome and unnecessary change.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22
VOTE ON PANEL ACTION:
AFFIRMATIVE: 22

(Log #1123)

16- 16 - (725): Reject
SUBMITTER: Paul Dobrowsky, Holley, NY
COMMENT ON PROPOSAL NO: 16-30
RECOMMENDATION: The proposal should be accepted.
SUBSTANTIATION: The definition of premises wiring uses the term "control wiring" and many other articles use the term "control circuit" to describe these types of circuits. Article 430 uses the term "motor control circuit" without the word remote. A control circuit at its connection point to a control transformer or Class 2 power supply inside an enclosure doesn't seem remote. The requirements applicable to control circuits do not change based on how far they are from device, equipment, or system being controlled. If the control circuit is an integral part of the equipment, it will be covered by the product standard. A corresponding proposal has been submitted to Code-Making Panel 1.
PANEL ACTION: Reject.

PANEL STATEMENT: The Panel 16 reaffirms its original reason for rejection as documented in the panel statement of Proposal 16-30.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22
VOTE ON PANEL ACTION:
AFFIRMATIVE: 22

(Log #1911)

16- 17 - (725): Accept
SUBMITTER: Michael I. Callanan, International Brotherhood of Electrical Workers
COMMENT ON PROPOSAL NO: 16-31
RECOMMENDATION: Reject this proposal.
SUBSTANTIATION: In his substantiation the submitter of this proposal states that this proposed change is intended to co-ordinate with the deletion of power limited power sources from section 725-21 (proposal 16-43). See sister comment to proposal 16-43.
This comment represents the official position of the International Brotherhood of Electrical Workers Codes & Standards Committee.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22
VOTE ON PANEL ACTION:
AFFIRMATIVE: 22

(Log #298)

16- 18 - (725-2 Abandoned Cable (New)): Accept in Principle
SUBMITTER: Gerald Lee Dorna, Belden Wire & Cable Co.
COMMENT ON PROPOSAL NO: 16-32
RECOMMENDATION: The definition of "Abandoned Cable" should be the same here as what we accepted in Proposal 16-273. It should be:
"Cable that is neither terminated at ~~both ends, at a connector or other~~ equipment, nor identified for future use with a tag."
This is the same wording we accepted for Proposal 16-273.
SUBSTANTIATION: The reason we took out the reference to connectors in Proposal 16-273 is because CATV cable usually has connectors attached. It was our concern that CATV cables would have connectors attached and then would not fall under the definition the panel had accepted in principal. If we make the definition the same as I have suggested above then it will make it irrelevant on whether the cable has connectors or not. I can foresee someone using the fact that the cable has a connector on it, therefore it does not fall under "abandoned cable" and does not need to be removed.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Refer to panel action and statement on Comment 16-21.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22
VOTE ON PANEL ACTION:
AFFIRMATIVE: 22

(Log #456)

16- 19 - (725-2, Abandoned Cable): Accept in Principle in Part
SUBMITTER: Technical Correlating Committee on Signaling Systems for the Protection of Life and Property
COMMENT ON PROPOSAL NO: 16-32
RECOMMENDATION: Revise the proposed definition of abandoned cable to read as follows:
"Cable that is neither terminated at equipment, nor identified for future use with a dated tag."
SUBSTANTIATION: The definition proposed for 820-2 by the Panel Action of Proposal 16-273 is clear and concise and should be used consistently in all Articles. This proposed definition has been modified in the above recommendation to add the word "dated" before the word "tag." The tag should be dated so the authority having jurisdiction can determine the date on which the cable was designated for future use. This will establish a means to allow the decision of abandonment to be re-evaluated periodically if the authority having jurisdiction so desires.
PANEL ACTION: Accept in Principle in Part.
PANEL STATEMENT: Refer to panel action and statement on Comment 16-21. Panel statement on Comment 16-246 includes the explanation for the rejected part.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22
VOTE ON PANEL ACTION:
AFFIRMATIVE: 22

(Log #1854)

16- 21 - (725-2): Accept in Principle
SUBMITTER: Robert W. Jensen, dbi-Telecommunications Infrastructure Design
COMMENT ON PROPOSAL NO: 16-32
RECOMMENDATION: New wording:
Abandoned Cable. Installed cable that is neither terminated at both ends at equipment, nor identified for future use with a tag.
SUBSTANTIATION: BICSI added the word installed to show that the cable needs to be installed and not in the installers truck. We retained "terminated at both ends" because fire alarm cable is typically terminated at both ends at equipment when it is in use (i.e., when not abandoned). We removed the term "connectors" since the cable is typically connected directly to equipment.
PANEL ACTION: Accept in Principle.
Revise the recommendation to read as follows:
"Abandoned Class 2, Class 3 and PLTC Cable. Installed Class 2, Class 3 and PLTC cable that is not terminated at equipment and not identified for future use with a tag."
PANEL STATEMENT: The revised text expresses the intended definition and complies with the Manual of Style.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22
VOTE ON PANEL ACTION:
AFFIRMATIVE: 22

(Log #1277)

16- 20 - (725-2- Abandoned Cable): Accept in Principle
SUBMITTER: Allen C. Weidman, The Society of the Plastics Industry, Inc.
COMMENT ON PROPOSAL NO: 16-32
RECOMMENDATION: We support the action of the Panel.
SUBSTANTIATION: None given.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Refer to panel action and statement on Comment 16-21.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21
ABSTENTION: 1
EXPLANATION OF ABSTENTION:
CAUDILL: The Society of the Plastics Industries could not reach a consensus position on this issue.

(Log #1572)

16- 22 - (725-2-Abandoned Cable): Accept in Principle
SUBMITTER: Wayne G. Carson, Carson Assoc. Inc.
COMMENT ON PROPOSAL NO: 16-32
RECOMMENDATION: Revise text to read as follows:
Abandoned Cable: Cable that is <u>not</u> ~~neither~~ terminated at both ends, ~~at a connector or other~~ <u>not connected to</u> equipment, <u>or not</u> ~~nor~~ identified for future use with a tag.
SUBSTANTIATION: The term "terminated at a connector" may result in cables being left in place as many cables come with connectors or the installer could add crimp connectors and leave the cables in place. The present language can be easily misunderstood: does the cable have to be terminated and tagged, or is it a choice?
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Refer to panel action and statement on Comment 16-21.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22
VOTE ON PANEL ACTION:
AFFIRMATIVE: 22

(Log #1743)

16- 23 - (725-2-Abandoned Cable): Accept in Principle
SUBMITTER: Francis W. Peri, Communications Design Corporation
COMMENT ON PROPOSAL NO: 16-32
RECOMMENDATION: Revise as follows:
Abandoned Cable. Installed cable that is neither terminated at both ends at equipment, nor identified for future use with a tag.
SUBSTANTIATION: The word "installed" shows that the cable needs to be installed and not in the installer's truck. The words "terminated at both ends" are needed because fire alarm cable is

typically terminated at both ends at equipment when it is in use (i.e., when not abandoned). The term "connectors" should be removed since the cable is typically connected directly to the active equipment.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Refer to the panel action and statement on Comment 16-21. The revised text clearly expresses the intended definition, correlates with similar definitions in other articles and complies with the Manual of Style.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22
VOTE ON PANEL ACTION:
AFFIRMATIVE: 22

(Log #266)

16- 24 - (725-3(a)): Accept in Principle
SUBMITTER: Stanley Kaufman, Lucent Technologies
COMMENT ON PROPOSAL NO: 16-80
RECOMMENDATION: Delete "not intended for future use."
SUBSTANTIATION: It is redundant to state "Abandoned cables not intended for future use...", since abandoned cables are defined as not being intended for future use.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Refer to panel action and statement on Comment 16-83.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22
VOTE ON PANEL ACTION:
AFFIRMATIVE: 22

(Log #193)

16- 25 - (725-3(b)): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 16-37
RECOMMENDATION: The Technical Correlating Committee directs that the action on this Proposal be rewritten to comply with the NEC Style Manual 3.3 to read as follows: "Section 300-22 for Class 1, Class 2, and Class 3 circuits installed in ducts, plenums or other space used for environmental air Type CL2P or CL3P cables shall be permitted for Class 2 and Class 3 circuits." This action will be considered by the Panel as a Public Comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22
VOTE ON PANEL ACTION:
AFFIRMATIVE: 22

(Log #1428)

16- 26 - (725-3(b)): Reject
SUBMITTER: Kari Barrett, American Chemistry Council
COMMENT ON PROPOSAL NO: 16-80
RECOMMENDATION: Delete the following text:
~~Abandoned cables not intended for future use shall not be permitted to remain.~~
SUBSTANTIATION: Removal of abandoned cables in these areas is a "housekeeping" issue. Whether or not to remove them should be the owner's decision and not be mandated by the NEC.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel reaffirms that removal of abandoned cables addresses a significant fire safety issue. The term "housekeeping" is not applicable to abandoned cables. Fire safety and cable installation are within the scope of the NEC.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22
VOTE ON PANEL ACTION:
AFFIRMATIVE: 22

(Log #1579)

16- 27 - (725-3(b)): Accept in Principle in Part
SUBMITTER: Wayne G. Carson, Carson Assoc. Inc.
COMMENT ON PROPOSAL NO: 16-80
RECOMMENDATION: Revise text to read as follows:
Spread of Fire or Products of Combustion. Installations in hollow spaces, vertical shafts, and ventilation or air-handling ducts shall be made so that the possible spread of fire or products of combustion will not be substantially increased. Openings around penetrations through fire resistance-rated walls, partitions, floors, or ceilings shall be firestopped using approved methods to maintain the fire resistance rating.

Abandoned cables not intended for future use shall not be permitted to remain.

FPN: Directories of electrical construction materials published by qualified testing laboratories contain many listing installation restrictions necessary to maintain the fire-resistive rating of assemblies where penetrations or openings are made.
SUBSTANTIATION: This definition under the section entitled "Spread of Fire or Products of Combustion" is not consistent throughout the Code. This comment uses language from ROP 16-250 [850-52(B)] to provide a consistent requirement throughout the code.

The same comment is being made for the following sections:
640-3A (ROP 16-1a)
645-5D6 (ROP 12-106)
645-5D6 (ROP 12-106)
760-3A (ROP 16-144)
770-3A (ROP 16-176)
820-3A (ROP 16-313)
820-52B (ROP 16-311)
830-3A (ROP 16-364)
830-58B (ROP 16-368)
PANEL ACTION: Accept in Principle in Part.
PANEL STATEMENT: The panel accepts in principle the statement regarding abandoned cables. Refer to panel action on Comment 16-83. This satisfies the submitter's concerns.

The current reference to 300-21 satisfies the balance of the comment, which is rejected. That portion of the comment repeats the text of 300-21.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22
VOTE ON PANEL ACTION:
AFFIRMATIVE: 22

(Log #194)

16- 28 - (725-5): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 16-38
RECOMMENDATION: It was the action of the Technical Correlating Committee that further consideration be given to the comments expressed in the voting of a similar Proposal 16-192. The Technical Correlating Committee directs that the action of this Proposal be revised to comply with the NEC Style Manual 3.2.1 relative to use of the unenforceable terms "practicable" and "impracticable". Also, cables above suspended ceilings are considered to be exposed and the wording approved for this Pproposal could be considered to conflict with the Action on Proposal 16-39. This action will be considered by the Panel as a Public Comment. It was also the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 3 for Comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
PANEL STATEMENT: Refer to the recommendation and substantiation on Comment 16-27a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22
VOTE ON PANEL ACTION:
AFFIRMATIVE: 22

(Log #702)

16- 29 - (725-5): Reject
SUBMITTER: Glenn W. Zieseniss, Crown Point, IN
COMMENT ON PROPOSAL NO: 16-38
RECOMMENDATION: Change the "Accept in Principle" to "Reject".
SUBSTANTIATION: I agree with Mr. Egesdal's and Mr. Speer's negative vote and comment on Proposal 16-192. This proposal is giving a "blanket okay for any type of ceiling tile to support the possible added weight of 3 cables of less than 1/2 in. in diameter on each ceiling tile. The proposal does not affirm that the ceiling tile industry was contacted of adding weight to lay on their product. This product is not part of the building structure, and is not designed to be suitable for supporting cables. I have seen ceiling tiles which look as if made of fiber glass insulation which has a finished surface on the exposed side of the ceiling. It is my belief that this ceiling tile would not accept additional weight upon it. I have contacted three ceiling tile companies or organizations on this proposal. They all suggested that their ceiling tiles are not to

support additional weight. I have provided copies of my e-mail contacts.

NOTE: Supporting Material is available at NFPA Headquarters.

PANEL ACTION: Reject.

PANEL STATEMENT: The recommendation of Comment 16-27a provides a reasonable, safe, and practical solution to placing a limited number of unsupported signaling and communications wires and cables in existing construction. The restrictions contained in Comment 16-27a limit both the number and size of wires and cables permitted on each ceiling panel, thereby controlling weight and accumulation so that cables can be easily moved aside to permit access. The submitter's concern about weight is addressed by decreasing the size of the cable to 1/4 inch and limiting the number of cables to three per each 10 ft x 10 ft area.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22

VOTE ON PANEL ACTION:

AFFIRMATIVE: 21

NEGATIVE: 1

EXPLANATION OF NEGATIVE:

SPEER: See my explanation of negative vote on Comment 16-27a.

(Log #856)

16- 30 - (725-5): Accept in Principle in Part

SUBMITTER: Larry F. Miller, National Electrical Manufacturers Association (NEMA)

COMMENT ON PROPOSAL NO: 16-38

RECOMMENDATION: The Panel should continue to Accept the proposal but revise the Panel action text to read as follows:

725-5. Access to Electrical Equipment Behind Panels Designed to Allow Access.

Access to electrical equipment shall not be denied by an accumulation of wires and cables that prevents removal of panels. Cables shall be installed in such a manner that the cable will not be damaged by normal building use or maintenance. Access to electrical equipment behind ceilings designed to allow access shall comply with (a) or (b).

a. New building construction (e.g., renovation, remodeling, new spaces). Installation of cables shall comply with Section 300.11.

b.1. Installation of cables in suspended lay-in type ceiling spaces shall comply with 300.11.

2. Installation of cables in other than suspended lay-in type ceiling spaces shall comply with 300.11 where the space is accessible.

3.Where the ceiling is not the lay-in type, and the space is not accessible, three cables less than 13 mm (0.5 in.) shall be permitted to be installed unsupported by the building structure between access points or access panels.

~~Buildings with existing cabling systems.~~

~~Where practicable, installation of cables shall comply with Section 300.11. Where impracticable to comply with Section 300.11, cables less than 13 mm (0.5 in) in diameter shall be permitted to be installed unsupported by the building structure in accordance with 1 or 2.~~

~~1. In areas having ceilings with access points or access panels, it shall be permissible to fish a maximum of three cables between access points in the ceiling.~~

~~2. In areas having suspended lay-in ceilings, it shall be permissible to install a maximum three supported cables on top of any one ceiling tile. The cables shall be run parallel to the ceiling grid."~~

SUBSTANTIATION: We agree with Mr. Egedsal's and Mr. Speer's negative comments that suspended ceilings are not intended to support electrical wires or cables.

Section 300-11(a)(1) (wiring located within the cavity of a fire-rated floor-ceiling or roof-ceiling) allows an exception for wiring that has been tested as part of the fire-rated assembly. This proposal could compromise the fire-rating of the ceiling by overriding that requirement. The words "or maintenance" have been added because so much of the damage occurs in ceiling spaces as various trades perform maintenance.

The submitter states that he has submitted companion proposals for Articles 725 760, 770, 820 and 830. If each of these articles will allow three cables per ceiling tile, this could result in a total of 18 cables per ceiling tile, which appears to be approaching the "excessive accumulation" the submitter agrees could be a hazard. Limiting the size and quantity of cable permitted to be fished in non-lay-in ceiling spaces will help control the weight of cable (combined with that permitted in the other articles referenced above) on these ceilings.

PANEL ACTION: Accept in Principle in Part.

The panel rejects the recommended addition of the word "maintenance."

The balance of the recommendation is accepted in principle.

PANEL STATEMENT: The term "normal building use" includes "maintenance." Refer to the recommendation and substantiation on Comment 16-27a.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22

VOTE ON PANEL ACTION:

AFFIRMATIVE: 21

NEGATIVE: 1

EXPLANATION OF NEGATIVE:

SPEER: See my explanation of negative vote on Comment 16-27a.

(Log #1148)

16- 31 - (725-5): Accept in Principle

SUBMITTER: James E. Brunssen, Telcordia Technologies, Inc.

COMMENT ON PROPOSAL NO: 16-38

RECOMMENDATION: Revise as follows:

725-5. Access to Electrical Equipment Behind Panels Designed to Allow Access. Access to electrical equipment shall not be denied by an accumulation of wires and cables that prevents removal of panels. Cables shall be installed in such a manner that the cable will not be damaged by normal building use. Access to electrical equipment behind ceilings designed to allow access shall comply with (a) or (b).

a. New building construction (e.g., renovation, remodeling, new spaces). Installation of cables shall comply with Section 300.11.

b. Buildings with existing cabling systems. Where practicable, installation of cables shall comply with Section 300-11. Where impracticable to comply with Section 300-11, cables less than 13 mm (0.5 in.) in diameter shall be permitted to be installed unsupported by the building structure in accordance with 1 or 2.

1. In areas having ceilings with access points or access panels, it shall be permissible to fish a maximum of three cables between access points in the ceiling.

2. In areas having suspended lay-in ceilings, it shall be permissible to install a maximum of three unsupported cables on top of ~~any one~~ each ceiling tile, i.e., up to three wires and cables are permitted to lay on a ceiling tile. The cables shall be run parallel to the ceiling grid.

SUBSTANTIATION: Proposed Section 725-5(b)(2), as presently written in Proposal 16-38, panel action, is confusing and could be interpreted as permitting a total of only three unsupported wires and cables above a suspended ceiling. The intent of the panel was that up to a maximum of three unsupported wires and cables may be routed across each and every ceiling tile. The revision proposed in this comment clarifies and accomplishes the intent of the panel. This is a companion comment and is intended to correlate with comments on Proposals 16-112, 16-159, 16-192, 16-276, and 16-332.

PANEL ACTION: Accept in Principle.

PANEL STATEMENT: Refer to the recommendation and substantiation on Comment 16-27a.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22

VOTE ON PANEL ACTION:

AFFIRMATIVE: 21

NEGATIVE: 1

EXPLANATION OF NEGATIVE:

SPEER: See my explanation of negative vote on Comment 16-27a.

(Log #1163)

16- 32 - (725-5): Accept in Principle

SUBMITTER: James E. Brunssen, Telcordia Technologies, Inc.

COMMENT ON PROPOSAL NO: 16-38

RECOMMENDATION: Revise as follows:

725-5. Access to Electrical Equipment Behind Panels Designed to Allow Access. Access to electrical equipment shall not be denied by an accumulation of wires and cables that prevents removal of panels. Cables shall be installed in such a manner that the cable will not be damaged by normal building use. Access to electrical equipment behind ceilings designed to allow access shall comply with (a) or (b).

a. New building construction (e.g., renovation, remodeling, new spaces). Installation of cables shall comply with Section 300.11.

b. Buildings with existing cabling systems. ~~Where practicable, installation of cables shall comply with Section 300-11. Where impracticable to comply with Section 300-11,~~Cables less than 13 mm (0.5 in.) in diameter shall be permitted to be installed unsupported by the building structure in accordance with 1 or 2.

1. In areas having ceilings with access points or access panels, it shall be permissible to fish a maximum of three cables between access points in the ceiling.

2. In areas having suspended lay-in ceilings, it shall be permissible to install a maximum of three unsupported cables on top of any one ceiling tile. The cables shall be run parallel to the ceiling grid.

Where the maximum number of cables permitted in 1 or 2 will be exceeded, installation of cables shall comply with Section 300.11.

SUBSTANTIATION: The Technical Correlating Committee has directed that Proposal 16-38 be revised to comply with the NEC Style Manual 3.2.1 relative to the use of unenforceable terms. The proposed revision contained in this comment removes the unenforceable terms "practicable" and "impracticable", the remaining text is in agreement with the NEC Style Manual 3.1.2 using the phrase "shall be permitted" to indicate allowed optional or alternate methods. The added text (final sentence) provides direction on how to proceed if the limits of 725-5(b)(1) or (2) will be exceeded. This is a companion comment and is intended to correlate with comments on Proposals 16-112, 16-159, 16-192, 16-276, and 16-332.

PANEL ACTION: Accept in Principle.

PANEL STATEMENT: Refer to the recommendation and substantiation on Comment 16-27a.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22

VOTE ON PANEL ACTION:

AFFIRMATIVE: 21

NEGATIVE: 1

EXPLANATION OF NEGATIVE:

SPEER: See my explanation of negative vote on Comment 16-27a.

(Log #1169)

16- 33 - (725-5): Accept in Principle

SUBMITTER: James E. Brunssen, Telcordia Technologies, Inc.

COMMENT ON PROPOSAL NO: 16-38

RECOMMENDATION: Continue to accept in principle.

SUBSTANTIATION: Panel 16 should continue to accept this proposal in principle as it provides a reasonable and safe solution to placing a limited number of signaling and communications wires and cables in existing construction. The restrictions contained in the proposed change limit both the number and size of wires and cables permitted on each suspended ceiling panel. In this manner additional weight, as well as an accumulation of wires and cables that would otherwise restrict access above suspended ceiling panels, is controlled and limited. The limited number of cables permitted can easily be moved aside to permit access. Some concern has also been expressed that cables placed directly on the ceiling panels would degrade the fire rating of the ceiling. The suspended ceiling, part of a membrane that is intended to retard fire from spreading into the ceiling cavity, would be unaffected in its ability to retard the spread of fire by a limited number of wires and cables resting on top of the panels. This is a companion comment and is intended to correlate with comments on Proposals 16-112, 16-159, 16-192, 16-276, and 16-332.

PANEL ACTION: Accept in Principle.

PANEL STATEMENT: Refer to the recommendation and substantiation of Comment 16-27a. This action meets the intent of the submitter.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22

VOTE ON PANEL ACTION:

AFFIRMATIVE: 21

NEGATIVE: 1

EXPLANATION OF NEGATIVE:

SPEER: See my explanation of negative vote on Comment 16-27a.

(Log #CC1602)

16- 27a - (725-5, 725-6, 725-7 and 525-9 (New)): Accept

Note: The Technical Correlating Committee directs that the references to Articles 640 and 650 be deleted because the panel did not accept similar requirements in those articles. The Technical Correlating Committee also directs that the FPN which contains a mandatory requirement be deleted to comply with the NEC Style Manual.

SUBMITTER: CMP 16

COMMENT ON PROPOSAL NO: 16-38

RECOMMENDATION: Renumber current Section 725-6 as 725-9.

Renumber current Section 725-7 as 725-6.

Retain the existing 1999 code text for Section 725-5 (unmodified).

Add new Section 725.7 to read as follows:

725.7 Installation of Circuits

Class 1, Class 2, and Class 3 circuits shall be installed in compliance with A or B.

A. New Ceiling Construction. The installation of cables in new ceiling construction shall comply with Section 300-11.

B. Existing Ceilings.

1. Fire-Rated Ceilings. The installation of cables in the cavity of an existing fire-rated ceiling assembly shall comply with Section 300-11.

2. Non-Fire-Rated Ceilings. For installations in the cavity of an existing non-fire-rated ceiling assembly, cables less than 6 mm (0.25 in) in diameter shall be permitted to be installed unsupported from the building structure in accordance with the following:

a. Fixed or Hard Ceilings. In areas having fixed or hard ceilings with access points or access panels, a combined total of three cables from Articles 640, 650, 725, 760, 770, 800, 820 and 830, shall be permitted to be placed between access points or access panels in the ceiling. Additional cables shall be installed in accordance with 300.11.

b. Suspended Lay-In Ceilings. In areas having suspended lay-in ceilings, in any 3 m by 3m (10 ft. x 10 ft) ceiling area, a combined total of three cables from Articles 640, 650, 725, 760, 770, 800, 820 and 830, shall be permitted to be installed directly on the ceiling grid. Additional cables shall be installed in accordance with 300.11.

FPN. Cables of all types are included in the total limit of three cables, not three cables from each article.

SUBSTANTIATION: Proposal 16-38 was accepted in principle to permit the installation of unsupported cables under limited conditions. The proposal text however, was too broad and unclear. The text of this comment clarifies the original intent. The new text includes requirements to comply with Section 300.11. Permitted installation conditions will not compromise the integrity of fire-rated ceilings. For non-fire-rated ceilings, the permitted relief from Section 300.11 is limited to very specific conditions. Section 725.5 is not being modified because the accessibility requirements should remain.

The sections have been renumbered so that they appear in a logical order.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22

VOTE ON PANEL ACTION:

AFFIRMATIVE: 21

NEGATIVE: 1

EXPLANATION OF NEGATIVE:

SPEER: The panel's action on these comments greatly reduces the effectiveness of previous changes in the Code, which eliminated any unsupported cable laying on suspended ceilings, the panel's statement on Comment 16-29 indicates that the panel's action on Comment 16-27a provides a reasonable, safe, and practical solution to placing unsupported cables in areas having non-fire rated ceilings. I must respectfully disagree.

The permitted relief from Section 300.11 is limited to "very specific conditions." The conditions noted by the panel began as 3 cables, each less than 0.5 inch in diameter, on any one lay-in ceiling tile. The panel has now reduced that quantity of weight by limiting the accumulative load to 3 cables, each less than 0.25 inch in diameter, within any 10 ft. x 10 ft. area.

The panel's statement on Comment 16-29, further indicates that the restrictions contained in 16-27a, addressed the submitter's concern regarding added weight, by reducing both the size and number of allowable cables in any specific area. The question must be asked, by what process or method did the panel use to arrive at the "allowable" added weight? How was the determination made, that by reducing from 0.5 inch to 0.25 inch, the accumulated unsupported weight, added to the suspended ceiling system, would be satisfactorily reduced to meet the submitter's concerns?

The specific conditions of this "relief" from the requirements of Section 300.11 are not supported technically, or by any other form of substantiation. The panel adopted the original criteria of Proposal 16-38 and then modified those conditions under Comment 16-27a. In either example, there has never been any technical or other form of substantiation for the amount of added weight these changes will accumulate on the ceiling system.

By allowing any unsupported cable on the ceiling tile, we are adding extra weight to the suspended ceiling system, which may not have been designed to support that additional weight.

In conclusion, it is my opinion that the panel's substantiation of this action does not support these proposed changes to the Code. Further, there is no basis for the panel's assumption that the limits described in Comment 16-27a provide a safe solution to the perceived problem addressed by Proposal 16-38.

(Log #1744)

16- 34 - (725-5): Accept in Principle
SUBMITTER: Francis W. Peri, Communications Design Corporation
COMMENT ON PROPOSAL NO: 16-38
RECOMMENDATION: Association of Cabling Professionals (ACP) recommends that Code Panel 16 continue to accept this proposal.
SUBSTANTIATION: ACP supports the introduction of complying with Section 300-11 and recognizes that it represents a major improvement in providing safe cabling pathways.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Refer to the recommendation and substantiation of Comment 16-27a. This action meets the intent of the submitter.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
NEGATIVE: 1
ABSTENTION: 1
EXPLANATION OF NEGATIVE:
SPEER: See my explanation of negative vote on Comment 16-27a.
EXPLANATION OF ABSTENTION:
CAUDILL: The Society of the Plastics Industries could not reach a consensus position on this issue.

(Log #1856)

16- 35 - (725-5): Accept in Principle
SUBMITTER: Robert W. Jensen, dbi-Telecommunications Infrastructure Design
COMMENT ON PROPOSAL NO: 16-38
RECOMMENDATION: BICSI recommends that Code Panel 16 continue to accept this proposal.
SUBSTANTIATION: BICSI supports the introduction of complying with Section 300-11 and recognizes that it represents a significant improvement in providing safe cabling pathways.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Refer to the action and statement on Comment 16-27a. This action meets the intent of the submitter.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
NEGATIVE: 1
ABSTENTION: 1
EXPLANATION OF NEGATIVE:
SPEER: See my explanation of negative vote on Comment 16-27a.
EXPLANATION OF ABSTENTION:
CAUDILL: The Society of the Plastics Industries could not reach a consensus position on this issue.

(Log #740)

16- 36 - (725-5(b)): Accept in Principle in Part
SUBMITTER: Richard P. Owen, City of St. Paul, Electrical Inspection
COMMENT ON PROPOSAL NO: 16-38
RECOMMENDATION: Replace (b) of the proposal with the following text:
(b) Buildings not Covered Under (a) Above. In areas having ceilings with access points or panels and having 900 mm (3 ft) or less vertical clearance above the ceiling, it shall be permissible to fish a maximum of 3 cables, each less than 13 mm (0.5 in.) in diameter, between access points in the ceiling.
SUBSTANTIATION: The Technical Correlating Committee directed Panel 3 Chair Raymond Weber to form a Task Group to review these proposals and to submit the results as comments to Panel 16. Task Group 3-16, consisting of Chair Weber, members Steven Speer; Lee Hewitt; Richard Owen and Ron Maassen held a conference call on October 3, 2000 and developed the above language as a comment. The Task Group was concerned with allowing unsupported cabling above suspended ceilings, since companion proposals for Articles 725, 760, 770, 800, 820 and 830 would also allow this limited cabling without support. The possible accumulation of cable allowed by all these articles would be excessive and would both limit access to a ceiling and conflict with Section 300.11. Rewording of (b) also eliminated the unenforceable terms "practicable" and "impracticable" as directed by the Technical Correlating Committee.
PANEL ACTION: Accept in Principle in Part.
PANEL STATEMENT: The panel rejects the specific limitations in the comment but accepts the principle of permitting a limited number of cables. The recommendation of Comment 16-27a provides a reasonable, safe, and practical solution to placing a limited number of unsupported signaling and communications wires and cables in existing construction.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
SPEER: See my explanation of negative vote on Comment 16-27a.

(Log #976)

16- 37 - (725-5(b)(2)): Accept in Part
SUBMITTER: Palmer Hickman, Royersford, PA
COMMENT ON PROPOSAL NO: 16-38
RECOMMENDATION: Reject Proposal 16-38 and retain present 725-5 as it appears in the 1999 NEC.
SUBSTANTIATION: I would strongly urge Code-Making Panel 16 to reconsider their action on this proposal. The proposed 725.5(B)(2) would now permit three cables to be installed on the tile of a suspended ceiling, without providing any technical substantiation for this allowance.

I offer the following reasons against accepting this proposal.

1) Chapters 1-4 apply except as amended by Chapters 5, 6, and 7. Sections 300-11(a)(1) and (2) state wiring shall not be supported by ceiling assembly.

2) Section 725-5 deals with access to electrical equipment, not support of wiring

3) Code-Making Panel 3 reaffirmed their prohibition of ceiling assemblies being used beyond the manufacturers design parameters in the Panel Statement to Comments 3-53 and 3-57 of the 1998 ROC, and Proposal 3-68 of the 2001 ROP. In the later reference, Code-Making Panel 3 states: "The panel reaffirms its position that an independent means of support shall be provided for all wiring, not just branch circuit wiring...".

I understand that this proposed allowance of ceiling support only applies to buildings with existing cabling systems where it is "impracticable" to comply with 300-11. Impracticability does not provide technical substantiation to allow a ceiling assembly that has not been evaluated to support the potential additional load of three cables on each and every ceiling tile. Essentially, the ceiling assembly is expected to carry the additional load of potentially hundreds of cables installed directly on it. As an example, a 100 ft X 100 ft room with a suspended ceiling using 2 ft x 2 ft tiles, would be expected to carry the full weight of 150 cables.

The substantiation offered by the submitter of this proposal does not even support the proposed change. He claims that "a limited amount of wiring or cabling laid directly on a suspended ceiling is permitted..." without stating where this permission is given, and by whom. The entire substantiation of the submitter seems contrary to the action of the panel. He begins his substantiation by stating "Section 725-5 may be misinterpreted to mean that conductors and cables may not be placed directly on suspended ceiling." He notes that the 1999 NEC Handbook "Figures 725-2 and 725-3 lead the reader to conclude that no wires or cables are permitted to rest directly on the suspended ceiling." The submitter also stated Code-Making Panel 16 responded to a proposal to Article 725 (1992 TCD Comment 16-18) that the proposed requirement "...would still allow some cabling of a limited quantity above the ceiling tile, but not an excessive amount." Note the words "above the ceiling tile", not on the ceiling tile. I feel these examples are not misinterpretations, but rather correct interpretations, and substantiation to reject this proposal.

In conclusion, I respectfully disagree with the Panel Action on this Proposal. I feel the implications are quite serious. I find no technical substantiation to warrant such a dramatic change. The substantiation of the submitter does not appear to support this change, but rather the rejection of it.
PANEL ACTION: Accept in Part.
The panel accepts the portion of the comment to retain Section 725.5, and rejects the portion of the comment to reject Proposal 16-38.
PANEL STATEMENT: Refer to the recommendation and substantiation on Comment Log 16-27a. Also refer to the panel action and statement on Comment 16-29.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21
NEGATIVE: 1

EXPLANATION OF NEGATIVE:
SPEER: See my explanation of negative vote on Comment 16-27a.

(Log #1254)

16- 38 - (725-5(b)(2)): Reject
SUBMITTER: J. Paul Spinn, USG Research & Technology Center
COMMENT ON PROPOSAL NO: 16-38
RECOMMENDATION: Delete the following text:
In areas having suspended lay in ceiling, it shall be permissible to install a maximum of three unsupported cables on top of any one ceiling tile. The cables shall be run parallel to the ceiling grid.
SUBSTANTIATION: By allowing a maximum of three unsupported cables on top of any one (or more) ceiling tiles, the fire-rating of the assembly and the Class A surface burning characteristic requirement, which includes flame spread and smoke development, could be jeopardized. By decreasing the fire-rating of the plenum assembly and the surface burning characteristic of the ceiling tile, the life safety of the occupants can be negatively affected. By rejecting this proposal, these problems can be eliminated.
To substantiate the comment made for the proposal, four key points are provided:
[1] For a fire rated floor/ceiling or roof/ceiling assembly, placement of unsupported cables on top of any one ceiling tile or a row of ceiling tiles could invalidate the fire-rating for a particular assembly. The rationale for this argument are:
(a) The weight of the cables could cause premature tile fallout leading to an early failure of the assembly, which is tested in accordance with NFPA 251 or ASTM E 119.
(b) The increased heat of combustion associated with the cable jackets, which commonly use plastics, will add to the total fire load of an assembly. As the total fire load increases for an assembly, the fire endurance of the assembly will decrease, which could jeopardize an assembly's fire-rating.
[2] For a Class A ceiling, placement of unsupported cables on the ceiling can effect flame spread and smoke development performance and jeopardize the required Class A rating for the ceiling tiles. The rationale for this argument are:
(a) The flame spread will increase due to the increased total heat load, which is caused by the plastic on the cable jacket.
(b) The smoke development will increase due to the cable jackets, which are usually plastic such as PVC or CPVC.
[3] The placement of unsupported cables on top of any one or more ceiling tiles presents potential life safety issues for occupants due to the decreased fire-rating of the floor/ceiling or roof/ceiling or an increase in the ceiling surface burning characteristics.
[4] Placement of unsupported cables on top of any one ceiling tile or a row of ceiling tiles would increase ceiling tile sag due to increased weight of the cables on the ceiling tiles, and would impair the accessibility of the ceiling plenum.
PANEL ACTION: Reject.
PANEL STATEMENT: The recommendation of Comment 16-27a provides a reasonable, safe, and practical solution to placing a limited number of unsupported signaling and communications wires and cables in existing construction. The restrictions contained in Comment 16-27a limit both the number and size of wires and cables permitted on each ceiling panel, thereby controlling weight and accumulation so that cables can be easily moved aside to permit access. The submitter's concern about weight is addressed by decreasing the size of the cable to 1/4 inch and limiting the number of cables to three per each 10 ft x 10 ft area. The revised text precludes the installation of cables in all fire-rated ceiling assemblies.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
SPEER: See my explanation of negative vote on Comment 16-27a.

(Log #2083)

16- 39 - (725-5(b)(2)): Accept in Principle in Part
SUBMITTER: Marcelo M. Hirschler, GBH International
COMMENT ON PROPOSAL NO: 16-38
RECOMMENDATION: Revise text as follows:
725-5. Access to Electrical Equipment Behind Panels Designed to Allow Access
Access to equipment shall not be denied by an accumulation of wires and cables that prevents removal of panels. Cables shall be installed in such a manner that the cable will not be damaged by normal building use. Access to electrical equipment behind ceilings designed to allow access shall comply with (a) or (b).
a. New building construction (e.g. renovation, remodeling, new spaces). Installation of cables shall comply with Section 300.11.
b. Buildings with existing cable systems. Where practicable, installation of cables shall comply with Section 300.11. Where impracticable to comply with Section 300.11, in those areas having ceilings with access points or access panels, it shall be permissible to fish a maximum of three cables less than 13 mm (0.5 in) in diameter, between access points in the ceiling. ~~cables less than 13 mm (0.5 in) in diameter shall be permitted to be installed unsupported by the building structure in accordance with 1 or 2.~~
~~1. In areas having ceilings with access points or access panels, it shall be permissible to fish a maximum of three cables between access points in the ceiling.~~
~~2. In areas having suspended lay-in ceilings, it shall be permissible to install a maximum of three unsupported cables on top of any one ceiling tile. The cables shall be run parallel to the ceiling grid.~~
SUBSTANTIATION: The permission granted by the panel to install cables on suspended ceiling tiles should be rescinded. Neither cables nor any other item should be installed on top of a suspended ceiling tile. The support systems of suspended ceilings are not designed to resist any significant amount of weight without being deflected or broken.
This issue has been raised on Proposal 16-192 (log 1665) in negative comments by two panel members, Mr Egesdal and Mr Speer, who both correctly point out that suspended ceiling tiles are not intended to support the weight of electrical cables. Mr. Sandy Egesdal repeats his negative comment on this proposal.
The point made by the Technical Correlating Committee that such use would constitute an exposed use of cables is an additional consideration to rejecting this part of the proposal.
PANEL ACTION: Accept in Principle in Part.
The panel accepts the principle of permitting a limited number of cables to be installed in a fixed or hard ceiling. The panel rejects the balance of the submitter's recommendation including the limiting of the installation of cables in a suspended lay-in ceiling.
PANEL STATEMENT: The recommendation of Comment 16-27a provides a reasonable, safe, and practical solution to placing a limited number of unsupported signaling and communications wires and cables in existing construction.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
SPEER: See my explanation of negative vote on Comment 16-27a.

(Log #857)

16- 40 - (725-7): Accept
SUBMITTER: Larry F. Miller, National Electrical Manufacturers Association (NEMA)
COMMENT ON PROPOSAL NO: 16-39
RECOMMENDATION: The Panel should continue to Accept the proposal in Principal but revise the Panel recommendation as follows:
Mechanical Execution of Work. Communications circuits and equipment shall be installed in a neat and workmanlike manner. Cables installed exposed on the outer surface of ceiling and sidewalls shall be supported by the structural components of the building structure...".
SUBSTANTIATION: To clarify this cable is in the room, not in the ceiling void space.
PANEL ACTION: Accept.
PANEL STATEMENT: The panel notes that the only effect of this action is to add the word "outer." The remaining text is not affected.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22
VOTE ON PANEL ACTION:
AFFIRMATIVE: 22

(Log #1155)

16- 41 - (725-7): Reject
SUBMITTER: James E. Brunssen, Telcordia Technologies, Inc.
COMMENT ON PROPOSAL NO: 16-39
RECOMMENDATION: Delete 725-7 and incorporate the information in 725-5 as follows:
725-5. ~~Access to Electrical Equipment Behind Panels Designed to Allow Access~~ Mechanical Execution of Work, Class 1, Class 2, and Class 3 circuits shall be installed in a neat and workmanlike

manner. Access to electrical equipment shall not be denied by an accumulation of ~~wires and~~ cables and conductors that prevents removal of panels. Cables and conductors shall be installed in such a manner that ~~the cable~~ they will not be damaged by normal building use. ~~Access to electrical equipment behind ceilings designed to allow access~~ Cables and conductors installed exposed shall comply with (a) or (b).

a. New building construction (e.g., renovation, remodeling, new spaces). Installation of cables and conductors shall comply with Section 300-11. Cables and conductors shall be supported by structural components of the building. Such cables and conductors shall be attached to structural components at intervals not exceeding 1.52 m (5 ft) and within 305 mm (12 in.) from every cabinet, box, or fitting by straps, staples, hangers or similar fittings designed and installed so as not to damage the cable or conductors. The installation shall also conform with Section 300-4(d).

b. Buildings with existing cable systems. Where practicable, installation of cables and conductors shall comply with ~~Section 300-11~~ 725-5(a), . Where impracticable to comply with ~~Section 300-11~~ 725-5(a), cables and conductors less than 13 mm (0.5 in.) in diameter shall be permitted to be installed unsupported by the building structure in accordance with 1 or 2.

1. In areas having ceilings with access points or access panels, it shall be permissible to fish a maximum of three cables between access points in the ceiling.

2. In areas having suspended lay-in ceilings, it shall be permissible to install a maximum of hree unsupported cables on top of any one ceiling tile. The cables shall be run parallel to the ceiling grid.

SUBSTANTIATION: Sections 725-5 and 725-7 actually address the same issue, the mechanical execution of work. Accessibility behind panels designed to allow access is really an "execution of work" issue. Additionally, the Technical Correlating Committee has identified a potential conflict between proposed revised 725-5 and 725-7. This comment editorially combines 725-5 and 725-7 into a single Section 725-5 requiring attachment to the building structure of exposed cables and conductors and, where impracticable to do so, permits a limited number of cables and conductors of specified maximum size to be placed on suspended ceiling tiles. It accommodates the intent of both proposals that cables and conductors should be supported by the building structure, but in extenuating circumstances in existing construction, a limited number and weight of cables and conductors may be placed on a suspended ceiling. This is a companion comment to similar comments to Proposal 16-115, 16-159a, 16-192a, 16-276a, and 16-333a.
PANEL ACTION: Reject.
PANEL STATEMENT: The sections should not be combined. Refer to the recommendation and substantiation for Comment 16-27a where these recommendations are addressed.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22
VOTE ON PANEL ACTION:
AFFIRMATIVE: 22

(Log #1425)

16- 42 - (725-7): Accept in Part
SUBMITTER: Kari Barrett, American Chemistry Council
COMMENT ON PROPOSAL NO: 16-39
RECOMMENDATION: Delete the following text:
~~Such cables shall be attached to structural components at intervals not exceeding 1.52 m (5 ft) and within 305 mm (12 In.) from every cabinet, box or fitting by straps, staples, hangers or similar fittings designed and installed so as not to damage the cable. The installation shall also conform with Section 300-4(d).~~
SUBSTANTIATION: The addition of this text would make the mandatory requirements of this section overly specific. The present wording is sufficient guidance to both the installer and the authority having jurisdiction.
PANEL ACTION: Accept in Part.
Revise the third sentence of the panel action text of Proposal 16-39 to read as follows:
"Such cables shall be attached to structural components by straps, staples, hangers or similar fittings designed and installed so as not to damage the cable."
PANEL STATEMENT: The panel accepts the removal of specific distances for the attachment of the cable. The panel does not agree that the existing code wording is sufficient guidance to both the installer and the authority having jurisdiction.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
SPEER: The inclusion of specific distances for spacing attachment points if not "overly specific" in its guidance offered to installers or the authority having jurisdiction. The specific distances mentioned, merely ensure that cables installed will be properly supported and, thus, protected from damage.

(Log #1640)

16- 43 - (725-7): Reject
SUBMITTER: Andy Scott, National Cable Television Association
COMMENT ON PROPOSAL NO: 16-39
RECOMMENDATION: Reject Proposal 16-39.
SUBSTANTIATION: NCTA, on behalf of the cable television industry, strongly urges Panel 16 to reject these proposals. While attachment every 5 ft may be a practice in many cases, it also may be overly restrictive and unnecessary in others. The requirement to support cables every 5 ft is outside the scope of the code. The NCTA urges Panel 16 not to allow the NEC to serve as an Installation Manual.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel action on Comment 16-42 addresses the concerns in the submitter's substantiation.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22
VOTE ON PANEL ACTION:
AFFIRMATIVE: 22

(Log #858)

16- 44 - (725-7(a)): Accept
SUBMITTER: Larry F. Miller, National Electrical Manufacturers Association (NEMA)
COMMENT ON PROPOSAL NO: 16-42
RECOMMENDATION: Panel should continue to Accept the proposal in Principal.
SUBSTANTIATION: The text proposed in comments to proposals 16-38 and 16-39 meets the intent of this proposal.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22
VOTE ON PANEL ACTION:
AFFIRMATIVE: 22

(Log #2259)

16- 45 - (725-10): Reject
SUBMITTER: Noel Williams, Noel Williams Consulting
COMMENT ON PROPOSAL NO: 16-62a
RECOMMENDATION: Revise the text of this section as follows:
"Class 1 and Class 2 or Class 3 circuits wired using Class 1 wiring methods shall..." (Remainder to be unchanged from proposal.)
SUBSTANTIATION: See the comments by Mr. Hughes.
Circuits and power sources using Class 2 or Class 3 methods are already sufficiently identified by the required markings on the cables and power supplies. Marking of terminal devices such as thermostats or pushbuttons is impractical.
PANEL ACTION: Reject.
PANEL STATEMENT: Identification is also needed for Class 2 and Class 3 circuits to prevent interference during maintenance, inspection and testing of these circuits.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22
VOTE ON PANEL ACTION:
AFFIRMATIVE: 22

(Log #195)

16- 46 - (725-21): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 16-43
RECOMMENDATION: It was the action of the Technical Correlating Committee that further consideration be given to the comments expressed in the voting. This action will be considered by the panel as a public comment.

SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22
VOTE ON PANEL ACTION:
AFFIRMATIVE: 22

(Log #460)

16- 47 - (725-21): Accept
SUBMITTER: Technical Correlating Committee on Signaling Systems for the Protection of Life and Property
COMMENT ON PROPOSAL NO: 16-43
RECOMMENDATION: The Technical Correlating Committee on Signaling Systems for the Protection of Life and Property recommends that Code Panel 16 reject this proposal.
SUBSTANTIATION: The elimination of Class 1 Power-Limited Circuits, that may be connected to a fire alarm system to provide a specific building fire safety function, has not been technically substantiated by the submitter of Proposal 16-43. No technical reason has been given for the elimination of requirements that define more precisely the electrical parameters of Class 1 Power-Limited Circuits.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22
VOTE ON PANEL ACTION:
AFFIRMATIVE: 22

(Log #1912)

16- 48 - (725-21): Accept
SUBMITTER: Michael I. Callanan, International Brotherhood of Electrical Workers
COMMENT ON PROPOSAL NO: 16-43
RECOMMENDATION: Reject this proposal.
SUBSTANTIATION: The submitter of this proposal makes no claim that Class 1 Power-limited Circuits are unsafe or present any type of hazard. His only reason for recommending that these types of circuits be deleted is that they are not needed because no one uses them. For evidence, he claims that there are no listed products that meet the requirements of Section 725-21(a). This is not true.

The only requirement for a Class 1 power limited circuit in Section 725-21(a) is that they be supplied from a source that has a rated output of not more than 30 volts and 1000 volt-amperes. Unlike the requirements in Section 725-4(a) for Class 2 and 3 power sources, which are required to be listed as either Class 2 or Class 3, there is no such requirement for Class 1 power-sources. As a result, UL does not list them as Class 1 and would respond to any inquiry by saying that they have no Class 1 products listed. However, they do have listed products that meet the requirements for Class 1 products.

The decision whether to install these products as Class 1 power sources is not made by the manufacturer; it is made by the installer. Deleting Class 1 power-limited circuits from the Code will unnecessarily deny the user of this code the option of taking advantage of the benefits provided by using Class 1 wiring methods.

This comment represents the official position of the International Brotherhood of Electrical Workers Codes & Standards Committee.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22
VOTE ON PANEL ACTION:
AFFIRMATIVE: 22

(Log #1934)

16- 49 - (725-21): Accept
SUBMITTER: Mike Holt, Mike Holt Enterprises
COMMENT ON PROPOSAL NO: 16-43
RECOMMENDATION: Reject this proposal.
SUBSTANTIATION: I support the explanation provided by Mr. Lanni for his negative vote as shown in the ROP.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22
VOTE ON PANEL ACTION:
AFFIRMATIVE: 22

(Log #2399)

16- 50 - (725-21): Accept
SUBMITTER: Irving Mande, Edwards Systems Technology
COMMENT ON PROPOSAL NO: 16-43
RECOMMENDATION: Reject this proposal.
SUBSTANTIATION: The submitter of this proposal makes no claim that Class 1 power-limited circuits are unsafe or present any type of hazard. His only reason for recommending that these types of circuits be deleted is that they are not needed because no one uses them. For evidence, he claims that there are no listed products that meet the requirements of Section 725-21(a). That is not true.

The only requirement for a Class 1 power-limited circuit in Section 725-21(a) is that they be supplied from a source that has a rated output of not more than 30 volts and 1000 volt-amperes. Unlike the requirements in Section 725-41(a) for Class 2 and 3 power sources, which are required to be listed as either Class 2 or Class 3, there is no such requirement for Class 1 power-sources. As a result, UL does not list them as Class 1 and would respond to an inquiry by saying that they have no Class 1 products listed. However, they do have listed products that meet the requirement for Class 1 products.

The decision whether to install these products as Class 1 power sources is not made by the manufacturer; it is made by the installer. Deleting Class 1 power-limited circuits from the code will unnecessarily deny them the option of taking advantage of the benefits provided by using Class 1 wiring methods.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22
VOTE ON PANEL ACTION:
AFFIRMATIVE: 22

(Log #1022)

16- 51 - (725-21(a)): Accept
SUBMITTER: Gene Pecora, Edwards Systems Technology (EST) Signaling Division
COMMENT ON PROPOSAL NO: 16-43
RECOMMENDATION: Reject this proposal because the information provided in the Substantiation is not correct.
SUBSTANTIATION: EST has been manufacturing and marketing UL listed transformers that meet the power limitations for Class 1 power-limited circuits, as specified in 725-21(a) for approximately 50 years. During that period of time, we have never received any negative feedback regarding the safety of Class 1 power-limited circuits.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22
VOTE ON PANEL ACTION:
AFFIRMATIVE: 22

(Log #426)

16- 52 - (725-21(b)): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
COMMENT ON PROPOSAL NO: 16-44
RECOMMENDATION: Accept proposal.
SUBSTANTIATION: The panel statement agrees that the proposed application is not prohibited, but I would venture that many Code users do not realize this. The power source maximums for Class 1 circuits do not prohibit lower parameters of voltage and current which would comply with Class 2 and 3 power sources. The wiring methods for Class 1 circuits are not likely to be mistaken for Class 2 circuits, therefore confusion re; separation Class 2 or 3 circuits is minimal and no greater than at present. The panel accepted proposal 16-62a which indicates a Class 2 or 3 power source can supply a (reclassified) Class 1 circuit.
PANEL ACTION: Reject.
PANEL STATEMENT: The Code presently does not disallow Class 2 and Class 3 power sources to connect to Class 1 circuits. There is no need to state that this is permitted.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22
VOTE ON PANEL ACTION:
AFFIRMATIVE: 22

(Log #2066)

16- 53 - (725-23 Exception No. 2): Reject
SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc.
COMMENT ON PROPOSAL NO: 16-46
RECOMMENDATION: Accept the proposal.
SUBSTANTIATION: This is a companion comment to the principal comment on 725.27(C)(new), submitted for correlation.
PANEL ACTION: Reject.
PANEL STATEMENT: Refer to the panel action and statement on Comment 16-67.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22
VOTE ON PANEL ACTION:
AFFIRMATIVE: 22

(Log #196)

16- 54 - (725-25): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 16-50
RECOMMENDATION: The Technical Correlating Committee directs that the action on this Proposal be revised to comply with the NEC Style Manual 3.1.4 regarding the wording of Exceptions No. 1 and No.2. The Technical Correlating Committee notes that the revised wording in the Panel Action appears to conflict with Section 725-3 that states in part that "Only those sections of Article 300 referenced in this article shall apply". The revised Section 725-25 does not refer to any specific section of Article 300. This action will be considered by the Panel as a Public Comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
Revise the panel action text of Proposal 16-50 to read as follows:
725-25 Class 1 Circuit Wiring Methods. Installations of Class 1 circuits shall be in accordance with Article 300 and the other appropriate articles in Chapter 3.
Exception No. 1: The provisions of Sections 725-26 through 725-28 shall be permitted to apply to installations of Class 1 circuits.
Exception No. 2: Methods permitted or required by other articles of the Code shall apply to installations of Class 1 circuits.
PANEL STATEMENT: It is the intent of the panel that all sections of Article 300 apply to installations of Class 1 Circuits.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22
VOTE ON PANEL ACTION:
AFFIRMATIVE: 22

(Log #1200)

16- 55 - (725-26): Reject
SUBMITTER: Kenneth P. White, Olin Corp.
COMMENT ON PROPOSAL NO: 16-51a
RECOMMENDATION: The panel should have rejected the proposal.
SUBSTANTIATION: This proposal is meant for conductors not cables and with tray cable and the outer jacket of the cable provides for sufficient insulating protection. The submitter has not shown that a significant problem exists.
PANEL ACTION: Reject.
PANEL STATEMENT: Refer to the panel actions and statements on Comments 16-57 and 16-60. Refer to the definition of conductor in Article 100.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
NEGATIVE: 2
EXPLANATION OF NEGATIVE:
HUGHES: See my explanation of negative vote on Comment 16-57.
RAO: For over twenty years this panel has maintained its position that it does not intend for insulation to be the only means of separation of power conductors and control conductors even though insulation materials and characteristics have improved tremendously over these years.
Where 600V insulation is used on power conductors, the insulation is the only separation from metal parts or ground. In fact, between power conductors the separation value is doubled to 1200 volts. This also would apply to the additive rating between power and control conductors.
Power and control conductors eventually come together somewhere in the system where the only separation is insulation.
Allowing power and control conductors to be run in cable trays would be a step forward in correcting an unnecessary restriction.

(Log #2207)

16- 56 - (725-26): Reject
SUBMITTER: Joyce Evans Blom, The Dow Chemical Company
COMMENT ON PROPOSAL NO: 16-51a
RECOMMENDATION: Revise (b)(4) from the panel proposal as follows:
(4) In cable trays, where all conductors are insulated for the maximum voltage of any one conductor installed in the cable tray, or where the Class 1 circuit conductors and power-supply conductors not functionally associated with them are separated by a solid fixed barrier of material compatible with the cable tray, or where the power-supply or Class 1 circuit conductors are in a metal-enclosed cable.
SUBSTANTIATION: Current industry practice in 600 volt class industrial cable tray installations is to route motor power and control (Class 1) conductors for several different motors in the same tray. Typically, these cables in the tray would include power-only, control-only or combined power and control. The motors are generally not directly associated with one another. There has been no safety problem with this type of installation as long as the conductors are rated for cable tray service and all the cables have the same insulation level.
The NEC should support the present industry practice because this is a very common type of installation and there has not been a safety problem - provided all conductors are insulated for 600 volts and rated for tray cable service. My suggested alternate wording is shown above.
PANEL ACTION: Reject.
PANEL STATEMENT: The comment would permit intermixing of power, Class 1, Class 2 and Class 3 circuits with only the conductor or cable insulation used for separation between circuits. The panel does not intend for insulation to be the only means for separation.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
NEGATIVE: 2
EXPLANATION OF NEGATIVE:
RAO: See my explanation of negative vote on Comment 16-55.
HUGHES: This comment should have been accepted. The panel statement substantiating its rejection of this comment is flawed. It states this comment would permit intermixing power, Class 1, Class 2, and Class 3 circuits with only the insulation as separation. This section of Article 725 (Part B, 725-21 through 725-29) addresses Class 1 circuits only and does not in any way address Class 2 and Class 3 circuits.

(Log #828)

16- 57 - (725-26(b)): Reject
SUBMITTER: Robert B. Alexander, Fluor Daniel
COMMENT ON PROPOSAL NO: 16-51a
RECOMMENDATION: Delete the reference to cable trays.
SUBSTANTIATION: • Neither the Panel Statement nor the underlying originating Proposal (16-54) offers a substantive safety issue that this broad reference to cable trays rectifies for public review. That is because there is no general safety issue that it rectifies.
• Class 1 circuits essentially use Chapter 3 wiring methods. Where wiring methods requiring functional conductor/circuit separation is a safety issue, it is properly addressed in Section 725-8 and Articles 700 and 701.
PANEL ACTION: Reject.
PANEL STATEMENT: Proposal 16-51a provides for separation of circuits in cable trays in a manner consistent with other wiring methods in Article 725 and provides restrictions beyond those provided in Chapter 3.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
NEGATIVE: 2
EXPLANATION OF NEGATIVE:
HUGHES: This comment should have been accepted. This comment and the originating proposal address separation of Class

1 circuits and power supply circuits only. Any needed restrictions for separation of Class 1 circuits from Class 2 or Class 3 circuits do not apply here. Using cable/conductor insulation as the means of physical separation per 300-3(c)(1) is appropriate and no further modification of that general rule should be included in Article 725.
RAO: See my explanation of negative vote on Comment 16-55.

(Log #829)

16- 58 - (725-26(b)): Reject
SUBMITTER: Robert B. Alexander, Fluor Daniel
COMMENT ON PROPOSAL NO: 16-54
RECOMMENDATION: Reject the proposal.
SUBSTANTIATION: • Neither the Panel Statement nor the Proposal offers for public review a substantive safety issue that this proposal corrects.
• Class 1 circuits essentially use Chapter 3 wiring methods. Where wiring methods requiring functional conductor/circuit separation is a genuine safety issue, it is properly addressed in Section 725-8 and Articles 700 and 701.
• This proposal creates unnecessary general costs to Class 1 wiring methods with no general safety benefits that are identifiable and necessary.
• Even if the system were to perform better, which is unlikely, it is inappropriate to make it a requirement unless it also corrects a known safety issue - not a speculated one.
NFPA 70 90-1 Purpose
(a) Practical Safeguarding. The purpose of this Code is the practical safeguarding of persons and property from hazards arising from the use of electricity.
(b) Adequacy. This Code contains provisions that are considered necessary for safety. Compliance therewith and proper maintenance will result in an installation that is essentially free from hazard but not necessarily efficient, convenient, or adequate for good service or future expansion of electrical use.
PANEL ACTION: Reject.
PANEL STATEMENT: Refer to panel actions and statements on Comments 16-57 and 16-60.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
NEGATIVE: 2
EXPLANATION OF NEGATIVE:
HUGHES: See my explanation of negative vote on Comment 16-57.
RAO: See my explanation of negative vote on Comment 16-55.

(Log #1459)

16- 59 - (725-26(b)): Reject
SUBMITTER: Peter D. Noval, Jr., Philadelphia, PA
COMMENT ON PROPOSAL NO: 16-51a
RECOMMENDATION: Revise text to read as follows:
"(B) Class 1 Circuits with Power Supply Circuits. Class 1 circuits shall be permitted to be installed with power supply conductors as specified in (1) through 3. (Delete reference to (4).)
(1) In a Cable, Cable Tray, Enclosure, or Raceway. Class 1 circuits and power supply circuits shall be permitted to occupy the same cable, cable tray, enclosure or raceway only where the equipment powered is functionally associated.
Exception: In cable trays, Class 1 circuit conductors and power supply conductors not functionally associated with them shall be permitted where one of the following conditions is met:
(a) The Class 1 circuit conductors and power supply conductors are separated by a solid fixed barrier of a material compatible with the cable tray.
(b) The power supply or Class 1 circuit conductors are in a metal-enclosed case.
(2) In Factory-or Field-Assembled Control Centers. Class 1 circuits and power supply circuits shall be permitted to be installed in factory-or field-assembled control centers.
(3) In a Manhole. Class 1 circuits and power supply circuits shall be permitted to be installed as underground conductors in a manhole in accordance with one of the following:
(a) The power supply or Class 1 circuit conductors are in a metal-enclosed cable or Type VF cable.
(b) The conductors are permanently separated from the power supply conductors by a continuous firmly fixed non-conductor, such as flexible tubing, in addition to the insulation on the wire.
(c) The conductors are permanently and effectively separated from the power supply conductors and securely fastened to racks, insulators, or other approved supports."
Delete the following:
~~(4) In cable trays, where the Class 1 circuit conductors and power supply conductors not functionally associated with them are separated by a solid fixed barrier of a material compatible with the cable tray, or where the power supply or Class 1 circuit conductors are in a metal-enclosed cable.~~
SUBSTANTIATION: Utilization of cable tray for functionally associated Class 1 Circuits and Power Supply Circuits is only implied by this section as presently proposed by ROP #16-51a. Revision to text (by comment) clarifies that Class 1 Circuits and Power Supply Circuits are permitted to occupy the same cable tray where equipment powered is functionally associated. It also provides a clear exception to this statement for non-functionally associated wiring in cable trays. The revised text should prove easier to interpret and enforce, helping designers, installers and inspectors alike.
PANEL ACTION: Reject.
PANEL STATEMENT: The text as recommended in Proposal 16-51a is clear and provides for the use of cable tray. In addition the proposed revision does not comply with the Manual of Style as specified in Section 3.1.4.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
RAO: See my explanation of negative vote on Comment 16-55.

(Log #1431)

16- 60 - (725-26(b)(4)): Reject
SUBMITTER: Kari Barrett, American Chemistry Council
COMMENT ON PROPOSAL NO: 16-51a
RECOMMENDATION: Revise text as follows:
725-26(b)(4) - In cable trays. Class I circuits and power supply circuits shall be permitted to be installed in cable tray.
SUBSTANTIATION: Installing motor leads and motor control wiring (both functionally associated and not functionally associated) in the same cable tray using type TC cable has long been an accepted method of wiring in industry. It has proven to be a reliable and cost effective method. The motor control wiring is sometimes Class I wiring. Incorporating the proposed wording in 725-26(b)(4) would require extraordinary and unnecessary installation methods to ensure separation when the lack of separation has never presented a problem. The Panel proposal already allows mixing these cables in Motor Control Centers per 725-26(b)(2). Revising the wording per my comment will accomplish two things. It will continue to permit a safe, reliable, and cost effective installation method and will also recognize cable tray as a wiring method.
PANEL ACTION: Reject.
PANEL STATEMENT: The intent of the panel is to require that in cable trays 1.) physical separation other than insulation, or 2.) that the power supply circuits be functionally associated with the Class 1 circuits.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
NEGATIVE: 2
EXPLANATION OF NEGATIVE:
HUGHES: See my explanation of negative vote on Comment 16-57.
RAO: See my explanation of negative vote on Comment 16-55.

(Log #1458)

16- 61 - (725-26(b)(4)): Reject
SUBMITTER: Paul E. Guidry, Fluor Daniel, Inc.
COMMENT ON PROPOSAL NO: 16-51a
RECOMMENDATION: This proposal should be rejected.
SUBSTANTIATION: There isn't any logical reason why Class 1 Circuits should be separated from lighting and power circuits, all wiring is rated 600V insulation. In this proposal, the proposed Section 725.26(b)(1) requires a barrier to be placed in a tray to separate Class 1 Circuits from power conductors not functionally associated with them. This isn't necessary. No documented safety hazards were presented in the proposal to warrant this rule. This requirement would place undue hardship on industrial installations.

PANEL ACTION: Reject.
PANEL STATEMENT: Refer to the panel action and statement on Comments 16-57 and 16-60.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
NEGATIVE: 2
EXPLANATION OF NEGATIVE:
HUGHES: See my explanation of negative vote on Comment 16-57.
RAO: See my explanation of negative vote on Comment 16-55.

(Log #1525)

16- 62 - (725-26(b)(4)): Reject
SUBMITTER: Carl J. Fredericks, S. Houston, TX
COMMENT ON PROPOSAL NO: 16-51a
RECOMMENDATION: Revise (b)(4) from the panel proposal as follows:
(4) In cable trays, where all conductors are insulated for the maximum voltage of any conductor in the cable tray, or where the Class I circuit conductors and power-supply conductors not functionally associated with them are separated by a solid fixed barrier of a material compatible with the cable tray, or where the power-supply or Class 1 circuit conductors are in a metal-enclosed cable.
SUBSTANTIATION: It is very common for 600 volt class industrial cable tray installations to include motor power and control (Class 1) conductors for several different motors in the same tray. The cables in the tray may be power-only, control-only, or combined power and control (usually they are a mix of all three), and the motors are generally not directly functionally associated with one another.
This is a very common type of installation and there is no safety problem with it, as long as all conductors are insulated for 600 volts and rated for tray cable service, and the NEC should not disallow it. One way to do so is with the suggested change as given above.
PANEL ACTION: Reject.
PANEL STATEMENT: Refer to the panel action and statement on Comment 16-60.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
NEGATIVE: 2
EXPLANATION OF NEGATIVE:
HUGHES: See my explanation of negative vote on Comment 16-57.
RAO: See my explanation of negative vote on Comment 16-55.

(Log #197)

16- 63 - (725-27(c) (New)): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 16-56
RECOMMENDATION: The Technical Correlating Committe directs the Panel to reconsider the Proposal relative to the incorporation of Article 727 into Article 725. This action will be considered by the Panel as a Public Comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
PANEL STATEMENT: Refer to panel actions and statements on Comments 16-67, 16-68, 16-116, and 16-117.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22
VOTE ON PANEL ACTION:
AFFIRMATIVE: 22

(Log #529)

16- 64 - (725-27(c)): Accept in Part
SUBMITTER: Craig M. Wellman, Newark, DE
COMMENT ON PROPOSAL NO: 16-57
RECOMMENDATION: Please continue to reject this proposal and leave Article 727 as an independent article. In the next code cycle, Article 725 should be split into two or more articles and harmonization with IEC low voltage systems should be considered for adoption.
SUBSTANTIATION: Article 727 was created because it was impossible to modify Article 725 to allow industrial users to meet code requirements. Article 727 is clearly understood and applied by its users in a way that assures safety and code compliance. By having a separate article for its applications much confusion has been eliminated.
Let's keep moving toward a more useable code vs going back to the bad old days. Future usability efforts should focus on improving ease of application of Article 725 as it exists today. That can most readily be accomplished by splitting it into two articles. Another article may be appropriate to enable harmonization with IEC low voltage systems. Providing separate articles for each type of application and its wiring systems greatly improves understanding and reduces code violations
PANEL ACTION: Accept in Part.
PANEL STATEMENT: The panel accepts the recommendation to leave Article 727 as an independent article. The panel rejects that Article 725 should be split.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22
VOTE ON PANEL ACTION:
AFFIRMATIVE: 22

(Log #598)

16- 65 - (725-27(c)): Accept in Part
SUBMITTER: John E. Propst, Equilon Enterprises, LLC
COMMENT ON PROPOSAL NO: 16-56
RECOMMENDATION: The purpose of this comment is to support the action of the panel and to reject the suggestion of the Correlating Committee to reconsider incorporating Article 727 into Article 725.
SUBSTANTIATION: In addition to the substantiation provided by the panel in rejecting this proposal, the clarity of Article 727 should not be compromised by trying to integrate it into the already very confusing Article 725. One of the primary reasons for the creation of Article 727 by CMP 7 was to provide a clear and well defined wiring method that industry could successfully apply to industrial process control because of the existing confusion and misapplication of PLTC cables for industrial controls. In general, ITC wiring is meeting the needs of industry. Trying to integrate Article 727 into 725 will only result in unnecessary confusion and a compromise in safety.
PANEL ACTION: Accept in Part.
PANEL STATEMENT: The panel accepts the comment regarding the support of the panel action. The panel rejects the recommendation to reject reconsideration of the Technical Correlating Committee suggestion.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22
VOTE ON PANEL ACTION:
AFFIRMATIVE: 22

(Log #1426)

16- 66 - (725-27(c)): Reject
SUBMITTER: Kari Barrett, American Chemistry Council
COMMENT ON PROPOSAL NO: 16-56
RECOMMENDATION: Delete entire proposal 16-56 (new section 725-27(c).
SUBSTANTIATION: One of the most confusing and hard to interpret Articles in the NEC is Article 725. When Article 727 was introduced to the NEC in 1996, it permitted an alternate wiring method for circuits that do not exceed 5 amperes and 150 volts. It is particularly suited for instrumentation circuits in industrial establishments where qualified persons perform service and maintenance. Application of Article 727 is very clear and the requirements are easy to understand and interpret. Incorporating Article 727 into Article 725 will only add to the complexity and confusion of an already complex and confusing Article 725.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel cannot "delete" a proposal. The panel has rejected Proposal 16-56 through actions on Comments 16-67 and 16-68.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22
VOTE ON PANEL ACTION:
AFFIRMATIVE: 22

(Log #2067)

16- 67 - (725-27(c) (New)): Reject
SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc.
COMMENT ON PROPOSAL NO: 16-56
RECOMMENDATION: Accept the proposal.
SUBSTANTIATION: The conflicts cited in the substantiation are real and not resolvable in separate articles. The concerns of the Technical Correlating Committee are well founded. This is a better approach.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel reaffirms that Type ITC Cable is limited to specific applications and is not applicable to all Article 725 applications. The submitter has stated that this issue is resolvable but has offered no acceptable solution.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22
VOTE ON PANEL ACTION:
AFFIRMATIVE: 22

(Log #2068)

16- 68 - (725-27(c) (New)): Reject
SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc.
COMMENT ON PROPOSAL NO: 16-56
RECOMMENDATION: Accept the proposal.
SUBSTANTIATION: The conflicts cited in the substantiation are real and not resolvable in separate articles. The concerns of the Technical Correlating Committee are well founded. This is a better approach.
PANEL ACTION: Reject.
PANEL STATEMENT: Refer to the panel action and statement on Comment 16-67.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22
VOTE ON PANEL ACTION:
AFFIRMATIVE: 22

(Log #1427)

16- 69 - (725-42 and 725-10): Reject
SUBMITTER: Kari Barrett, American Chemistry Council
COMMENT ON PROPOSAL NO: 16-62a
RECOMMENDATION: Delete new Section 725-42 and Section 725-10.
SUBSTANTIATION: The need for new Section 725-42 and Section 725-10 is unsupported. There is not adequate substantiation to require Class 2 wiring to be identified when using a higher class wiring method.
PANEL ACTION: Reject.
PANEL STATEMENT: The marking is required. The panel reaffirms its initial action as supported by the substantiation of Proposal 16-62a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
HUGHES: This comment should have been accepted. Identification of Article 725 circuits per their class at all equipment, terminal locations, and junction locations, is a solution to a nonexistent problem. This requirement will add unnecessary cost and will not result in any meaningful practical safeguarding of persons and property from hazards arising from the use of electricity.

(Log #415)

16- 70 - (725-52, 725-42, 725-10): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
COMMENT ON PROPOSAL NO: 16-62a
RECOMMENDATION: Reject proposal.
SUBSTANTIATION: Permission to install Class 2 or 3 circuits using Class 1 wiring methods is unnecessary since it is not presently prohibited. Section 90-3 states Chapters 1, 2, 3, and 4 apply generally except as amended by this chapter. The FPN for 725-1 indicates alternative requirements are given with regard to... and wiring methods. An alternative to Chapter 3 wiring methods is an option, not a requirement.

The Department of Public Works of the City of Los Angeles has for many years specified that all wiring in public buildings be in raceways.

Sections 725-54(a)(1) and Exceptions No. 4(a)(2), (a)(3), Exception No. 1(b)(1)(2)(3)(5), 725-61(b) ex., (e) Exception No. 1 ex., indicate raceway and cable wiring methods.

If these Class 2 and 3 circuits become defacto Class 1 circuits, 725-28 appears to negate the need for proposed Exception No. 1, which doesn't limit the exception to only the reclassified conductors.

Proposed (b) is already in the Code.

I agree with Mr. Hughes' comment re: Proposed 725-10.
PANEL ACTION: Reject.
PANEL STATEMENT: The reason for the change is to provide requirements to describe how to install Class 2 and Class 3 circuits using Class 1 wiring methods. The panel wants to make it clear that wiring methods such as the use of raceway or other Chapter 3 wiring methods are acceptable for Class 2 and 3 circuits as long as they are identified.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
HUGHES: See my explanation of negative vote on Comment 16-69.

(Log #CC1601)

16- 70a - (725-52(a)): Accept
Note: It was the action of the Technical Correlating Committee that the Fine Print Note to 725-52(A) in Proposal 16-62a be removed and a new second sentence be added to 725-52(A), Exception No. 2 of the Recommendation in this Comment to state: "Class 2 and Class 3 circuits reclassified and installed as Class 1 circuits shall not be classified as Class 2 or Class 3 circuits, regardless of the continued connection to a Class 2 or Class 3 power source." This action corrects the violation of the NEC Style Manual prohibiting mandadory language in Fine Print Notes.
SUBMITTER: CMP 16
COMMENT ON PROPOSAL NO: 16-62a
RECOMMENDATION: Renumber Exception No. 3 of the recommendation of Proposal 16-62 as Exception No. 2 and insert into Section 725-52(a) of the committee action of Proposal 16-62a, positioning it between Exception No. 1 and the Fine Print Note (FPN).
Exception No. 2 will read as follows:
Exception No. 2: Class 2 and Class 3 circuits shall be permitted to be reclassified and installed as Class 1 circuits if the Class 2 and Class 3 markings required in Section 725-42 are eliminated and the entire circuit is installed using the wiring methods and materials in accordance with Part B, Class 1 circuits.
SUBSTANTIATION: Panel Proposal 16-62a is a rewrite of Proposal 16-62. The panel made two changes to Proposal 16-62:
1. Deleted Section 725-52(a) Exception No. 2 to correlate with the action to reject Proposal 16-58.
2. Added new Section 725-10 regarding identification of circuits.

Section 725-52(a) Exception No. 3 in Proposal 16-62 was inadvertently omitted from Panel Proposal 16-62a.

The panel statement for Panel Proposal 16-62a addresses the use of Class 2 and Class 3 circuits installed as Class 1 circuits. The panel statement also addresses the need for identification of circuits in the new Section 725-10.

The panel statement does not include substantiation for the deletion of Exception No. 3 in Proposal 16-62 therefore it is apparent that the exception was omitted from Proposal 16-62a. Notes from a CMP-16 member indicates that this Exception should have been included in Proposal 16-62a.

Additionally, if both Exception No. 2 and No. 3 had been deleted in Proposal 16-62a, Exception No. 1 would have been changed to just Exception. This further suggests that the original Exception No. 3 should have been retained as Exception No. 2.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22
VOTE ON PANEL ACTION:
AFFIRMATIVE: 22

(Log #2260)

16- 71 - (725-52(a), FPN): Reject
SUBMITTER: Noel Williams, Noel Williams Consulting
COMMENT ON PROPOSAL NO: 16-62a
RECOMMENDATION: Revise the accepted language by deleting the fine print note following 725-52(a) Exception No. 1.
SUBSTANTIATION: The fine print note concerns reclassification of Class 2 and 3 systems. Nothing in the rule requires or permits reclassification. The section heading and the new language only permit the use of Class 1 wiring methods. The use of Class 1 wiring methods does not necessitate or justify reclassification. The power sources and connected equipment may not be suitable for Class 1 use.
PANEL ACTION: Reject.
PANEL STATEMENT: The FPN provides useful information to the installer and should be retained. Also refer to Comment 16-70a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22
VOTE ON PANEL ACTION:
AFFIRMATIVE: 22

(Log #1880)

16- 72 - (725-54 and 760-55): Accept in Principle
SUBMITTER: Stanley D. Kahn, Tri-City Electric Co., Inc.
COMMENT ON PROPOSAL NO: 16-64
RECOMMENDATION: Reconsider the proposal but revise the wording and substitute the wording in parallel Section 760-55 to read as follows:
725.54. Installation of Conductors and Equipment In Cables, Compartments, Cable Trays, Enclosures, Manholes, Outlet Boxes, Device Boxes and Raceways for Class 2 and Class 3 Circuits. Conductors and equipment for Class 2 and Class 3 circuits shall be installed in accordance with Sections 725.55 through 725.58.
725.55. Separation from Electric Light, Power, Class 1, Non-Power-Limited Fire Alarm Circuit Conductors, and Medium Power Network-Powered Broadband Communications Cables.
725.55.1. Cables and conductors of Class 2 and Class 3 circuits shall not be placed in any cable, cable tray, compartment, enclosure, manhole, outlet box, device box, raceway, or similar fitting with conductors of electric light, power, Class 1, non-power-limited fire alarm circuits, and medium power network-powered broadband communications circuits unless permitted by 725.55.2 through 725.55.10 below.
725.55.2. Class 2 and Class 3 circuits shall be permitted to be installed together with Class 1, non-power-limited fire alarm, and medium power network-powered broadband communications circuits when they are separated by a barrier.
725.55.3. In enclosures, Class 2 and Class 3 circuits shall be permitted to be installed in a raceway to separate them from Class 1, non-power-limited fire alarm, and medium power network-powered broadband communications circuits.
725.55.4. Class 2 and Class 3 circuit conductors in compartments, enclosures, device boxes, outlet boxes, or similar fittings shall be permitted to be installed with Class 1, non-power-limited fire alarm, and medium power network-powered broadband communications circuits where they are introduced solely to connect the equipment connected to Class 2 and Class 3 circuits, and
725.55.4.1. The electric light, power, Class 1, non-power-limited fire alarm, and medium power network-powered broadband communications circuit conductors are routed to maintain a minimum of 6 mm (0.25 in) separation form the conductors or cables of Class 2 and Class 3 circuits, or
725.55.4.2. The circuit conductors operate at 150 volts or less to ground and also comply with one of the following:

(a) The Class 2 and Class 3 circuits are installed using Type CL3, CL3R, or CL3P or permitted substitute cables, provided these Class 3 cable conductors extending beyond the jacket are separated by a minimum of 6 mm (0.25 in) or by a nonconductive sleeve or nonconductive barrier from all other conductors, or

(b) The Class 2 and Class 3 circuit conductors are installed as a Class 1 circuit in accordance with Section 725.21.

725.55.5. Class 2 and Class 3 circuit conductors entering compartments, enclosures, device boxes, outlet boxes, or similar fittings shall be permitted to be installed with Class 1, non-power-limited fire alarm, and medium power network-powered broadband communications circuits where they are introduced solely to connect the equipment connected to Class 2 and Class 3 circuits and if they must enter an enclosure that is provided with a single opening, they shall be permitted to enter through a single fitting (such as a tee) provided the conductors are separated from the conductors of the other circuits by a continuous and firmly fixed nonconductor, such as flexible tubing.
725.55.6. Underground Class 2 and Class 3 circuit conductors in a manhole shall be permitted to be installed with Class 1, non-power-limited fire alarm, and medium power network-powered broadband communications circuits where one of the following conditions is met.
725.55.6.1. The electric light, power, Class 1, non-power-limited fire alarm, and medium power network-powered broadband communications circuit conductors are in a metal-enclosed cable or Type UF cable.
725.55.6.2. The Class 2 and Class 3 circuit conductors are permanently and effectively separated from the conductors of other circuits by a continuous and firmly fixed nonconductor, such as flexible tubing, in addition to the insulation or covering on the wire.
725.55.6.3. The Class 2 and Class 3 circuit conductors are permanently and effectively separated from conductors of the other circuits and securely fastened to racks, insulators, or other approved supports.
725.55.7. Class 2 and Class 3 conductors as permitted by Section 780-6(a) shall be permitted to be installed in accordance with Article 780.
725.55.8. Class 2 and Class 3 circuit conductors shall be permitted to be installed in cable trays, where the conductors of the electric light, Class 1 and non-power-limited fire alarm circuits are separated by a solid fixed barrier of a material compatible with the cable tray or where the Class 2 or Class 3 circuits are installed in Type MC cable.
725.55.9. In hoistways, Class 2 or Class 3 circuit conductors shall be installed in rigid metal conduit, rigid nonmetallic conduit, intermediate metal conduit or electrical metallic tubing. For elevators or similar equipment, these conductors shall be permitted to be installed as provided in Section 620.21.
725.55.10. For other applications, conductors of Class 2 and Class 3 circuits shall be separated by at least 50 mm (2 in) from conductors of any electric light, power, Class 1 non- power-limited fire alarm, or medium power network-powered broadband communications circuits unless one of the following conditions are met:
725.55.10.1. Either (a) all of the electric light, power, Class 1, non-power-limited fire alarm, and medium power network-powered broadband circuit conductors or (b) all of the Class 2 and Class 3 circuit conductors are in a raceway or in metal sheathed, metal clad, non-metallic-sheathed, or Type UF cables.
725.55.10.2. All of the electric light, power, Class 1 non-power-limited fire alarm, and medium power network-powered broadband communication circuit conductors are permanently separated from all of the Class 2 and Class 3 circuit conductors by a continuous and firmly fixed nonconductor, such as porcelain tubes or flexible tubing, in addition to the insulation on the conductors.
725.56. Installation of Conductors of Different Circuits in the Same Cable, Enclosure, or Raceway.
725.56.1 Two or More Class 2 Circuits. Conductors of two or more Class 2 circuits shall be permitted within the same cable, enclosure or raceway.
725.56.2 Two or More Class 3 Circuits. Conductors of two or more Class 3 circuits shall be permitted within the same cable, enclosure or raceway.
725.56.3. Class 2 Circuits with Class 3 Circuits. Conductors of one or more Class 2 circuits shall be permitted within the same cable, enclosure or raceway with conductors of Class 3 circuits, provided that the insulation of the Class 2 circuit conductors in the cable, enclosure or raceway is at least that required for Class 3 circuits.
725.56.4 Class 2 and Class 3 Circuits with Communications Circuits.
725.56.4.1. Class 2 and Class 3 circuit conductors shall be permitted in the same cable with communications circuits in which case the Class 2 and Class 3 circuits shall be classified as communications circuits and shall be installed in accordance with the requirements of Article 800. The cables shall be listed as communications cables or multipurpose cables.
725.56.4.2. Cables constructed of individually listed Class 2, Class 3 and communications cables under a common jacket shall be permitted to be classified as communications cables. The fire-resistance rating of the composite cable shall be determined by the performance of the composite cable.
725.56.5. Class 2 or Class 3 Cables with Other Circuit Cables. Jacketed cables of Class 2 or Class 3 circuits shall be permitted in the same enclosure or raceway with jacketed cables of any of the following:

(a) Power-limited fire alarm systems in compliance with Article 760.

(b) Nonconductive and conductive optical fiber cables in compliance with Article 770.

(c) Communications circuits in compliance with Article 800.

(d) Community antenna television and radio distribution systems in compliance with Article 820.

(e)Low power network-powered broadband communications in compliance with Article 830.

725.57. Installation of Circuit Conductors Extending Beyond One Building. Where Class 2 or Class 3 circuit conductors extend beyond one building and are run so as to be subject to accidental contact with electric light or power conductors operating over 300 volts to ground, or are exposed to lightning on inter building circuits on the same premise, the requirements of the following shall also apply:

(a) Sections 800.10, 800.12, 800.13, 800.31, 800.32, 800.33 and 800.40 for other than coaxial conductors.

(b) Sections 820.10, 820.33 and 820.40 for coaxial conductors.

725.58. Support of Conductors. Class 2 or Class 3 circuit conductors shall not be strapped, taped or attached by any means to the exterior of any conduit or other raceway as a means of support. These conductors shall be permitted to be installed as permitted by Section 300.11(b)(2).

760.54. Installation of Conductors and Equipment In Cables, Compartments, Cable Trays, Enclosures, Manholes, Outlet Boxes, Device Boxes and Raceways for Power-Limited Circuits.

Conductors and equipment for power-limited fire alarm circuits shall be installed in accordance with Sections 760.55 through 760.58.

760.55. Separation from Electric Light, Power, Class 1, NPLFA, and Medium Power Network-Powered Broadband Communications Circuit Conductors.

760.55.1. Power-limited fire alarm circuit cables and conductors shall not be placed in any cable, cable tray, compartment, enclosure, manhole, outlet box, device box, raceway, or similar fitting with conductors of electric light, power, Class 1, non-power-limited fire alarm circuits, and medium power network-powered broadband communications circuits unless permitted by 760.55.2 through 760.55.7 below.

760.55.2. Power-limited fire alarm circuit cables shall be permitted to be installed together with Class 1, non-power-limited fire alarm, and medium power network-powered broadband communications circuits when they are separated by a barrier.

760.55.3. In enclosures, power-limited fire alarm circuits shall be permitted to be installed in a raceway within the enclosure to separate them from Class 1, non-power-limited fire alarm, and medium power network-powered broadband communications circuits.

760.55.4. Power-limited fire alarm conductors in compartments, enclosures, device boxes, outlet boxes, or similar fittings shall be permitted to be installed with Class 1, non-power-limited fire alarm, and medium power network-powered broadband communications circuits where they are introduced solely to connect the equipment connected to Class 2 and Class 3 circuits, and

760.55.4.1. The electric light, power, Class 1, non-power-limited fire alarm, and medium power network-powered broadband communications circuit conductors are routed to maintain a minimum of 6 mm (0.25 in) separation form the conductors or cables of Class 2 and Class 3 circuits, or

760.55.4.2. The circuit conductors operate at 150 volts or less to ground and also comply with one of the following:

(a) The fire alarm power-limited circuits are installed using Type FPL, FPLR, FPLP or permitted substitute cables, provided these power-limited cable conductors extending beyond the jacket are separated by a minimum of 6 mm (0.25 in) or by a nonconductive sleeve or nonconductive barrier from all other conductors, or

(b) The power-limited fire alarm circuit conductors are installed as non-power-limited circuits in accordance with Section 760.25.

760.55.5. Power-limited fire alarm circuit conductors entering compartments, enclosures, device boxes, outlet boxes, or similar fittings shall be permitted to be installed with Class 1, non-power-limited fire alarm, and medium power network-powered broadband communications circuits where they are introduced solely to connect the equipment connected to power-limited fire alarm circuits or to other circuits controlled by the fire alarm system to which the other conductors in the enclosure are connected and if they must enter an enclosure that is provided with a single opening, they shall be permitted to enter through a single fitting (such as a tee) provided the conductors are separated from the conductors of the other circuits by a continuous and firmly fixed nonconductor, such as flexible tubing.

760.55.6. In hoistways, power-limited fire alarm circuit conductors shall be installed in rigid metal conduit, rigid non-metallic conduit, intermediate metal conduit or electrical metallic tubing. For elevators or similar equipment, these conductors shall be permitted to be installed as provided in Section 620.21.

760.55.7. For other applications power-limited fire alarm circuit conductors shall be separated by at least 50 mm (2 in) from conductors of any electric light, power, Class 1 non-power-limited fire alarm, or medium power network-powered broadband communications circuits unless one of the following conditions are met:

760.55.7.1. Either (a) all of the electric light, power, Class 1, non-power-limited fire alarm, and medium power network-powered broadband circuit conductors or (b) all of the power-limited fire alarm circuit conductors are in a raceway or in metal sheathed, metal clad, nonmetallic-sheathed, or Type UF cables.

760.55.7.2. All of the electric light, power, Class 1 non-power-limited fire alarm, and medium power network-powered broadband communication circuit conductors are permanently separated from all of the power-limited fire alarm circuit conductors by a continuous and firmly fixed nonconductor, such as porcelain tubes or flexible tubing, in addition to the insulation on the conductors.

760.56. Installation of Conductors of Different PLFA Circuits, Class 2, Class 3 and Communications Circuits in the Same Cable, Enclosure, or Raceway.

760.56.1 Two or More PLFA Circuits. Cable and conductors of two or more power-limited fire alarm circuits, communications circuits or Class 3 circuits shall be permitted within the same cable, enclosure or raceway.

760.56.2. Class 2 Circuits with PLFA Circuits. Conductors of one or more Class 2 circuits shall be permitted within the same cable, enclosure or raceway with conductors of power-limited fire alarm circuits, provided that the insulation of the Class 2 circuit conductors in the cable, enclosure or raceway is at least that required by the power-limited fire alarm circuits.

760.56.3. Low Power Network-Powered Broadband Communications Cables and PLFA Cables. Low power network-powered broadband communication circuits shall be permitted in the same enclosure or raceway with PLFA cables.

760.57. Support of Conductors. Power-limited fire alarm circuit conductors shall not be strapped, taped or attached by any means to the exterior of any conduit or other raceway as a means of support.

760.58. Conductor Size. Conductors of No. 26 shall only be permitted where spliced with a connector listed as suitable for No. 26 to No. 24 or larger conductors that are terminated on equipment or where the No. 26 conductors are terminated on equipment listed as suitable for No. 26 conductors. Single conductors shall not be smaller than No. 18.

SUBSTANTIATION: The Exceptions are changed to positive code language in compliance with 3.1.4.2 of the Style Manual. In accordance with the Panel Statement for this Proposal, the wording and arrangement have been modified to completely and clearly reflect all the requirements and permitted methods. Section 760-55 for fire alarm cables which parallels the requirements of Section 725-54 for Class 2 and Class 3 wiring has been similarly changed for consistency of presentation. There have been no changes in the technical requirements.

PANEL ACTION: Accept in Principle.

Revise the recommendation to read as follows:

725.54. Installation of Conductors and Equipment In Cables, Compartments, Cable Trays, Enclosures, Manholes, Outlet Boxes, Device Boxes and Raceways for Class 2 and Class 3 Circuits.

Conductors and equipment for Class 2 and Class 3 circuits shall be installed in accordance with Sections 725.55 through 725.58.

725.55. Separation from Electric Light, Power, Class 1, Non-Power-Limited Fire Alarm Circuit Conductors, and Medium Power Network-Powered Broadband Communications Cables.

725.55.1. Cables and conductors of Class 2 and Class 3 circuits shall not be placed in any cable, cable tray, compartment, enclosure, manhole, outlet box, device box, raceway, or similar fitting with conductors of electric light, power, Class 1, non-power-limited fire alarm circuits, and medium power network-powered broadband communications circuits unless permitted by 725.55.2 through 725.55.10 below.

725.55.2. Class 2 and Class 3 circuits shall be permitted to be installed together with Class 1, non-power-limited fire alarm, and medium power network-powered broadband communications circuits ~~when~~ where they are separated by a barrier.

725.55.3. In enclosures, Class 2 and Class 3 circuits shall be permitted to be installed in a raceway to separate them from Class 1, non-power-limited fire alarm, and medium power network-powered broadband communications circuits.
725.55.4. Class 2 and Class 3 circuit conductors in compartments, enclosures, device boxes, outlet boxes, or similar fittings shall be permitted to be installed with electric light, power, Class 1, non-power-limited fire alarm, and medium power network-powered broadband communications circuits where they are introduced solely to connect the equipment connected to Class 2 and Class 3 circuits, and
725.55.4.1. The electric light, power, Class 1, non-power-limited fire alarm, and medium power network-powered broadband communications circuit conductors are routed to maintain a minimum of 6 mm (0.25 in) separation ~~form~~ from the conductors ~~or~~ and cables of Class 2 and Class 3 circuits, or
725.55.4.2. The circuit conductors operate at 150 volts or less to ground and also comply with one of the following:
(a) The Class 2 and Class 3 circuits are installed using Type CL3, CL3R, or CL3P or permitted substitute cables, provided these Class 3 cable conductors extending beyond the jacket are separated by a minimum of 6 mm (0.25 in) or by a nonconductive sleeve or nonconductive barrier from all other conductors, or
(b) The Class 2 and Class 3 circuit conductors are installed as a Class 1 circuit in accordance with Section 725.21.
725.55.5. Class 2 and Class 3 circuit conductors entering compartments, enclosures, device boxes, outlet boxes, or similar fittings shall be permitted to be installed with Class 1, non-power-limited fire alarm, and medium power network-powered broadband communications circuits where they are introduced solely to connect the equipment connected to Class 2 and Class 3 circuits and if they must enter an enclosure that is provided with a single opening, they shall be permitted to enter through a single fitting (such as a tee) provided the conductors are separated from the conductors of the other circuits by a continuous and firmly fixed nonconductor, such as flexible tubing.
725.55.6. Underground Class 2 and Class 3 circuit conductors in a manhole shall be permitted to be installed with Class 1, non-power-limited fire alarm, and medium power network-powered broadband communications circuits where one of the following conditions is met.
725.55.6.1. The electric light, power, Class 1, non-power-limited fire alarm, and medium power network-powered broadband communications circuit conductors are in a metal-enclosed cable or Type UF cable.
725.55.6.2. The Class 2 and Class 3 circuit conductors are permanently and effectively separated from the conductors of other circuits by a continuous and firmly fixed nonconductor, such as flexible tubing, in addition to the insulation or covering on the wire.
725.55.6.3. The Class 2 and Class 3 circuit conductors are permanently and effectively separated from conductors of the other circuits and securely fastened to racks, insulators, or other approved supports.
725.55.7. Class 2 and Class 3 conductors as permitted by Section 780-6(a) shall be permitted to be installed in accordance with Article 780.
725.55.8. Class 2 and Class 3 circuit conductors shall be permitted to be installed in cable trays, where the conductors of the electric light, Class 1 and non-power-limited fire alarm circuits are separated by a solid fixed barrier of a material compatible with the cable tray or where the Class 2 or Class 3 circuits are installed in Type MC cable.
725.55.9. In hoistways, Class 2 or Class 3 circuit conductors shall be installed in rigid metal conduit, rigid nonmetallic conduit, intermediate metal conduit, liquidtight flexible nonmetallic conduit or electrical metallic tubing. For elevators or similar equipment, these conductors shall be permitted to be installed as provided in Section 620.21.
725.55.10. For other applications, conductors of Class 2 and Class 3 circuits shall be separated by at least 50 mm (2 in) from conductors of any electric light, power, Class 1 non- power-limited fire alarm, or medium power network-powered broadband communications circuits unless one of the following conditions are met:
725.55.10.1. Either (a) all of the electric light, power, Class 1, non-power-limited fire alarm, and medium power network-powered broadband communications circuit conductors or (b) all of the Class 2 and Class 3 circuit conductors are in a raceway or in metal sheathed, metal clad, non-metallic-sheathed, or Type UF cables.
725.55.10.2. All of the electric light, power, Class 1 non-power-limited fire alarm, and medium power network-powered broadband communications circuit conductors are permanently separated from all of the Class 2 and Class 3 circuit conductors by a continuous and firmly fixed nonconductor, such as porcelain tubes or flexible tubing, in addition to the insulation on the conductors.
725.56. Installation of Conductors of Different Circuits in the Same Cable, Enclosure, or Raceway.
725.56.1 Two or More Class 2 Circuits. Conductors of two or more Class 2 circuits shall be permitted within the same cable, enclosure or raceway.
725.56.2 Two or More Class 3 Circuits. Conductors of two or more Class 3 circuits shall be permitted within the same cable, enclosure or raceway.
725.56.3. Class 2 Circuits with Class 3 Circuits. Conductors of one or more Class 2 circuits shall be permitted within the same cable, enclosure or raceway with conductors of Class 3 circuits, provided that the insulation of the Class 2 circuit conductors in the cable, enclosure or raceway is at least that required for Class 3 circuits.
725.56.4 Class 2 and Class 3 Circuits with Communications Circuits.
725.56.4.1. Class 2 and Class 3 circuit conductors shall be permitted in the same cable with communications circuits in which case the Class 2 and Class 3 circuits shall be classified as communications circuits and shall be installed in accordance with the requirements of Article 800. The cables shall be listed as communications cables or multipurpose cables.
725.56.4.2. Cables constructed of individually listed Class 2, Class 3 and communications cables under a common jacket shall be permitted to be classified as communications cables. The fire-resistance rating of the composite cable shall be determined by the performance of the composite cable.
725.56.5. Class 2 or Class 3 Cables with Other Circuit Cables. Jacketed cables of Class 2 or Class 3 circuits shall be permitted in the same enclosure or raceway with jacketed cables of any of the following:
(a) Power-limited fire alarm systems in compliance with Article 760.
(b) Nonconductive and conductive optical fiber cables in compliance with Article 770.
(c) Communications circuits in compliance with Article 800.
(d) Community antenna television and radio distribution systems in compliance with Article 820.
(e) Low power network-powered broadband communications in compliance with Article 830.
725.57. Installation of Circuit Conductors Extending Beyond One Building. Where Class 2 or Class 3 circuit conductors extend beyond one building and are run so as to be subject to accidental contact with electric light or power conductors operating over 300 volts to ground, or are exposed to lightning on inter building circuits on the same premise, the requirements of the following shall also apply:
(a) Sections 800.10, 800.12, 800.13, 800.31, 800.32, 800.33 and 800.40 for other than coaxial conductors.
(b) Sections 820.10, 820.33 and 820.40 for coaxial conductors.
725.58. Support of Conductors. Class 2 or Class 3 circuit conductors shall not be strapped, taped or attached by any means to the exterior of any conduit or other raceway as a means of support. These conductors shall be permitted to be installed as permitted by Section 300.11(b)(2).
760.54. Installation of Conductors and Equipment In Cables, Compartments, Cable Trays, Enclosures, Manholes, Outlet Boxes, Device Boxes and Raceways for Power-Limited Circuits.
Conductors and equipment for power-limited fire alarm circuits shall be installed in accordance with Sections 760.55 through 760.58.
760.55. Separation from Electric Light, Power, Class 1, NPLFA, and Medium Power Network-Powered Broadband Communications Circuit Conductors.
760.55.1. Power-limited fire alarm circuit cables and conductors shall not be placed in any cable, cable tray, compartment, enclosure, manhole, outlet box, device box, raceway, or similar fitting with conductors of electric light, power, Class 1, non-power-limited fire alarm circuits, and medium power network-powered broadband communications circuits unless permitted by 760.55.2 through 760.55.7 below.
760.55.2. Power-limited fire alarm circuit cables shall be permitted to be installed together with Class 1, non-power-limited fire alarm, and medium power network-powered broadband communications circuits ~~when~~ where they are separated by a barrier.
760.55.3. In enclosures, power-limited fire alarm circuits shall be permitted to be installed in a raceway within the enclosure to separate them from Class 1, non-power-limited fire alarm, and

medium power network-powered broadband communications circuits.
760.55.4. Power-limited fire alarm conductors in compartments, enclosures, device boxes, outlet boxes, or similar fittings shall be permitted to be installed with electric light, power, Class 1, non-power-limited fire alarm, and medium power network-powered broadband communications circuits where they are introduced solely to connect the equipment connected to Class 2 and Class 3 circuits, and
760.55.4.1. The electric light, power, Class 1, non-power-limited fire alarm, and medium power network-powered broadband communications circuit conductors are routed to maintain a minimum of 6 mm (0.25 in) separation ~~form~~ from the conductors ~~or~~ and cables of Class 2 and Class 3 circuits, or
760.55.4.2. The circuit conductors operate at 150 volts or less to ground and also comply with one of the following:
(a) The fire alarm power-limited circuits are installed using Type FPL, FPLR, FPLP or permitted substitute cables, provided these power-limited cable conductors extending beyond the jacket are separated by a minimum of 6 mm (0.25 in) or by a nonconductive sleeve or nonconductive barrier from all other conductors, or
(b) The power-limited fire alarm circuit conductors are installed as non-power-limited circuits in accordance with Section 760.25.
760.55.5. Power-limited fire alarm circuit conductors entering compartments, enclosures, device boxes, outlet boxes, or similar fittings shall be permitted to be installed with electric light, power, Class 1, non-power-limited fire alarm, and medium power network-powered broadband communications circuits where they are introduced solely to connect the equipment connected to power-limited fire alarm circuits or to other circuits controlled by the fire alarm system to which the other conductors in the enclosure are connected and if they must enter an enclosure that is provided with a single opening, they shall be permitted to enter through a single fitting (such as a tee) provided the conductors are separated from the conductors of the other circuits by a continuous and firmly fixed nonconductor, such as flexible tubing.
760.55.6. In hoistways, power-limited fire alarm circuit conductors shall be installed in rigid metal conduit, rigid non-metallic conduit, intermediate metal conduit, liquidtight flexible nonmetallic conduit or electrical metallic tubing. For elevators or similar equipment, these conductors shall be permitted to be installed as provided in Section 620.21.
760.55.7. For other applications power-limited fire alarm circuit conductors shall be separated by at least 50 mm (2 in) from conductors of any electric light, power, Class 1 non-power-limited fire alarm, or medium power network-powered broadband communications circuits unless one of the following conditions are met:
760.55.7.1. Either (a) all of the electric light, power, Class 1, non-power-limited fire alarm, and medium power network-powered broadband communications circuit conductors or (b) all of the power-limited fire alarm circuit conductors are in a raceway or in metal sheathed, metal clad, nonmetallic-sheathed, or Type UF cables.
760.55.7.2. All of the electric light, power, Class 1, non-power-limited fire alarm, and medium power network-powered broadband communications circuit conductors are permanently separated from all of the power-limited fire alarm circuit conductors by a continuous and firmly fixed nonconductor, such as porcelain tubes or flexible tubing, in addition to the insulation on the conductors.
760.56. Installation of Conductors of Different PLFA Circuits, Class 2, Class 3 and Communications Circuits in the Same Cable, Enclosure, or Raceway.
760.56.1 Two or More PLFA Circuits. Cable and conductors of two or more power-limited fire alarm circuits, communications circuits or Class 3 circuits shall be permitted within the same cable, enclosure or raceway.
760.56.2. Class 2 Circuits with PLFA Circuits. Conductors of one or more Class 2 circuits shall be permitted within the same cable, enclosure or raceway with conductors of power-limited fire alarm circuits, provided that the insulation of the Class 2 circuit conductors in the cable, enclosure or raceway is at least that required by the power-limited fire alarm circuits.
760.56.3. Low Power Network-Powered Broadband Communications Cables and PLFA Cables. Low power network-powered broadband communications circuits shall be permitted in the same enclosure or raceway with PLFA cables.
760.57. Support of Conductors. Power-limited fire alarm circuit conductors shall not be strapped, taped or attached by any means to the exterior of any conduit or other raceway as a means of support.
760.58. Conductor Size. Conductors of No. 26 shall only be permitted where spliced with a connector listed as suitable for No. 26 to No. 24 or larger conductors that are terminated on equipment or where the No. 26 conductors are terminated on equipment listed as suitable for No. 26 conductors. Single conductors shall not be smaller than No. 18.
PANEL STATEMENT: The changes made to the recommended text are editorial in nature and provide consistent language.
Revisions have also been made to reflect the intent of the recommendation in Comment 16-73 by adding "liquidtight flexible nonmetallic conduit" in appropriate places.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22
VOTE ON PANEL ACTION:
AFFIRMATIVE: 22

(Log #198)

16- 73 - (725-54(2)): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 16-66
RECOMMENDATION: The Technical Correlating Committee directs that the Panel clarify the action on this Proposal. The Panel Action adds 620-37 in the Exception and refers to the Panel Action on Proposal 16-64. The Technical Correlating Committee notes that Proposal 16-64 was rejected so there is no action on it. The Technical Correlating Committee directs that this Proposal be forwarded to Code-Making Panel 12 for information. This action will be considered by the Panel as a Public Comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
PANEL STATEMENT: Refer to panel action and statement on Comment 16-72.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22
VOTE ON PANEL ACTION:
AFFIRMATIVE: 22

(Log #1094)

16- 74 - (725-54(e)): Accept in Principle
SUBMITTER: Marcelo M. Hirschler, GBH International/Rep. Plenum Cable Association and Fire Retardant Chemicals Assoc.
COMMENT ON PROPOSAL NO: 16-80
RECOMMENDATION: Continue accepting this proposal in principle, by retaining the phrase: "Abandoned cables, not intended for future use shall not be permitted to remain."
SUBSTANTIATION: There is a potential for increased fire hazard or fire risk when any cable, irrespective of whether it is or is not limited combustible, remains as fuel load unnecessarily once it has been taken out of use. Materials that are limited combustible can also burn (i.e., they are not noncombustible) and also increase the fire load. Furthermore, all abandoned cables can also affect the safety of plenums because of their weight. There is, thus, no justification for permitting any cable to remain in a plenum once it is abandoned and not intended for future use.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Refer to panel action and statement on Comment 16-83.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22
VOTE ON PANEL ACTION:
AFFIRMATIVE: 22

(Log #1266)

16- 75 - (725-54(e) (New)): Accept in Principle
SUBMITTER: Allen C. Weidman, The Society of the Plastics Industry, Inc.
COMMENT ON PROPOSAL NO: 16-74
RECOMMENDATION: We support the action of the Panel.
SUBSTANTIATION: None given.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Refer to the panel action and statement on Comment 16-83.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21
ABSTENTION: 1

EXPLANATION OF ABSTENTION:
CAUDILL: The Society of the Plastics Industries could not reach a consensus position on this issue.

(Log #1267)

16- 76 - (725-54(e) (New)): Accept in Principle
SUBMITTER: Allen C. Weidman, The Society of the Plastics Industry, Inc.
COMMENT ON PROPOSAL NO: 16-75
RECOMMENDATION: We support the action of the Panel.
SUBSTANTIATION: None given.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Refer to the panel action and statement on Comment 16-83.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21
ABSTENTION: 1
EXPLANATION OF ABSTENTION:
CAUDILL: The Society of the Plastics Industries could not reach a consensus position on this issue.

(Log #1268)

16- 77 - (725-54(e) (New)): Accept in Principle
SUBMITTER: Allen C. Weidman, The Society of the Plastics Industry, Inc.
COMMENT ON PROPOSAL NO: 16-76
RECOMMENDATION: We support the action of the Panel.
SUBSTANTIATION: None given.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Refer to the panel action and statement on Comment 16-83.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21
ABSTENTION: 1
EXPLANATION OF ABSTENTION:
CAUDILL: The Society of the Plastics Industries could not reach a consensus position on this issue.

(Log #1269)

16- 78 - (725-54(e)): Accept in Principle
SUBMITTER: Allen C. Weidman, The Society of the Plastics Industry, Inc.
COMMENT ON PROPOSAL NO: 16-77
RECOMMENDATION: We support the action of the Panel.
SUBSTANTIATION: None given.
Note: Supporting Material is available for review at NFPA Headquarters.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Refer to the panel action and statement on Comment 16-83.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21
ABSTENTION: 1
EXPLANATION OF ABSTENTION:
CAUDILL: The Society of the Plastics Industries could not reach a consensus position on this issue.

(Log #1270)

16- 79 - (725-54(e)): Accept in Principle
SUBMITTER: Allen C. Weidman, The Society of the Plastics Industry, Inc.
COMMENT ON PROPOSAL NO: 16-78
RECOMMENDATION: We support the action of the Panel.
SUBSTANTIATION: None given.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Refer to the panel action and statement on Comment 16-83.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21
ABSTENTION: 1
EXPLANATION OF ABSTENTION:
CAUDILL: The Society of the Plastics Industries could not reach a consensus position on this issue.

(Log #1271)

16- 80 - (725-54(e) (New)): Accept in Principle
SUBMITTER: Allen C. Weidman, The Society of the Plastics Industry, Inc.
COMMENT ON PROPOSAL NO: 16-79
RECOMMENDATION: We support the action of the Panel.
SUBSTANTIATION: None given.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Refer to the panel action and statement on Comment 16-83.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21
ABSTENTION: 1
EXPLANATION OF ABSTENTION:
CAUDILL: The Society of the Plastics Industries could not reach a consensus position on this issue.

(Log #1272)

16- 81 - (725-54(e) (New)): Accept in Principle
SUBMITTER: Allen C. Weidman, The Society of the Plastics Industry, Inc.
COMMENT ON PROPOSAL NO: 16-80
RECOMMENDATION: We support the action of the Panel.
SUBSTANTIATION: None given.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Refer to panel action and statement on Comment 16-83.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21
ABSTENTION: 1
EXPLANATION OF ABSTENTION:
CAUDILL: The Society of the Plastics Industries could not reach a consensus position on this issue.

(Log #1745)

16- 82 - (725-54(e) (New)): Accept in Principle
SUBMITTER: Francis W. Peri, Communications Design Corporation
COMMENT ON PROPOSAL NO: 16-80
RECOMMENDATION: Abandoned cables shall not be permitted to remain.
SUBSTANTIATION: Association of Cabling Professionals (ACP) supports the panel actions to accept the BICSI proposal in principle, and further broaden it beyond removal of abandoned cable from ducts, plenums, and other spaces used for environmental air to also include risers and hollow spaces. We support this action in the interest of fire safety. ACP also supports removal of the phrase "for future use" which is redundant.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Refer to panel action and statement on Comment 16-83.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22
VOTE ON PANEL ACTION:
AFFIRMATIVE: 22

(Log #1857)

16- 83 - (725-54(e)): Accept in Principle
SUBMITTER: Robert W. Jensen, dbi-Telecommunications Infrastructure Design
COMMENT ON PROPOSAL NO: 16-80
RECOMMENDATION: Abandoned cables shall not be permitted to remain.
SUBSTANTIATION: We recognize the Panel action to accept our proposal in principle, broadened it's impact from requiring cable to be removed from ducts, plenums, and other spaces used for environmental air to also include risers and hollow spaces. We support this action in the interest of fire safety. We also removed the phrase "for future use" because it is redundant.

PANEL ACTION: Accept in Principle.
Revise the second sentence of 725-3(a) in the panel action of Proposal 16-80 to read as follows:
The accessible portion of abandoned Class 2, Class 3 and PLTC cables shall not be permitted to remain.
PANEL STATEMENT: The intent is not to remove cables where it would be extremely difficult or damaging to the building or the remaining cables.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22
VOTE ON PANEL ACTION:
AFFIRMATIVE: 22

(Log #1083)
16- 84 - (725-54(e), Exception): Accept
SUBMITTER: Marcelo M. Hirschler, GBH International/Rep. Plenum Cable Association and Fire Retardant Chemicals Assoc.
COMMENT ON PROPOSAL NO: 16-74
RECOMMENDATION: Continue rejecting the exception for permitting cable to be listed as limited combustible to remain in plenums, in particular CL2P-50 and CL3P-50.
SUBSTANTIATION: Materials that are limited combustible can burn (i.e., they are not noncombustible) and increase the fire load. Therefore, there is a potential for increased fire hazard or fire risk when any cable irrespective of whether it is or is not limited combustible, remains as fuel load unnecessarily once it has been taken out of use. Furthermore, all abandoned cables can also affect the safety of plenums because of their weight. There is, thus, no justification for permitting a "limited combustible" cable to remain in a plenum once it is abandoned and not intended for future use.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22
VOTE ON PANEL ACTION:
AFFIRMATIVE: 22

(Log #1084)
16- 85 - (725-54(e), Exception): Accept
Note: "See Technical Correlating Committee action on Comment 16-98."
SUBMITTER: Marcelo M. Hirschler, GBH International/Rep. Plenum Cable Association and Fire Retardent Chemicals Assoc.
COMMENT ON PROPOSAL NO: 16-75
RECOMMENDATION: Continue rejecting the exception for permitting cable to be listed as limited combustible to remain in plenums, in particular CL2P-50 and CL3P-50.
SUBSTANTIATION: Materials that are limited combustible can burn (i.e., they are not noncombustible) and increase the fire load. Therefore, there is a potential for increased fire hazard or fire risk when any cable, irrespective of whether it is or is not limited combustible, remains as fuel load unnecessarily once it has been taken out of use. Furthermore, all abandoned cables can also affect the safety of plenums because of their weight. There is, thus, no justification for permitting a "limited combustible" cable to remain in a plenum once it is abandoned and not intended for use.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22
VOTE ON PANEL ACTION:
AFFIRMATIVE: 22

(Log #1085)
16- 86 - (725-54(e), Exception): Accept
SUBMITTER: Marcelo M. Hirschler, GBH International/Rep. Plenum Cable Association and Fire Retardant Chemicals Assoc.
COMMENT ON PROPOSAL NO: 16-77
RECOMMENDATION: Continue rejecting the exception for permitting cable to be listed as limited combustible to remain in plenums, in particular CL2PP and CL3PP.
SUBSTANTIATION: Materials that are limited combustible can burn (i.e., they are not noncombustible) and increase the fire load. Therefore, there is a potential for increased fire hazard or fire risk when any cable, irrespective of whether it is or is not limited combustible, remains as fuel load unnecessarily once it has been taken out of use. Furthermore, all abandoned cables can also affect the safety of plenums because of their weight. There is, thus, no justification for permitting a "limited combustible" cable to remain in a plenum once it is abandoned and not intended for future use.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22
VOTE ON PANEL ACTION:
AFFIRMATIVE: 22

(Log #1881)
16- 87 - (725-61, 760-61, 770-53, 800-53, 820-53, and 830-55): Accept
SUBMITTER: Stanley D. Kahn, Tri-City Electric Co., Inc.
COMMENT ON PROPOSAL NO: 16-81
RECOMMENDATION: Reconsider the proposal but revise the wording including Approved Proposals 16-82 and 16-83, substitute the wording in parallel Sections 760-61, 770-53, 800-53, 820-53 and 830-53 and move Section 800-52(d) into Section 800.53 renumbering 800-53(e) as 800-52(d) to read as follows:
725.61. Applications of Listed Class 2, Class 3 and PLTC Cables. Class 2, Class 3 and PLTC Cables shall comply with the requirements described in any of the following Sections: 725.61.1 through 725.61.6, or where cable substitutions are made as shown in Section 725.61.7.
725.61.1. Plenum. Cables installed in ducts, plenums, and other spaces used for environmental air shall be Type CL2P or CL3P. Abandoned cables shall not be permitted to remain. Listed wires and cables installed in compliance with Section 300.22 shall be permitted.
725.61.2. Riser. Cables installed in risers shall be as described in any of the following Sections: 725.61.2.1 through 725.61.2.3.
725.61.2.1. Cables installed in vertical runs and penetrating more than one floor, or cables installed in vertical runs in a shaft, shall be Type CL2R or CL3R. Floor penetrations requiring Type CL2R or CL3R shall contain only cables suitable for riser or plenum use. Abandoned cables shall not be permitted to remain.
725.61.2.2. Other cables as covered in Table 725.61 and other listed wiring methods as covered in Chapter 3, shall be installed in metal raceways or located in a fireproof shaft having firestops at each floor.
725.61.2.3. Type CL2, CL3, CL2X and CL3X cables shall be permitted in one- and two-family dwellings.
FPN: *See Section 300.21 for firestop requirements for floor penetrations.*
725.61.3. Cable Trays. Cables installed in cable trays outdoors shall be Type PLTC. Cables installed in cable trays indoors shall be Types PLTC, CL3P, CL3R, CL3, CL2P, CL2R and CL2.
FPN: *See Section 800.52(d) for cables permitted in cable trays.*
725.61.4. Hazardous (Classified) Locations. Cables installed in hazardous locations shall be as described in any of the following Sections: 725.61.4.1 through 725.61.4.4.
725.61.4.1. Cables installed in hazardous (classified) locations shall be Type PLTC. Where the use of Type PLTC cable is permitted by Sections 501.4(b), 502.4(b) and 504.20, the cable shall be installed in cable trays, in raceways supported by messenger wire or otherwise adequately supported and mechanically protected by angles, struts, channels or other mechanical means. The cable shall be permitted to be directly buried where the cable is listed for this use.
725.61.4.2. Wiring for Class 2 circuits as permitted by Section 501.4(b) *Exception* shall be permitted.
725.61.4.3. Conductors in Type PLTC cables used for Class 2 thermocouple circuits shall be permitted to be any of the materials used for thermocouple extension wire.
725.61.4.4. In industrial establishments where the conditions of maintenance and supervision ensure that only qualified persons will service the installation, and where the cable is not subject to physical damage, Type PLTC cable that complies with the crush and impact requirements of Type MC cable and is identified for such use shall be permitted as open wiring between cable tray and utilization equipment in lengths not to exceed 15 m (50 ft). The cable shall be supported and protected against physical damage using mechanical protection such as dedicated struts, angles or channels. The cable shall be supported and secured at intervals not exceeding 1.75 m (6 ft).
725.61.5. Other Wiring Within Buildings. Cables installed in building locations other than those covered in Sections 725.65.1 through 725.61.4 shall be as described in any of the following Sections: 725.65.5.1 through 725.65.6. Abandoned cables in hollow spaces shall not be permitted to remain.
725.61.5.1. Type CL2 or CL3 shall be permitted.
725.61.5.2. Type CL2X or CL3X shall be permitted to be installed in a raceway, or other wiring methods covered in Chapter 3.
725.61.5.3. Cables shall be permitted to be installed in nonconcealed spaces where the exposed length of cable does not exceed 3 m (10 ft).
725.61.5.4. Listed Type CL2X cables less than 6 mm (0.25 in) in diameter and listed Type CL3X cables less than 6 mm (0.25 in) in

diameter shall be permitted to be installed in one- and two-family dwellings.
725.61.5.5. Listed Type CL2X cables less than 6 mm (0.25 in) in diameter and listed Type CL3X cables less than 6 mm (0.25 in) in diameter shall be permitted to be installed in nonconcealed spaces in multi-family dwellings.
725.61.5.6. Type CMUC undercarpet communications wires and cables shall be permitted to be installed under carpet.
725.61.6. Cross-Connect Arrays. Type CL2 or CL3 conductors or cables shall be used for cross-connect arrays.
725.61.7. Class 2 and Class 3 Cable Uses and Permitted Substitutions. The uses and permitted substitutions for Class 2 and Class 3 cables listed in Table 725.61 shall be considered suitable for the purpose and shall be permitted.

Insert revised Table 725-61. Cable Uses and Permitted Substitutions *in accordance with Accepted Proposal 16-82.*

FPN: For information on Types CMP, CMR, CMG, CM and CMX cables, see Section 800.51.

Insert revised Figure 725-61. Cable Substitution Hierarchy. *In accordance with Accepted Proposal 16-82 and Comment on Affirmative by Stanley Kaufman.*

(Artwork not provided)

760.61. Applications of Listed PLFA Cables.
PLFA Cables shall comply with the requirements described in any of the following Sections: 760.61.1 through 760.61.3,or
where cable substitutions are made as shown in Section 760.61.4.
760.61.1. Plenum. Cables installed in ducts, plenums, and other spaces used for environmental air shall be Type FPLP. Abandoned cables shall not be permitted to remain. Types FPLP, FPLR and FPL cable installed in compliance with Section 300.22 shall be permitted.
760.61.2. Riser. Cables installed in risers shall be as described in any of the following Sections: 760.61.2.1 through 760.61.2.3.
760.61.2.1. Cables installed in vertical runs and penetrating more than one floor, or cables installed in vertical runs in a shaft, shall be Type FPLR. Floor penetrations requiring Type FPLR shall contain only cables suitable for riser or plenum use. Abandoned cables shall not be permitted to remain.
760.61.2.2. Other cables shall be installed in metal raceways or located in a fireproof shaft having firestops at each floor.
760.61.2.3. Type FPL cable shall be permitted in one- and two-family dwellings.
FPN: *See Section 300.21 for firestop requirements for floor penetrations.*
760.61.3. Other Wiring Within Buildings. Cables installed in building locations other than those covered in Sections 760.61.1 or 760.61.2 shall be as described in any of the following Sections: 760.61.3.1 through 760.61.3.4. Abandoned cables in hollow spaces shall not be permitted to remain
760.61.3.1. Type FPL shall be permitted.
760.61.3.2. Cables shall be permitted to be installed in raceways.
760.61.3.3. Cables specified in Chapter 3 and meet the requirements of Sections 760.71.1 and 760.71.2 shall be permitted to be installed in nonconcealed spaces where the exposed length of cable does not exceed 3 m (10 ft).
760.61.3.4. A portable fire alarm system provided to protect a stage or set when not in use shall be permitted to use wiring methods in accordance with Section 530.12.
760.61.4. Fire Alarm Cable Uses and Permitted Substitutions. The uses and permitted substitutions for fire alarm cables listed in Table 760.61 shall be considered suitable for the purpose and shall be permitted.

Insert revised Table 760-61. Cable Uses and Permitted Substitutions

FPN: For information on multipurpose cables (Types MPP, MPR, MPG, MP) and communications cables (Types CMP, CMR, CMG, CM), see Section 800.501.

770.53. Applications of Listed Optical Fiber Cables and Raceways.
Nonconductive and conductive optical fiber cables shall comply with the requirements any of the following Sections: 770.53.1
through 770.53.5 or where cable substitutions are made as shown in Section 770-53.6.
770.53.1. Plenum. Cables installed in ducts, plenums, and other spaces used for environmental air shall be Type OFNP or OFCP. Abandoned cables shall not be permitted to remain. Types OFNR, OFCR, OFNG, OFN, OFCG and OFC cables installed in compliance with Section 300.22 shall be permitted. Listed plenum optical fiber raceways shall be permitted to be installed in ducts and plenums as described in Section 300-22(b) and in other spaces used for environmental air as described in Section 300-22(c). Only Type OFNP cable shall be permitted to be installed in these raceways.
770.53.2. Riser. Cables installed in risers shall be as described in any of the following Sections: 800.53.2.1 through 800.53.2.3.
770.53.2.1. Cables installed in vertical runs and penetrating more than one floor, or cables installed in vertical runs in a shaft, shall be Types OFNR or OFCR. Floor penetrations requiring Types OFNR or OFCR shall contain only cables suitable for riser or plenum use. Abandoned cables shall not be permitted to remain. Listed riser optical fiber raceways shall be permitted to be installed in vertical riser runs in a shaft from floor to floor. Only Types OFNR and OFNP cables shall be permitted to be installed in these raceways.
770.53.2.2. Listed optical fiber cables shall be permitted to be encased in a metal raceway or located in a fireproof shaft having firestops at each floor.
770.53.2.3. Type OFNG, OFN, OFCG and OFC cable shall be permitted in one- and two-family dwellings.
FPN: *See Section 300.21 for firestop requirements for floor penetrations.*
770.53.3. Other Wiring Within Buildings. Cables installed in building locations other than the locations covered in Sections 770.53.1 and 770.53.2 shall be Type OFNG, OFN, OFCG or OFC. Such cables shall be permitted to be installed in listed general-purpose optical fiber raceways.
770.53.4. Hazardous (Classified) Locations. Cables installed in hazardous (classified) locations shall be any type indicated in Table 770.53.
770.53.5. Cable Trays. Optical fiber cables of the types listed in Table 770.50 shall be permitted to be installed in cable trays.
FPN: *It is not the intent to require that these optical fiber cables be listed specifically for use in cable trays.*
770.53.6. Cable Substitutions. The substitutions for optical fiber cables listed in Table 770.53 shall be permitted.

Insert Table 770.53. Cable Substitution *as modified by Stan Kaufman's*
Comment.

Insert Figure 770.53. Cable Substitution Hierarchy.
(Artwork not provided)

800.53. Applications of Listed Communications Wires and Cables, and Communications Raceways.
Communications wires and cables shall comply with the requirements any of the following Sections: 800.53.1 through 800.53.7
or where cable substitutions are made as shown in Section 800-53.8
800.53.1. Plenum. Cables installed in ducts, plenums, and other spaces used for environmental air shall be Type CMP. Abandoned cables shall not be permitted to remain. Types CMP, CMR, CMG, CM and CMX and communications wire installed in compliance with Section 300.22 shall be permitted. Listed plenum communications raceways shall be permitted to be installed in ducts and plenums as described in Section 300-22(b) and in other spaces used for environmental air as described in Section 300-22(c). Only Type CMP cable shall be permitted to be installed in these raceways.
800.53.2. Riser. Cables installed in risers shall be as described in any of the following Sections: 800.53.2.1 through 800.53.2.3.
800.53.2.1. Cables installed in vertical runs and penetrating more than one floor, or cables installed in vertical runs in a shaft, shall be Type CMR. Floor penetrations requiring Type CMR shall contain only cables suitable for riser or plenum use. Abandoned cables shall not be permitted to remain. Listed riser communications raceways shall be permitted to be installed in vertical riser runs in a shaft from floor to floor. Only Type CMR and CMP cables shall be permitted to be installed in these raceways.
800.53.2.2. Listed communications cables shall be encased in a metal raceway or located in a fireproof shaft having firestops at each floor.
800.53.2.3. Type CM and CMX cable shall be permitted in one- and two-family dwellings.
FPN: *See Section 800.52.2 for firestop requirements for floor penetrations.*
800.53.3. Distributing Frames and Cross-connect Arrays. Listed communications wire and Types CMP, CMR, CMG, and CM

communications cables shall be used in distributing frames and cross-connect arrays.
800.53.4. Cable Trays. Types MPP, MPR, MPG, and MP multipurpose cables and Types CMP, CMR, CMG, and CM communications cables shall be permitted to be installed in cable trays.
800.53.5. Other Wiring Within Buildings. Cables installed in building locations other than the locations covered in Sections 800.53.1, through 800.53.4 shall be as installed described in any of the following Sections: 800.53.5.1 through 800.53.5.6.
800.53.5.1. Cables shall be Type CMG or Type CM. Listed communications general purpose raceways shall be permitted. Only Type CMG, CM, CMR or CMP cables shall be permitted to be installed in general purpose communications raceways.
800.53.5.2. Listed communications wires that are enclosed in a raceway of a type included in Chapter 3 shall be permitted.
800.53.5.3. Type CMX communications cable shall be permitted to be installed in nonconcealed spaces where the exposed length of cable does not exceed 3 m (10 ft).
800.53.4.4. Type CMX communications cables less than 6 mm (0.25 in) in diameter shall be permitted to be installed in one- and two-family dwellings.
800.53.4.5. Type CMX communications cables less than 6 mm (0.25 in) in diameter shall be permitted to be installed in nonconcealed spaces in multi-family dwellings.
800.53.4.6. Type CMUC under-carpet communications wires and cables shall be permitted to be installed under carpet.
800.53.5. Hybrid Power and Communications Cable. Hybrid power and communications cable listed in accordance with Section 800.51.8 shall be permitted to be installed in one- and two-family dwellings/
800.53.6. Cable Substitutions. The uses and permitted substitutions for communications cables listed in Table 800.53 shall be considered suitable for the purpose and shall be permitted.

Insert Table 800.53. Cable Uses and Permitted Substitutions *as modified below:*

820.53. Applications of Listed CATV Cables.
CATV cables shall comply with the requirements any of the following Sections: 820.53.1 through 820.53.5 or where cable substitutions are made as shown in Section 820-53.6.
820.53.1. Plenum. Cables installed in ducts, plenums, and other spaces used for environmental air shall be Type CATVP. Abandoned cables shall not be permitted to remain. Types CATVP, CATVR, CATV and CATVX cables installed in compliance with Section 300.22 shall be permitted.
820.53.2. Riser. Cables installed in risers shall be as described in any of the following Sections: 800.53.2.1 through 800.53.2.3.
820.53.2.1. Cables installed in vertical runs and penetrating more than one floor, or cables installed in vertical runs in a shaft, shall be Type CATVR. Floor penetrations requiring Type CATVR shall contain only cables suitable for riser or plenum use. Abandoned cables shall not be permitted to remain.
820.53.2.2. Types CATV and CATVX cables shall be permitted to be encased in a metal raceway or located in a fireproof shaft having firestops at each floor.
820.53.2.3. Types CATV and CATVX cables shall be permitted in one- and two-family dwellings.
FPN: *See Section 820.52.2 for firestop requirements for floor penetrations.*
820.53.3. Other Wiring Within Buildings. Cables installed in building locations other than the locations covered in Sections 820.53.1 and 820.53.2 shall be shall be as described in any of the following Sections: 820.53.3.1 through 820.53.3.6. Abandoned cables in hollow spaces shall not be permitted to remain.
820.53.3.1. Type CATV shall be permitted.
820.53.3.2. Type CATVX shall be permitted to be installed in a raceway.
820.53.3.3. Type CATVX shall be permitted to be installed in nonconcealed spaces where the exposed length of cable does not exceed 3 m (10 ft).
820.53.3.4. Type CATVX cables less than 10 mm (0.375 in) in diameter shall be permitted to be installed in one- and two-family dwellings.

Table 800-53. Cable Uses and Permitted Substitutions

Cable Type	Use	References	Permitted Substitutions
CMP	Communications plenum cable	800-53.1	MPP
CMR	Communication riser cable	800-53.2	MPP, CMP, MPR
CMG, CM	Communications general-purpose cable	800-53.5.1	MPP, CMP, MPR, CMR, MPG, MP
CMX	Communications cable, limited use	800-53.3, 53.4 & 53.5	MPP, CMP, MPR, CMR, MPG, MP, CMG, CM

Note: See Figure 800-53, Cable substitution hierarchy.

FPN: For information on Types CMP, CMR, CMG, CM and CMX cables, see Section 800.51.

Insert Figure 800.53. Cable Substitution Hierarchy *as modified by Stan Kaufman's comment.*
(Artwork not provided)

Replace Figure 800.50. Cable Substitution Hierarchy with the following~~Exception No. 5~~

820.53.3.5. Type CATVX cables less than 10 mm (0.375 in) in diameter shall be permitted to be installed in nonconcealed spaces in multi-family dwellings.
820.53.4. Cable Substitutions. The substitution for community antenna television cables listed in Table 820.53 shall be considered suitable for the purpose and shall be permitted.

Insert Table 820.53. Coaxial Cable Uses and Permitted Substitutions

Table 800-50. Cable Markings

Cable Marking	Type	Reference
MPP	Multipurpose plenum cable	800-51(g) and 800-53.1
CMP	Communications plenum cable	800-51(a) and 800-53.1
MPR	Multipurpose riser cable	800-51(g) and 800-53.2)
CMR	Communications riser cable	800-51(b) and 800-53.2
MPG	Multipurpose general-purpose cable	800-51(g) and 800-53.4 & 53.5.1
CMG	Communications general-purpose cable	800-51(c) and 800-53.4 & 53.5.1
MP	Multipurpose general-purpose cable	800-51(g) and 800-53.4 & 53.5.1
CM	Communications general-purpose cable	800-51(d) and 800-53.4 & 53.5.1
CMX	Communications cable, limited use	800-51(e) and 800-53.3, 53.4 & 53.5
CMUC	Under-carpet communications wire and cable	800-51(f) and 800-53.4.6

FPN: *The substitute cables in Table 820.53 are only coaxial-type cables.*

Insert Figure 820.53. Cable Substitution Hierarchy.
(Artwork not provided)

830.55. Low Power Network-Powered Broadband Communications System Wiring Methods.
Low power network-powered broadband systems shall comply with the requirements any of the following Sections: 830.55.1 through 830.55.4.
830.55.1. In Buildings. Low power network-powered broadband communications systems shall be installed within buildings using listed Type BLX or Type BLP network-powered broadband communications low power cables.
830.55.2. Ducts, Plenums and Other Air Handling Spaces. Cables installed in ducts, plenums, and other spaces used for environmental air shall be Type BLP. Abandoned cables shall not be permitted to remain. Types BLX cable installed in compliance with Section 300.22 shall be permitted.
830.55.3. Riser. Cables installed in risers shall be as described in any of the following Sections: 830.55.3.1 through 830.55.3.3.
830.55.3.1. Cables installed in vertical runs and penetrating more than one floor, or cables installed in vertical runs in a shaft, shall be Type BLP or BMR. Floor penetrations requiring Type BMR shall contain only cables suitable for riser or plenum use. Abandoned cables shall not be permitted to remain.
830.55.3.2. Type BLX cables shall be permitted to be encased in a metal raceway or located in a fireproof shaft having firestops at each floor.
830.55.3.3. Type BLX cables less than 10 mm (0.375 in) in diameter shall be permitted in one- and two-family dwellings.
830.55.4. Other Wiring. Cables installed in locations other than the locations covered in Sections 830.55.1 through 830.55.3 shall be as described in any of the following Sections: 830.55.4.1 through 830.55.4.5. Abandoned cables in hollow spaces shall not be permitted to remain.
830.55.4.1. Type BLP or BM shall be permitted.
830.55.4.2. Type BLX shall be permitted to be installed in a raceway.
830.55.4.3. Type BLU cable entering the building from outside shall be permitted to be run in rigid metal conduit or intermediate metal conduit. Such conduits shall be grounded to an electrode in accordance with Section 830.40.2
830.55.4.4. Type BLX cable less than 10 mm (0.375 in) in diameter shall be permitted to be installed in one- and two-family dwellings.
830.55.4.5. Type BLX cable entering the building from outside and terminated at a grounding block or a primary protection location shall be permitted to be installed provided that the length of cable within the building does not exceed 15 m (50 ft).

FPN: *This provision limits the length of Type BLX cable to 15 m (50 ft) while Section 830.30.2 requires that the primary protector, or NIU with integral protection, be located as close as practicable to the point at which the cable enters the building. Therefore, in installations requiring a primary protector, or NIU with integral protection, Type BLX cable may not be permitted to extend 15 m (50 ft) into the building if it is practicable to place the primary protector closer than 15 m (50 ft) to the entrance point.*

SUBSTANTIATION: The Exceptions are changed to positive code language in compliance with 3.1.4.2 of the Style Manual. In accordance with the Panel Statement for this Proposal, the wording and arrangement have been modified to completely and clearly reflect all the requirements and permitted methods. Section 760-61 for fire alarm cables, Section 770-53 for optical fiber cables and raceways, Section 800-53 for communications wiring, Section 820-53 for listed CATV cables and Section 830-53 for low power network-powered broadband communications systems which parallel the requirements of Section 725-61 for Class 2 and Class 3 wiring have been similarly changed for consistency of presentation. There have been no changes in the technical requirements. Section 800-52(d) was incorporated into new Section 800.53 since it is more appropriate to place it there.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22
VOTE ON PANEL ACTION:
AFFIRMATIVE: 22

(Log #1077)

16- 88 - (Table 725-61): Reject
Note: "See Technical Correlating Committee action on Comment 16-98."
SUBMITTER: Marcelo M. Hirschler, GBH International/Rep. Plenum Cable Association and Fire Retardent Chemicals Assoc.
COMMENT ON PROPOSAL NO: 16-82
RECOMMENDATION: This proposal should be rejected, the references to CL2P-50 and CL3P-50 should be deleted from the Table 725-61 and not incorporated into Figure 725-61 and the CL2P-50 and CL3P-50 classifications should not be created.
SUBSTANTIATION: The CL2P-50 and CL3P-50 classifications are unnecessary classification because they are not justified either by requirements for reduction in fire hazard in plenums (fire hazard is the potential for harm associated with fire) or a general reduction in fire risk (fire risk is the combination of fire hazard and the probability of fires resulting in undesirable outcomes). Furthermore, they are based on a research project which is incomplete (according to the Interim Report issued) and they are based on flawed testing technology, as represented by the oxygen bomb calorimeter.

The Plenum Cable Association endorses use of fire hazard assessment and fire risk assessment in order to further develop technically supportable standards, codes and regulations, that ensure reasonable and justifiable classification and control of plastic and other combustible products. The creation of the (CXP-50) marking is not justified based on fire hazard or on fire risk and is simply an effort for one type of material to gain market share at the expense of others. If a search for better fire performance is continued indefinitely, without taking into account the overall fire safety required by the application, clearly the use of plastics and other combustible materials should be discontinued, as a non combustible material can always be found which outperforms any plastic material. Thus, if the National Electrical Code were to support unjustified improvements in fire performance, eventually any use of plastic or other combustible materials would be in jeopardy.

Thus, there are 4 reasons to oppose the CXP-50 classifications: (i) no justification based on fire risk, (ii) no justification based on fire hazard, (iii) the study for the development of the classification by the proponents is incomplete, and (iv) the technique of oxygen bomb calorimetry, and the concept of limited combustible, are technically flawed. These concerns are exemplified as follows:

(i) An analysis of fire performance of cables addresses fire hazard.

Fire hazard analysis: Traditional CMP-rated cables will not cause significant flame spread or smoke obscuration unless the fire source is very large. For example, a CMP cable with a PVC jacket and FEP insulation was shown to have no significant flame spread (out of a possible flame spread of 20 feet) and a peak optical density of much less than 0.2 when exposed to a fire of approximately 1 MW, from a wood crib, in a full scale facility, that simulated a room and plenum [Reference: L.M. Caudill, J.R. Hoover, J.T. Walnock and J.T. Chapin, "Fire Performance of Communications Cables in Concealed Spaces", pages 277-285, NFPRF Fire Risk and Hazard Assessment Symposium, June 26-28, 1996, San Francisco, CA]. The same cable also showed approximately 2 feet flame spread in the NFPA 262 plenum cable test, with a peak optical density not exceeding 0.3, according to the same reference. Clearly, if a cable does not spread flame significantly when a 1 MW fire source is applied, it does not represent any severe fire hazard. In a different scenario, a similar type of cable was studied by the European research project FIPEC, and found to release 42 kW and less than 6 MJ, to spread flame vertically for only 1.1 m, and to give low smoke release when tested in a severe vertical cable tray test (30 kW input at high air flow rate) [Reference: Fire Performance of Electric Cables Report, Interscience Communications, UK, 1999]. This indicates that the fire hazard associated with traditional CMP cables (and this with traditional CL2P and CL3P cables) is very low.

(ii) Analysis of NFPA statistics serves to illustrate fire risk. NFPA statistics address the following types of fires:

* "Non residential concealed space structure fires involving ignition of fixed wiring in ceiling/roof assemblies" {Roof plenums are examples of these spaces}

*"Non residential concealed space structure fires involving ignition of fixed wiring in ceiling/floor assemblies" {Floor plenums are examples of these spaces}

In each case, the statistics can distinguish whether wire and cable insulation was or was not the item first ignited, giving four sets of statistics relevant to plenum cables. These statistics are

relevant to the fire risk from plenum cables, as plenum cables are the typical type of wire and cable insulation present in roof plenums or in floor plenums.

Fire risk analysis: The statistics indicate that, between 1980 and 1996, there have been an average of only 584 fires per year, and of those only 171 have started with ignition of a wire and cable product, and the trend has been downwards (see the attached Tables with fire statistics and the attached charts, indicating a similar type of downward trend for both concealed roof spaces and concealed floor spaces). In fact, over the entire period between 1980 and 1996 the total number of fires in concealed roof spaces involving ignition of fixed wiring has been 0.29% of the total number of non residential structure fires (of which less than 30% started in wire and cable) and the total number of fires in concealed floor spaces involving ignition of fixed wiring has been 0.10% of the total number of non residential structure fires (of which ca. 32% started in wire and cable). With regard to fatalities or injuries: out of 3,734 fatalities in non residential structure fires, only 7 occurred in concealed roof or floor spaces involving ignition of fixed wiring (less than 0.19%), and out of 60,950 injuries in non residential structure fires, only 85 occurred in concealed roof or floor spaces involving ignition of fixed wiring (less than 0.14%). At least 4 of the 7 fatalities have been shown not to have resulted from plenum cable fires with the other 3 unknown. Thus, the fire record in a period when the amount of installed plenum cables increased from virtually none to some 20 billion feet, indicates that the fire risk is minimal.

(iii) The classifications of CXP-50 are not yet ready for application, since the NFPA Fire Protection Research Foundation Project developing the classification has not yet issued its final report. The Interim Report (International Limited Combustible Plenum Cable Fire Test Project, Interim Report, by F.B. Clarke and R.G. Gewain, June 2000) is the source of our [Plenum Cable Association] concerns. The first objective of this project was to: "Develop harmonized Steiner Tunnel listing protocols for permanent plenum cables related to NFPA 262/UL 910 and NFPA 255." The Interim Report describes part of Phase I of the project, wherein no harmonized listing protocol has been developed. The Interim Report addresses NFPA 255 and NFPA 259 and states, among other things:

* NFPA 255, flame travel distance: "... The NFPA 255 flame travel distances appear to be highly repeatable {i.e. within one lab} in each laboratory, as evidenced by the small variance of the measurements, *but not particularly reproducible* {i.e. between labs}, as can be seen by comparing this variance with the interlaboratory results. ..." {Emphasis added, but statement comes verbatim from report}

* NFPA 255, smoke index, or SDI: "... With respect to the smoke measurements, multiple determinations of the SDI by a given laboratory on a given cable agree with one another quite closely *but the SDI's reported by the two labs for the same cables do not appear to be close at all*. The results reported by Laboratory 2 are, with one exception, systematically higher than those of Laboratory 1. ..." {Emphasis added, but statement comes verbatim from report}

* NFPA 255 precision: " ... The flame spread and smoke measurements in NFPA 255 show ... *relatively poor reproducibility*, i.e. the result for a cable in a given laboratory can be repeated with precision but the difference in results between laboratories is on average considerably larger than the repeatability error. ..." {Emphasis added, but statement comes verbatim from report}

* Procedure for NFPA 255: "It is possible to test wire and cable following the current NFPA 255 test procedure, using the mounting specified for plastics in Appendix B7 of the standard." Appendix B-7 of NFPA 255 states:

"B-7 Plastics. B-7.1 The term plastics includes foams, reinforced panels, laminates, grids, and transparent or translucent sheets.

B-7.2 Where any plastic remains in position in the tunnel during a fire test, no additional support is necessary. Thermoplastic materials and other plastics that do not remain in place should be supported by 1/4-in. (6.3-mm) round metal rods or 3/16 in. (4.8 mm) thick 2 in. (51 mm) wide steel bars, or 2-in. (51-mm) galvanized hexagonal wire mesh supported with metal bars or rods spanning the width of the tunnel."

It is interesting to compare this with the statements in NFPA 262, as follows:

"1-1.3* Although this test uses equipment similar to that used in NFPA 255, Standard Method of Test of Surface Burning Characteristics of Building Materials, and ASTM E 84, Standard Test Method for Surface Burning Characteristics of Building Materials, sufficient changes have been made to the chamber so that a test conducted in the apparatus used for NFPA 255 or ASTM E 84 cannot be considered identical or produce comparable results.

A-1-1.3 The changes made in equipment for this test were deemed necessary in order to obtain proper precision from the test when the equipment is used for small quantities of wire and cable, which produce much smaller quantities of heat release and smoke obscuration."

* NFPA 259: "... NFPA 259 has traditionally been carried out on individual materials, and so the potential heat of a finished product like a cable would be calculated as the um of the contributions of each component, each contribution being the potential heat of the component multiplied by the mass fraction of that component in the cable. To produce such a measurement it would be necessary to disassemble the cable into its different components – insulation, jacket, shielding, rip cord and the like – and measure the potential heat of each component. *An obvious question is whether such a cumbersome procedure is necessary* ..." {Emphasis added, but statement comes verbatim from report}.

* Observations on NFPA 259: "One of the labs (Laboratory 2) had both more experience and more advanced equipment ..."

* Procedure for NFPA 259: "... The procedure followed was NFPA 259, Standard Test Method for Potential Heat of Building Materials, 1998 Edition, with modifications to the following sections: ... *This modification should be viewed provisionally since it so far has only been tested on 4-pair unshielded twisted pair (UTP) plenum cable*." {Emphasis added, but statement comes verbatim from report}

(iv) The oxygen bomb calorimeter test used to assess "limited combustible" classifications is severely flawed. NFPA 259 uses the oxygen bomb calorimeter as part of its testing to assess potential heat. The term "limited combustible" was developed for "building construction materials", with the intent of applying it to materials of construction of the plenum and not to cables. NFPA 90A defines "limited combustible" as follows:

"Limited-Combustible Material. A building construction material not complying with the definition of noncombustible material that in the form in which it is used, has a potential heat value not exceeding 3500 Btu/lb (8141 kJ/kg) where tested in accordance with NFPA 259, Standard Test Method for Potential Heat of Building Materials, and complies with (a) or (b):

(a) Materials having a structural base of noncombustible material, with a surfacing not exceeding a thickness of 1/8 in. (3.2 mm), that has a flame spread index not greater than 50; (b) Materials, in the form and thickness used, other than as described in (a), having neither a flame spread index greater than 25 nor evidence of continued progressive combustion, and of such composition that surfaces that would be exposed by cutting through the material on any plane would have neither a flame spread index greater than 25 nor evidence of continued progressive combustion. Materials subject to increase in combustibility or flame spread index beyond the limits herein established through the effects of age, moisture, or other atmospheric condition shall be considered combustible."

The oxygen bomb calorimeter is a method for determining the theoretical (or complete or absolute) calorific energy (or heat of combustion), as opposed to the effective (or practical) values. The reason such instruments are used is to ensure that the correct value is chosen. As such they represent the following chemical equations for combustible fuels containing only carbon, hydrogen and oxygen:

$$C + O_2 = CO_2$$

$$4\,H + O_2 = 2\,H_2O$$

For hydrocarbon fuels: $- C\,H_2 - + O_2 = CO_2 + H_2O$

However, when building materials are more complex, because they contain other elements, there is a certain inconsistency in the equation and in the energy calculated.

1. Cl: Thus, for example, when PVC is burnt in an oxygen bomb, depending on the fraction of hydrogen atoms present, there will be different proportions of the following two equations:

$$(C_2\,H_3\,Cl)_n + 2.5\,n\,O_2 = 2\,n\,CO_2 + n\,H_2O + n\,HCl$$

$$(C_2\,H_3\,Cl)_n + 2.75\,n\,O_2 = 2\,n\,CO_2 + 1.5\,n\,H_2O + 0.5\,n\,Cl_2$$

where the two equations differ by 380 kJ/kg.

2. S: Combustion of materials containing sulphur also depends on the final product. Typically the combustion bomb

generates sulphuric acid as the final sulphur containing product, while furnace combustion generates sulphur dioxide (with the sulphur less fully oxidized). Therefore, the convention in bomb calorimetry is to determine values of calorific value of fuels (including coal), by referring to the quantitative conversion to sulphur dioxide, and ignoring the conversion to sulphuric acid (or sulphur trioxide) that occurs, by using a conversion factor based on the sulphur content. Interestingly, gypsum (which is calcium sulphate dihydrate), is a building material containing sulphur. The typical fuel containing sulphur is coal. The difference between conversion to sulphur dioxide and sulphuric acid is 9410 kJ/kg.

3. N: Combustion of materials containing nitrogen also has a convention: the heat of convention is normally calculated assuming that all the nitrogen is converted into molecular nitrogen. However, that is not what happens in oxygen bomb calorimetry, where nitrogen oxides and nitric acid are actually formed. Thus, a correction is applied to account for the following equation:

$HNO_3 = 0.5\ H_2O + 0.5\ N_2 + 1.25\ O_2$, with a net heat of reaction of 1017 kJ/kg.

4. F: Combustion of materials containing fluorine is generally represented as ending in the formation of carbon tetrafluoride (CF_4) and of hydrogen fluoride (HF), in varying proportions. The equation is as follows:

$$C_a\ H_b\ O_c\ F_e + (a+b/4-c/2-e/4)\ O_2 + (n+1/2)*e*(1-x) - b/2)\ H_2O = (a-ex/4)\ CO_2 + + ex/4\ CF_4 + e(1-x)\ (HF) + e(1-x)\ n\ H_2O$$

where x is the fraction of fluorine atoms converted to CF_4 as opposed to converted to HF. The energy of the conversion of CF_4 to HF is approximately 192 kJ/kg. Moreover, fluorine materials will attack the walls of the bomb calorimeter.

5. Si: Compounds containing silicon are impossible to convert completely to their final oxidation product, which is silica (SiO_2), by conventional means because as burning proceeds, the material becomes covered by a layer of silica which prevents access of oxygen and leads to the formation of a residue. The only way to obtain a reliable result of heat of combustion of materials containing silicon (such as silicones) is by a method which combines the material with an organic fluorine compound (the value of which has been accurately assessed in advance) in rotating bomb containing also water and aqueous HF. This converts all the Si into fluorosilicic acid, and the results can then be calculated back.

6. P: Compounds containing phosphorus are exceedingly difficult to assess by oxygen bomb combustion calorimetry. There are four major problems: (1) various phosphorus acids with different energies of dilution are formed in various concentrations throughout the oxygen bomb, (2) the combustion products contain different types of phosphorus oxyacids, each one of which has a different heat of formation, (3) the burning compound gets covered by phosphorus oxides and acids, which inhibit further combustion and (4) the bomb calorimeter walls are attacked and metal phosphates are formed, so that the recommended wall materials should be corundum or gold, since Pyrex glass, quartz, stainless steel titanium, porcelain and platinum all suffered heavy weight losses. For example, depending on whether a rotating bomb or a static bomb is used, the fraction of pyrophosphoric acid formed varied from 10 to 18% and that of triphosphoric acid from 1 to 3%.

7. Auxiliary combustion material: When an auxiliary material is used for assessing the heat of combustion, a 1% error in the assessment of the heat of combustion of the auxiliary material (such as benzoic acid), which is typically used in the order of 20% energy loading, corresponds to a 5% error in the total energy/heat measured. Thus, at a value of 1500 kJ/kg that would be an error of 75 kJ/kg, and this would be a systematic error for that series of experiments.

8. Moisture content: the moisture content of the building material is critical, because the combustion reaction considered in the oxygen bomb is that to convert to gaseous water. Thus, if a material contains water, the water will have reaction to vaporize the water content. Thus, results must be expressed as a function of the original moisture content for them to be valid. This matters, of course, for materials that absorb moisture when exposed to the atmosphere.

Bibliography on oxygen bomb calorimetry:

* Mansson, Margret, "Determination of Calorific Values of Building Materials - A Guide", SP Nordtest Report Project 871-90, Swedish National Testing and Research Institute, Boras, Sweden, 1991.

* Head, Arthur J, and Good, William D., "Combustion of Liquid/Solid Compounds with Non-Metallic Hetero Atoms", Chapter 9 in "Combustion Calorimetry", "Volume 1, Experimental Chemical thermodynamics", Eds. Stig Sunner & Margret M. Mansson), Pergamon Press, Oxford, UK (for Int. Union Pure & Applied Chemistry, IUPAC), 1979.

* Mansson, Margret and Hubbard, Ward N., "Strategies in the Calculation of Standard-State Energies of Combustion from the Experimentally Determined Quantities", Chapter 5 in "Combustion Calorimetry", "Volume 1, Experimental Chemical thermodynamics", Eds. Stig Sunner & Margret M. Mansson), Pergamon Press, Oxford, UK (for Int. Union Pure & Applied Chemistry, IUPAC), 1979.

* Hu, Andrew T., Sinke, G.C., Mansson, Margret and Ringner, Birgitta, "Test Substances for Bomb Combustion Calorimetry, p-Chlorobenzoic Acid". J. Chem. Thermodynamics, 4, 283-99 (1972).

* Mansson, Margret, "Thermochemistry - Some Recent Lines of Development", Pure & Applied Chemistry, 55(3), 417-26 (1983).

* Mansson, Margret, "A 4.5 cm^3 Bomb Combustion Calorimeter and an Ampoule Technique for 5 to 10 mg Samples with Vapour Pressures Below Approximately 3 kPa (20 Torr)", J. Chem. Thermodynamics, 5, 7232 (1973).

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

PANEL ACTION: Reject.

PANEL STATEMENT: Refer to panel action and statement on Comment 16-98.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22

VOTE ON PANEL ACTION:

AFFIRMATIVE: 19
NEGATIVE: 2
ABSTENTION: 1

EXPLANATION OF NEGATIVE:

JOHNSON: Limited Combustible Cable. To our knowledge, nothing in the code precludes the use of this cable type as a plenum substitute. No improvements in safety have been demonstrated to warrant the need for limited combustible cables, nor has sufficient evidence has been submitted to justify a special classification for this cable type. The panel's action could be conceived as an endorsement of a material or method by the NEC, which is beyond its scope.

Section 90-1(b) of the NEC states that: "This Code contains provisions that are considered necessary for safety." The addition of the new cable does not fit into this mandate. The fact that the panel did not consider use of this cable as a requirement for any wiring method (it is only optional) supports this point.

Significant and well-documented objections to these proposals have been raised. For example, disagreement exists on the validity and repeatability of limited combustible cable testing. In light of these numerous objections, further study is justified before reaching a conclusion to add this new cable type to the code.

WADEHRA: A. The computerization of offices and homes started to take place in the early eighties necessitating the installation of a high volume of inter-connect cables in the plenum areas. Around the same timeframe, the 1981 NEC was revised to require the use of low flame spread and low smoke cables (UL-910 rated) plenum cables. Accordingly, it can be stated that the bulk of the cables installed are already fully flame retardant and there is no additional need to further tighten the flammability requirement.

B. I am not aware of any recent field fire incidents justifying the use of "Limited Combustion Cables." Besides, no improvements in safety have been demonstrated to warrant the need for limited combustible cables, nor has sufficient evidence been submitted to justify a special classification for this cable type.

C. The 2002 NEC will require the removal of abandoned cables in the plenum areas, which should result in sizable reduction in the number of cables presently installed in the plenums.

D. To our knowledge, nothing in the Code precludes the use of this cable type as a plenum substitute.

E. The NFPA Fire Protection Research Foundation Project developing the classification has not issued its final report. The Interim Report exhibits poor validity and repeatability between the two labs conducting the test. Further study is justified before reaching a conclusion to add this new cable type to the code.

COMMENT ON AFFIRMATIVE:

KAHN: I agree with the panel action recognizing limited combustible cables as meeting existing code requirements and permitting their application for these circuits. It should be noted that the panel approved a permissive use, not a mandatory use. There was extensive discussion and numerous technical

presentations at the panel meeting and the conclusion reached is prudent and consistent with the recognition of new technologies.

KAUFMAN: The Standards Council has given the Technical Committee on Air Conditioning and its standard, NFPA 90A, Standard for the Installation of Air-Conditioning and Ventilating Systems, primary responsibility for fire protection of plenum spaces. The establishment of listing requirements for limited combustible cable in the National Electrical Code facilities choosing a cable which meets the NFPA 90A general rule for materials (cables) in plenums.

Using limited combustible plenum cable is permissive. Panel 16 did not receive any proposals requiring their use. In the panel discussion of limited combustible cables, some panel members were concerned that establishing these cable was a first step and that in later code cycles these cables would be required. Their concern obviously involved the added cost of the high-performance materials currently used in limited combustible cables. I have confidence that panel 16 will not accept any proposals requiring limited combustible cables unless presented with compelling safety issues that we have not yet heard. The panel also heard extensive discussions of the test methods for limited combustible cables. Both the UL and ETL representatives on the panel stated that they had listing programs for limited combustible cable and that the test methods were appropriate for use in their listing programs.

EXPLANATION OF ABSTENTION:

CAUDILL: The Society of the Plastics Industries could not reach a consensus position on this issue.

(Log #1591)

16- 89 - (Table 725-61): Reject

Note: "See Technical Correlating Committee action on Comment 16-98."

SUBMITTER: Wayne G. Carson, Carson Assoc. Inc.

COMMENT ON PROPOSAL NO: 16-82

RECOMMENDATION: Delete reference to CL3P-50 and CL2P-50 cables in Table 725-61 and Figure 725-61.

SUBSTANTIATION: The new cable classification "Limited Combustible Cable" if deleted as recommended by comments to sections 725.71(b) [16-89]; 760-71(e) [16-149]; 770-51(b) [16-169]; 800-51(h) [16-232]; and 820-51(b) [16-302] will not be included in the Code. This type cable designation is not needed and is premature - see related comments for complete substantiation.

PANEL ACTION: Reject.

PANEL STATEMENT: Refer to panel action and statement on Comment 16-98.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22

VOTE ON PANEL ACTION:

AFFIRMATIVE: 21

ABSTENTION: 1

EXPLANATION OF ABSTENTION:

CAUDILL: The Society of the Plastics Industries could not reach a consensus position on this issue.

(Log #272)

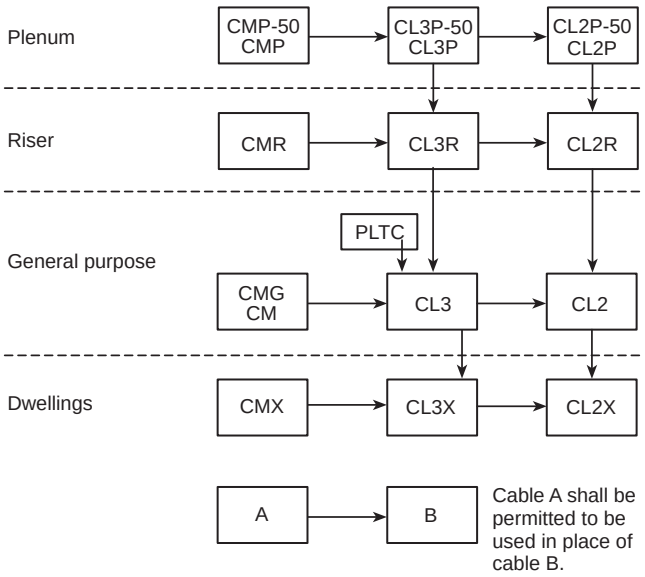
16- 90 - (Figure 725-61): Accept

Note: "See Technical Correlating Committee action on Comment 16-98."

SUBMITTER: Stanley Kaufman, Lucent Technologies

COMMENT ON PROPOSAL NO: 16-82

RECOMMENDATION: Revise Figure 725-61 as shown:



Revise Table 725-61 as shown below (Additions are boldface)

Table 725-61. Cable Uses and Permitted Substitutions

SUBSTANTIATION: This comment corrects several errors in the table and adds a consistent revision of the cable substitution figure.

PANEL ACTION: Accept.

Cable Type	Use	References	Permitted Substitutions
CL3P	**Class 3 plenum cable**	**725-61(a)**	CMP-50, **CMP, CL3P-50**
CL2P	**Class 2 plenum cable**	**725-61(a)**	CMP-50, **CMP, CL3P-50, CL3P,** CL2P-50
CL3R	**Class 3 riser cable**	**725-61(b)**	CMP-50, **CMP, CL3P-50, CL3P, CMR**
CL2R	**Class 2 riser cable**	**725-61(b)**	CMP-50, **CMP, CL3P-50, CL3P, CL2P-50, CL2P, CMR, CL3R**
PLTC	**Power-limited tray cable**	**725-61(c) and (d)**	
CL3	**Class 3 cable**	**725-61(b), (e), and (f)**	CMP-50, **CMP, CL3P-50, CL3P, CMR, CL3R, CMG, CM, PLTC**
CL2	**Class 2 cable**	**725-61(b), (e), and (f)**	CMP-50, **CMP, CL3P-50, CL3P, CL2P-50, CL2P, CMR, CL3R, CL2R, CMG, CM, PLTC, CL3**
CL3X	**Class 3 cable, limited use**	**725-61(b) and (e)**	CMP-50, **CMP, CL3P-50, CL3P, CMR, CL3R, CMG, CM, PLTC, CL3, CMX**
CL2X	**Class 2 cable, limited use**	**725-61(b) and (e)**	CMP-50, **CMP, CL3P-50, CL3P, CL2P-50, CL2P, CMR, CL3R, CL2R, CMG, CM, PLTC, CL3, CL2, CMX, CL3X**

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21
ABSTENTION: 1
EXPLANATION OF ABSTENTION:
CAUDILL: The Society of the Plastics Industries could not reach a consensus position on this issue.

(Log #1273)

16- 91 - (725-61(a)): Accept in Principle
SUBMITTER: Allen C. Weidman, The Society of the Plastics Industry, Inc.
COMMENT ON PROPOSAL NO: 16-83
RECOMMENDATION: We support the action of the Panel.
SUBSTANTIATION: None given.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Refer to the panel action and statement on Comment 16-83.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21
ABSTENTION: 1
EXPLANATION OF ABSTENTION:
CAUDILL: The Society of the Plastics Industries could not reach a consensus position on this issue.

(Log #1274)

16- 92 - (725-71): Accept
SUBMITTER: Allen C. Weidman, The Society of the Plastics Industry, Inc.
COMMENT ON PROPOSAL NO: 16-84
RECOMMENDATION: We support the action of the Panel.
SUBSTANTIATION: None given.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21
ABSTENTION: 1
EXPLANATION OF ABSTENTION:
CAUDILL: The Society of the Plastics Industries could not reach a consensus position on this issue.

(Log #1616)

16- 93 - (725-71): Accept
Note: "See Technical Correlating Committee action on Comment 16-98."
SUBMITTER: Phil Brown, Communications Products Inc. (CP)
COMMENT ON PROPOSAL NO: 16-89
RECOMMENDATION: CPI recommends that Code Panel 16 continue to accept this proposal.
SUBSTANTIATION: CPI supports the NFPA's acceptance and recognition of limited combustible cable in the 2002 NEC. This cable design would provide a significant improvement in fire safety and protect lives and property. The NFPRF research project demonstrated that cable can be tested and listed for full compliance to the NFPA 255 and 259 test methods. Limited combustible cable is consistent with the full requirements of NFPA 90A and its originally intended fire safety performance.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21
ABSTENTION: 1
EXPLANATION OF ABSTENTION:
CAUDILL: The Society of the Plastics Industries could not reach a consensus position on this issue.

(Log #1076)

16- 94 - (Table 725-71): Reject
Note: "See Technical Correlating Committee action on Comment 16-98."
SUBMITTER: Marcelo M. Hirschler, GBH International/Rep. Plenum Cable Association and Fire Retardent Chemicals Assoc.
COMMENT ON PROPOSAL NO: 16-85
RECOMMENDATION: This proposal should be rejected, the references to CL2P-50 and CL3P-50 should be deleted from the Table 725-71 and the CL23P-50 and CL3P-50 classifications should not be created.
SUBSTANTIATION: The CL2P-50 and CL3P-50 classifications are unnecessary classification because they are not justified either by requirements for reduction in fire hazard in plenums (fire hazard is the potential for harm associated with fire) or a general reduction in fire risk (fire risk is the combination of fire hazard and the probability of fires resulting in undesirable outcomes). Furthermore, they are based on a research project which is incomplete (according to the Interim Report issued) and they are based on flawed testing technology, as represented by the oxygen bomb calorimeter.

The CL2P-50 and CL3P-50 classifications are unnecessary classification because they are not justified either by requirements for reduction in fire hazard in plenums (fire hazard is the potential for harm associated with fire) or a general reduction in fire risk (fire risk is the combination of fire hazard and the probability of fires resulting in undesirable outcomes). Furthermore, they are based on a research project which is incomplete (according to the Interim Report issued) and they are based on flawed testing technology, as represented by the oxygen bomb calorimeter.

The Plenum Cable Association endorses use of fire hazard assessment and fire risk assessment in order to further develop technically supportable standards, codes and regulations, that ensure reasonable and justifiable classification and control of plastic and other combustible products. The creation of the (CXP-50) marking is not justified based on fire hazard or on fire risk and is simply an effort for one type of material to gain market share at the expense of others. If a search for better fire performance is continued indefinitely, without taking into account the overall fire safety required by the application, clearly the use of plastics and other combustible materials should be discontinued, as a non combustible material can always be found which outperforms any plastic material. Thus, if the National Electrical Code were to support unjustified improvements in fire performance, eventually any use of plastic or other combustible materials would be in jeopardy.

Thus, there are 4 reasons to oppose the CXP-50 classifications: (i) no justification based on fire risk, (ii) no justification based on fire hazard, (iii) the study for the development of the classification by the proponents is incomplete, and (iv) the technique of oxygen bomb calorimetry, and the concept of limited combustible, are technically flawed. These concerns are exemplified as follows:

(i) An analysis of fire performance of cables addresses fire hazard.

Fire hazard analysis: Traditional CMP-rated cables will not cause significant flame spread or smoke obscuration unless the fire source is very large. For example, a CMP cable with a PVC jacket and FEP insulation was shown to have no significant flame spread (out of a possible flame spread of 20 feet) and a peak optical density of much less than 0.2 when exposed to a fire of approximately 1 MW, from a wood crib, in a full scale facility, that simulated a room and plenum [Reference: L.M. Caudill, J.R. Hoover, J.T. Walnock and J.T. Chapin, "Fire Performance of Communications Cables in Concealed Spaces", pages 277-285, NFPRF Fire Risk and Hazard Assessment Symposium, June 26-28, 1996, San Francisco, CA]. The same cable also showed approximately 2 feet flame spread in the NFPA 262 plenum cable test, with a peak optical density not exceeding 0.3, according to the same reference. Clearly, if a cable does not spread flame significantly when a 1 MW fire source is applied, it does not represent any severe fire hazard. In a different scenario, a similar type of cable was studied by the European research project FIPEC, and found to release 42 kW and less than 6 MJ, to spread flame vertically for only 1.1 m, and to give low smoke release when tested in a severe vertical cable tray test (30 kW input at high air flow rate) [Reference: Fire Performance of Electric Cables Report, Interscience Communications, UK, 1999]. This indicates that the fire hazard associated with traditional CMP cables (and this with traditional CL2P and CL3P cables) is very low.

(ii) Analysis of NFPA statistics serves to illustrate fire risk. NFPA statistics address the following types of fires:

*"Non residential concealed space structure fires involving ignition of fixed wiring in ceiling/roof assemblies" {Roof plenums are examples of these spaces}

*"Non residential concealed space structure fires involving ignition of fixed wiring in ceiling/floor assemblies" {Floor plenums are examples of these spaces}

In each case, the statistics can distinguish whether wire and cable insulation was or was not the item first ignited, giving four sets of statistics relevant to plenum cables. These statistics are relevant to the fire risk from plenum cables, as plenum cables are

the typical type of wire and cable insulation present in roof plenums or in floor plenums.

Fire risk analysis: The statistics indicate that, between 1980 and 1996, there have been an average of only 584 fires per year, and of those only 171 have started with ignition of a wire and cable product, and the trend has been downwards (see the attached Tables with fire statistics and the attached charts, indicating a similar type of downward trend for both concealed roof spaces and concealed floor spaces). In fact, over the entire period between 1980 and 1996 the total number of fires in concealed roof spaces involving ignition of fixed wiring has been 0.29% of the total number of non residential structure fires (of which less than 30% started in wire and cable) and the total number of fires in concealed floor spaces involving ignition of fixed wiring has been 0.10% of the total number of non residential structure fires (of which ca. 32% started in wire and cable). With regard to fatalities or injuries: out of 3,734 fatalities in non residential structure fires, only 7 occurred in concealed roof or floor spaces involving ignition of fixed wiring (less than 0.19%), and out of 60,950 injuries in non residential structure fires, only 85 occurred in concealed roof or floor spaces involving ignition of fixed wiring (less than 0.14%). At least 4 of the 7 fatalities have been shown not to have resulted from plenum cable fires with the other 3 unknown. Thus, the fire record in a period when the amount of installed plenum cables increased from virtually none to some 20 billion feet, indicates that the fire risk is minimal.

(iii) The classifications of CXP-50 are not yet ready for application, since the NFPA Fire Protection Research Foundation Project developing the classification has not yet issued its final report. The Interim Report (International Limited Combustible Plenum Cable Fire Test Project, Interim Report, by F.B. Clarke and R.G. Gewain, June 2000) is the source of our [Plenum Cable Association] concerns. The first objective of this project was to: "Develop harmonized Steiner Tunnel listing protocols for permanent plenum cables related to NFPA 262/UL 910 and NFPA 255." The Interim Report describes part of Phase I of the project, wherein no harmonized listing protocol has been developed. The Interim Report addresses NFPA 255 and NFPA 259 and states, among other things:

*NFPA 255, flame travel distance: "... The NFPA 255 flame travel distances appear to be highly repeatable {i.e. within one lab} in each laboratory, as evidenced by the small variance of the measurements, *but not particularly reproducible* {i.e. between labs}, as can be seen by comparing this variance with the interlaboratory results. ..." {Emphasis added, but statement comes verbatim from report}

*NFPA 255, smoke index, or SDI: "... With respect to the smoke measurements, multiple determinations of the SDI by a given laboratory on a given cable agree with one another quite closely *but the SDI's reported by the two labs for the same cables do not appear to be close at all*. The results reported by Laboratory 2 are, with one exception, systematically higher than those of Laboratory 1. ..." {Emphasis added, but statement comes verbatim from report}

*NFPA 255 precision: " ... The flame spread and smoke measurements in NFPA 255 show ... *relatively poor reproducibility*, i.e. the result for a cable in a given laboratory can be repeated with precision but the difference in results between laboratories is on average considerably larger than the repeatability error. ..." {Emphasis added, but statement comes verbatim from report}

*Procedure for NFPA 255: "It is possible to test wire and cable following the current NFPA 255 test procedure, using the mounting specified for plastics in Appendix B7 of the standard." Appendix B-7 of NFPA 255 states:

"B-7 Plastics. B-7.1 The term plastics includes foams, reinforced panels, laminates, grids, and transparent or translucent sheets.

B-7.2 Where any plastic remains in position in the tunnel during a fire test, no additional support is necessary. Thermoplastic materials and other plastics that do not remain in place should be supported by 1/4-in. (6.3-mm) round metal rods or 3/16 in. (4.8 mm) thick 2 in. (51 mm) wide steel bars, or 2-in. (51-mm) galvanized hexagonal wire mesh supported with metal bars or rods spanning the width of the tunnel."

It is interesting to compare this with the statements in NFPA 262, as follows:

"1-1.3* Although this test uses equipment similar to that used in NFPA 255, Standard Method of Test of Surface Burning Characteristics of Building Materials, and ASTM E 84, Standard Test Method for Surface Burning Characteristics of Building Materials, sufficient changes have been made to the chamber so that a test conducted in the apparatus used for NFPA 255 or ASTM E 84 cannot be considered identical or produce comparable results.

A-1-1.3 The changes made in equipment for this test were deemed necessary in order to obtain proper precision from the test when the equipment is used for small quantities of wire and cable, which produce much smaller quantities of heat release and smoke obscuration."

*NFPA 259: "... NFPA 259 has traditionally been carried out on individual materials, and so the potential heat of a finished product like a cable would be calculated as the um of the contributions of each component, each contribution being the potential heat of the component multiplied by the mass fraction of that component in the cable. To produce such a measurement it would be necessary to disassemble the cable into its different components – insulation, jacket, shielding, rip cord and the like – and measure the potential heat of each component. *An obvious question is whether such a cumbersome procedure is necessary* ..." {Emphasis added, but statement comes verbatim from report}.

*Observations on NFPA 259: "One of the labs (Laboratory 2) had both more experience and more advanced equipment ..."

*Procedure for NFPA 259: "... The procedure followed was NFPA 259, Standard Test Method for Potential Heat of Building Materials, 1998 Edition, with modifications to the following sections: ... *This modification should be viewed provisionally since it so far has only been tested on 4-pair unshielded twisted pair (UTP) plenum cable*." {Emphasis added, but statement comes verbatim from report}

(iv) The oxygen bomb calorimeter test used to assess "limited combustible" classifications is severely flawed. NFPA 259 uses the oxygen bomb calorimeter as part of its testing to assess potential heat. The term "limited combustible" was developed for "building construction materials", with the intent of applying it to materials of construction of the plenum and not to cables. NFPA 90A defines "limited combustible" as follows:

"Limited-Combustible Material. A building construction material not complying with the definition of noncombustible material that in the form in which it is used, has a potential heat value not exceeding 3500 Btu/lb (8141 kJ/kg) where tested in accordance with NFPA 259, Standard Test Method for Potential Heat of Building Materials, and complies with (a) or (b):

(a) Materials having a structural base of noncombustible material, with a surfacing not exceeding a thickness of 1/8 in. (3.2 mm), that has a flame spread index not greater than 50; (b) Materials, in the form and thickness used, other than as described in (a), having neither a flame spread index greater than 25 nor evidence of continued progressive combustion, and of such composition that surfaces that would be exposed by cutting through the material on any plane would have neither a flame spread index greater than 25 nor evidence of continued progressive combustion. Materials subject to increase in combustibility or flame spread index beyond the limits herein established through the effects of age, moisture, or other atmospheric condition shall be considered combustible."

The oxygen bomb calorimeter is a method for determining the theoretical (or complete or absolute) calorific energy (or heat of combustion), as opposed to the effective (or practical) values. The reason such instruments are used is to ensure that the correct value is chosen. As such they represent the following chemical equations for combustible fuels containing only carbon, hydrogen and oxygen:

$$C + O_2 = CO_2$$

$$4\,H + O_2 = 2\,H_2O$$

For hydrocarbon fuels: $- C\,H_2 - + O_2 = CO_2 + H_2O$

However, when building materials are more complex, because they contain other elements, there is a certain inconsistency in the equation and in the energy calculated.

1. Cl: Thus, for example, when PVC is burnt in an oxygen bomb, depending on the fraction of hydrogen atoms present, there will be different proportions of the following two equations:

$$(C_2\,H_3\,Cl)_n + 2.5\,n\,O_2 = 2\,n\,CO_2 + n\,H_2O + n\,HCl$$

$$(C_2\,H_3\,Cl)_n + 2.75\,n\,O_2 = 2\,n\,CO_2 + 1.5\,n\,H_2O + 0.5\,n\,Cl_2$$

where the two equations differ by 380 kJ/kg.

2. S: Combustion of materials containing sulphur also depends on the final product. Typically the combustion bomb generates sulphuric acid as the final sulphur containing product, while furnace combustion generates sulphur dioxide (with the sulphur less fully oxidized). Therefore, the convention in bomb

calorimetry is to determine values of calorific value of fuels (including coal), by referring to the quantitative conversion to sulphur dioxide, and ignoring the conversion to sulphuric acid (or sulphur trioxide) that occurs, by using a conversion factor based on the sulphur content. Interestingly, gypsum (which is calcium sulphate dihydrate), is a building material containing sulphur. The typical fuel containing sulphur is coal. The difference between conversion to sulphur dioxide and sulphuric acid is 9410 kJ/kg.

3. N: Combustion of materials containing nitrogen also has a convention: the heat of convention is normally calculated assuming that all the nitrogen is converted into molecular nitrogen. However, that is not what happens in oxygen bomb calorimetry, where nitrogen oxides and nitric acid are actually formed. Thus, a correction is applied to account for the following equation:

$HNO_3 = 0.5\ H_2O + 0.5\ N_2 + 1.25\ O_2$, with a net heat of reaction of 1017 kJ/kg.

4. F: Combustion of materials containing fluorine is generally represented as ending in the formation of carbon tetrafluoride (CF_4) and of hydrogen fluoride (HF), in varying proportions. The equation is as follows:

$$C_a\ H_b\ O_c\ F_e + (a+b/4-c/2-e/4)\ O_2 + (n+1/2)*e*(1-x) - b/2)\ H_2O = (a-ex/4)\ CO_2 + + ex/4\ CF_4 + e(1-x)\ (HF) + e(1-x)\ n\ H_2O$$

where x is the fraction of fluorine atoms converted to CF_4 as opposed to converted to HF. The energy of the conversion of CF_4 to HF is approximately 192 kJ/kg. Moreover, fluorine materials will attack the walls of the bomb calorimeter.

5. Si: Compounds containing silicon are impossible to convert completely to their final oxidation product, which is silica (SiO_2), by conventional means because as burning proceeds, the material becomes covered by a layer of silica which prevents access of oxygen and leads to the formation of a residue. The only way to obtain a reliable result of heat of combustion of materials containing silicon (such as silicones) is by a method which combines the material with an organic fluorine compound (the value of which has been accurately assessed in advance) in rotating bomb containing also water and aqueous HF. This converts all the Si into fluorosilicic acid, and the results can then be calculated back.

6. P: Compounds containing phosphorus are exceedingly difficult to assess by oxygen bomb combustion calorimetry. There are four major problems: (1) various phosphorus acids with different energies of dilution are formed in various concentrations throughout the oxygen bomb, (2) the combustion products contain different types of phosphorus oxyacids, each one of which has a different heat of formation, (3) the burning compound gets covered by phosphorus oxides and acids, which inhibit further combustion and (4) the bomb calorimeter walls are attacked and metal phosphates are formed, so that the recommended wall materials should be corundum or gold, since Pyrex glass, quartz, stainless steel titanium, porcelain and platinum all suffered heavy weight losses. For example, depending on whether a rotating bomb or a static bomb is used, the fraction of pyrophosphoric acid formed varied from 10 to 18% and that of triphosphoric acid from 1 to 3%.

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8. Moisture content: the moisture content of the building material is critical, because the combustion reaction considered in the oxygen bomb is that to convert to gaseous water. Thus, if a material contains water, the water will have reaction to vaporize the water content. Thus, results must be expressed as a function of the original moisture content for them to be valid. This matters, of course, for materials that absorb moisture when exposed to the atmosphere.

Bibliography on oxygen bomb calorimetry:

* Mansson, Margret, "Determination of Calorific Values of Building Materials - A Guide", SP Nordtest Report Project 871-90, Swedish National Testing and Research Institute, Boras, Sweden, 1991.
* Head, Arthur J, and Good, William D., "Combustion of Liquid/Solid Compounds with Non-Metallic Hetero Atoms", Chapter 9 in "Combustion Calorimetry", "Volume 1, Experimental Chemical thermodynamics", Eds. Stig Sunner & Margret M. Mansson), Pergamon Press, Oxford, UK (for Int. Union Pure & Applied Chemistry, IUPAC), 1979.
* Mansson, Margret and Hubbard, Ward N., "Strategies in the Calculation of Standard-State Energies of Combustion from the Experimentally Determined Quantities", Chapter 5 in "Combustion Calorimetry", "Volume 1, Experimental Chemical thermodynamics", Eds. Stig Sunner & Margret M. Mansson), Pergamon Press, Oxford, UK (for Int. Union Pure & Applied Chemistry, IUPAC), 1979.
* Hu, Andrew T., Sinke, G.C., Mansson, Margret and Ringner, Birgitta, "Test Substances for Bomb Combustion Calorimetry, p-Chlorobenzoic Acid". J. Chem. Thermodynamics, 4, 283-99 (1972).
* Mansson, Margret, "Thermochemistry - Some Recent Lines of Development", Pure & Applied Chemistry, 55(3), 417-26 (1983).
* Mansson, Margret, "A 4.5 cm^3 Bomb Combustion Calorimeter and an Ampoule Technique for 5 to 10 mg Samples with Vapour Pressures Below Approximately 3 kPa (20 Torr)", J. Chem. Thermodynamics, 5, 7232 (1973).

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

PANEL ACTION: Reject.
PANEL STATEMENT: Refer to panel action and statement on Comment 16-98.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21
ABSTENTION: 1
EXPLANATION OF ABSTENTION:
CAUDILL: The Society of the Plastics Industries could not reach a consensus position on this issue.

(Log #1592)

16- 95 - (Table 725-71): Reject
Note: "See Technical Correlating Committee action on Comment 16-98."
SUBMITTER: Wayne G. Carson, Carson Assoc. Inc.
COMMENT ON PROPOSAL NO: 16-85
RECOMMENDATION: Delete reference to CL3P-50 and CL2P-50 cables.
SUBSTANTIATION: The new cable classification "Limited Combustible Cable" if deleted as recommended by comments to sections 725.71(b) [16-89]; 760-71(e) [16-149]; 770-51(b) [16-169]; 800-51(h) [16-232]; and 820-51(b) [16-302] will not be included in the Code. This type cable designation is not needed and is premature - see related comments for complete substantiation.
PANEL ACTION: Reject.
PANEL STATEMENT: Refer to panel action and statement on Comment 16-98.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21
ABSTENTION: 1
EXPLANATION OF ABSTENTION:
CAUDILL: The Society of the Plastics Industries could not reach a consensus position on this issue.

(Log #462)

16- 96 - (725-71(b)): Accept

Note: "See Technical Correlating Committee action on Comment 16-98."

SUBMITTER: Technical Correlating Committee on Signaling Systems for the Protection of Life and Property

COMMENT ON PROPOSAL NO: 16-89

RECOMMENDATION: The Technical Correlating Committee on the National Fire Alarm Code recommends that Code Panel 16 continue to accept this proposal.

SUBSTANTIATION: The Technical Correlating Committee on the National Fire Alarm Code supports the introduction of limited combustible cable and recognizes that it represents a significant improvement in fire safety.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22

VOTE ON PANEL ACTION:

AFFIRMATIVE: 21

ABSTENTION: 1

EXPLANATION OF ABSTENTION:

CAUDILL: The Society of the Plastics Industries could not reach a consensus position on this issue.

(Log #1068)

16- 97 - (725-71(b)): Reject

SUBMITTER: Marcelo M. Hirschler, GBH International/Rep. Plenum Cable Association and Fire Retardent Chemicals Assoc.

COMMENT ON PROPOSAL NO: 16-88

RECOMMENDATION: This proposal should be rejected, the new section 725-71(b) should not be created and the CL2P-50 and CL3P-50 classifications should not be created.

SUBSTANTIATION: The CL2P-50 and CL3P-50 classifications are unnecessary classification because they are not justified either by requirements for reduction in fire hazard in plenums (fire hazard is the potential for harm associated with fire) or a general reduction in fire risk (fire risk is the combination of fire hazard and the probability of fires resulting in undesirable outcomes). Furthermore, they are based on a research project which is incomplete (according to the Interim Report issued) and they are based on flawed testing technology, as represented by the oxygen bomb calorimeter.

The Plenum Cable Association endorses use of fire hazard assessment and fire risk assessment in order to further develop technically supportable standards, codes and regulations, that ensure reasonable and justifiable classification and control of plastic and other combustible products. The creation of the (CXP-50) marking is not justified based on fire hazard or on fire risk and is simply an effort for one type of material to gain market share at the expense of others. If a search for better fire performance is continued indefinitely, without taking into account the overall fire safety required by the application, clearly the use of plastics and other combustible materials should be discontinued, as a non combustible material can always be found which outperforms any plastic material. Thus, if the National Electrical Code were to support unjustified improvements in fire performance, eventually any use of plastic or other combustible materials would be in jeopardy.

Thus, there are 4 reasons to oppose the CXP-50 classifications: (i) no justification based on fire risk, (ii) no justification based on fire hazard, (iii) the study for the development of the classification by the proponents is incomplete, and (iv) the technique of oxygen bomb calorimetry, and the concept of limited combustible, are technically flawed. These concerns are exemplified as follows:

(i) An analysis of fire performance of cables addresses fire hazard.

Fire hazard analysis: Traditional CMP-rated cables will not cause significant flame spread or smoke obscuration unless the fire source is very large. For example, a CMP cable with a PVC jacket and FEP insulation was shown to have no significant flame spread (out of a possible flame spread of 20 feet) and a peak optical density of much less than 0.2 when exposed to a fire of approximately 1 MW, from a wood crib, in a full scale facility, that simulated a room and plenum [Reference: L.M. Caudill, J.R. Hoover, J.T. Walnock and J.T. Chapin, "Fire Performance of Communications Cables in Concealed Spaces", pages 277-285, NFPRF Fire Risk and Hazard Assessment Symposium, June 26-28, 1996, San Francisco, CA]. The same cable also showed approximately 2 feet flame spread in the NFPA 262 plenum cable test, with a peak optical density not exceeding 0.3, according to the same reference. Clearly, if a cable does not spread flame significantly when a 1 MW fire source is applied, it does not represent any severe fire hazard. In a different scenario, a similar type of cable was studied by the European research project FIPEC, and found to release 42 kW and less than 6 MJ, to spread flame vertically for only 1.1 m, and to give low smoke release when tested in a severe vertical cable tray test (30 kW input at high air flow rate) [Reference: Fire Performance of Electric Cables Report, Interscience Communications, UK, 1999]. This indicates that the fire hazard associated with traditional CMP cables (and this with traditional CL2P and CL3P cables) is very low.

(ii) Analysis of NFPA statistics serves to illustrate fire risk. NFPA statistics address the following types of fires:

* "Non residential concealed space structure fires involving ignition of fixed wiring in ceiling/roof assemblies" {Roof plenums are examples of these spaces}
* "Non residential concealed space structure fires involving ignition of fixed wiring in ceiling/floor assemblies" {Floor plenums are examples of these spaces}

In each case, the statistics can distinguish whether wire and cable insulation was or was not the item first ignited, giving four sets of statistics relevant to plenum cables. These statistics are relevant to the fire risk from plenum cables, as plenum cables are the typical type of wire and cable insulation present in roof plenums or in floor plenums.

Fire risk analysis: The statistics indicate that, between 1980 and 1996, there have been an average of only 584 fires per year, and of those only 171 have started with ignition of a wire and cable product, and the trend has been downwards (see the attached Tables with fire statistics and the attached charts, indicating a similar type of downward trend for both concealed roof spaces and concealed floor spaces). In fact, over the entire period between 1980 and 1996 the total number of fires in concealed roof spaces involving ignition of fixed wiring has been 0.29% of the total number of non residential structure fires (of which less than 30% started in wire and cable) and the total number of fires in concealed floor spaces involving ignition of fixed wiring has been 0.10% of the total number of non residential structure fires (of which ca. 32% started in wire and cable). With regard to fatalities or injuries: out of 3,734 fatalities in non residential structure fires, only 7 occurred in concealed roof or floor spaces involving ignition of fixed wiring (less than 0.19%), and out of 60,950 injuries in non residential structure fires, only 85 occurred in concealed roof or floor spaces involving ignition of fixed wiring (less than 0.14%). At least 4 of the 7 fatalities have been shown not to have resulted from plenum cable fires with the other 3 unknown. Thus, the fire record in a period when the amount of installed plenum cables increased from virtually none to some 20 billion feet, indicates that the fire risk is minimal.

(iii) The classifications of CXP-50 are not yet ready for application, since the NFPA Fire Protection Research Foundation Project developing the classification has not yet issued its final report. The Interim Report (International Limited Combustible Plenum Cable Fire Test Project, Interim Report, by F.B. Clarke and R.G. Gewain, June 2000) is the source of our [Plenum Cable Association] concerns. The first objective of this project was to: "Develop harmonized Steiner Tunnel listing protocols for permanent plenum cables related to NFPA 262/UL 910 and NFPA 255." The Interim Report describes part of Phase I of the project, wherein no harmonized listing protocol has been developed. The Interim Report addresses NFPA 255 and NFPA 259 and states, among other things:

* NFPA 255, flame travel distance: "... The NFPA 255 flame travel distances appear to be highly repeatable {i.e. within one lab} in each laboratory, as evidenced by the small variance of the measurements, *but not particularly reproducible* {i.e. between labs}, as can be seen by comparing this variance with the interlaboratory results. ..." {Emphasis added, but statement comes verbatim from report}
* NFPA 255, smoke index, or SDI: "... With respect to the smoke measurements, multiple determinations of the SDI by a given laboratory on a given cable agree with one another quite closely *but the SDI's reported by the two labs for the same cables do not appear to be close at all*. The results reported by Laboratory 2 are, with one exception, systematically higher than those of Laboratory 1. ..." {Emphasis added, but statement comes verbatim from report}
* NFPA 255 precision: " ... The flame spread and smoke measurements in NFPA 255 show ... *relatively poor reproducibility*, i.e. the result for a cable in a given laboratory can be repeated with precision but the difference in results between laboratories is on average considerably larger than the repeatability error. ..." {Emphasis added, but statement comes verbatim from report}
* Procedure for NFPA 255: "It is possible to test wire and cable following the current NFPA 255 test procedure, using the mounting specified for plastics in Appendix B7 of the standard." Appendix B-7 of NFPA 255 states:

"B-7 Plastics. B-7.1 The term plastics includes foams, reinforced panels, laminates, grids, and transparent or translucent sheets.

B-7.2 Where any plastic remains in position in the tunnel during a fire test, no additional support is necessary. Thermoplastic materials and other plastics that do not remain in place should be supported by 1/4-in. (6.3-mm) round metal rods or 3/16 in. (4.8 mm) thick 2 in. (51 mm) wide steel bars, or 2-in. (51-mm) galvanized hexagonal wire mesh supported with metal bars or rods spanning the width of the tunnel."

It is interesting to compare this with the statements in NFPA 262, as follows:

"1-1.3* Although this test uses equipment similar to that used in NFPA 255, Standard Method of Test of Surface Burning Characteristics of Building Materials, and ASTM E 84, Standard Test Method for Surface Burning Characteristics of Building Materials, sufficient changes have been made to the chamber so that a test conducted in the apparatus used for NFPA 255 or ASTM E 84 cannot be considered identical or produce comparable results.

A-1-1.3 The changes made in equipment for this test were deemed necessary in order to obtain proper precision from the test when the equipment is used for small quantities of wire and cable, which produce much smaller quantities of heat release and smoke obscuration."

* NFPA 259: "... NFPA 259 has traditionally been carried out on individual materials, and so the potential heat of a finished product like a cable would be calculated as the um of the contributions of each component, each contribution being the potential heat of the component multiplied by the mass fraction of that component in the cable. To produce such a measurement it would be necessary to disassemble the cable into its different components – insulation, jacket, shielding, rip cord and the like – and measure the potential heat of each component. *An obvious question is whether such a cumbersome procedure is necessary* ..." {Emphasis added, but statement comes verbatim from report}.

* Observations on NFPA 259: "One of the labs (Laboratory 2) had both more experience and more advanced equipment ..."

* Procedure for NFPA 259: "... The procedure followed was NFPA 259, Standard Test Method for Potential Heat of Building Materials, 1998 Edition, with modifications to the following sections: ... *This modification should be viewed provisionally since it so far has only been tested on 4-pair unshielded twisted pair (UTP) plenum cable*." {Emphasis added, but statement comes verbatim from report}

(iv) The oxygen bomb calorimeter test used to assess "limited combustible" classifications is severely flawed. NFPA 259 uses the oxygen bomb calorimeter as part of its testing to assess potential heat. The term "limited combustible" was developed for "building construction materials", with the intent of applying it to materials of construction of the plenum and not to cables. NFPA 90A defines "limited combustible" as follows:

"Limited-Combustible Material. A building construction material not complying with the definition of noncombustible material that in the form in which it is used, has a potential heat value not exceeding 3500 Btu/lb (8141 kJ/kg) where tested in accordance with NFPA 259, Standard Test Method for Potential Heat of Building Materials, and complies with (a) or (b):

(a) Materials having a structural base of noncombustible material, with a surfacing not exceeding a thickness of 1/8 in. (3.2 mm), that has a flame spread index not greater than 50; (b) Materials, in the form and thickness used, other than as described in (a), having neither a flame spread index greater than 25 nor evidence of continued progressive combustion, and of such composition that surfaces that would be exposed by cutting through the material on any plane would have neither a flame spread index greater than 25 nor evidence of continued progressive combustion. Materials subject to increase in combustibility or flame spread index beyond the limits herein established through the effects of age, moisture, or other atmospheric condition shall be considered combustible."

The oxygen bomb calorimeter is a method for determining the theoretical (or complete or absolute) calorific energy (or heat of combustion), as opposed to the effective (or practical) values. The reason such instruments are used is to ensure that the correct value is chosen. As such they represent the following chemical equations for combustible fuels containing only carbon, hydrogen and oxygen:

$C + O_2 = CO_2$

$4\,H + O_2 = 2\,H_2O$

For hydrocarbon fuels: $-C\,H_2- + O_2 = CO_2 + H_2O$

However, when building materials are more complex, because they contain other elements, there is a certain inconsistency in the equation and in the energy calculated.

1. Cl: Thus, for example, when PVC is burnt in an oxygen bomb, depending on the fraction of hydrogen atoms present, there will be different proportions of the following two equations:

$$(C_2\,H_3\,Cl)_n + 2.5\,n\,O_2 = 2\,n\,CO_2 + n\,H_2O + n\,HCl$$

$$(C_2\,H_3\,Cl)_n + 2.75\,n\,O_2 = 2\,n\,CO_2 + 1.5\,n\,H_2O + 0.5\,n\,Cl_2$$

where the two equations differ by 380 kJ/kg.

2. S: Combustion of materials containing sulphur also depends on the final product. Typically the combustion bomb generates sulphuric acid as the final sulphur containing product, while furnace combustion generates sulphur dioxide (with the sulphur less fully oxidized). Therefore, the convention in bomb calorimetry is to determine values of calorific value of fuels (including coal), by referring to the quantitative conversion to sulphur dioxide, and ignoring the conversion to sulphuric acid (or sulphur trioxide) that occurs, by using a conversion factor based on the sulphur content. Interestingly, gypsum (which is calcium sulphate dihydrate), is a building material containing sulphur. The typical fuel containing sulphur is coal. The difference between conversion to sulphur dioxide and sulphuric acid is 9410 kJ/kg.

3. N: Combustion of materials containing nitrogen also has a convention: the heat of convention is normally calculated assuming that all the nitrogen is converted into molecular nitrogen. However, that is not what happens in oxygen bomb calorimetry, where nitrogen oxides and nitric acid are actually formed. Thus, a correction is applied to account for the following equation:

$HNO_3 = 0.5\,H_2O + 0.5\,N_2 + 1.25\,O_2$, with a net heat of reaction of 1017 kJ/kg.

4. F: Combustion of materials containing fluorine is generally represented as ending in the formation of carbon tetrafluoride (CF_4) and of hydrogen fluoride (HF), in varying proportions. The equation is as follows:

$$C_a\,H_b\,O_c\,F_e + (a+b/4-c/2-e/4)\,O_2 + (n+1/2)*e*(1-x) - b/2)\,H_2O = (a-ex/4)\,CO_2 + ex/4\,CF_4 + e(1-x)\,(HF) + e(1-x)\,n\,H_2O$$

where x is the fraction of fluorine atoms converted to CF_4 as opposed to converted to HF. The energy of the conversion of CF_4 to HF is approximately 192 kJ/kg. Moreover, fluorine materials will attack the walls of the bomb calorimeter.

5. Si: Compounds containing silicon are impossible to convert completely to their final oxidation product, which is silica (SiO_2), by conventional means because as burning proceeds, the material becomes covered by a layer of silica which prevents access of oxygen and leads to the formation of a residue. The only way to obtain a reliable result of heat of combustion of materials containing silicon (such as silicones) is by a method which combines the material with an organic fluorine compound (the value of which has been accurately assessed in advance) in rotating bomb containing also water and aqueous HF. This converts all the Si into fluorosilicic acid, and the results can then be calculated back.

6. P: Compounds containing phosphorus are exceedingly difficult to assess by oxygen bomb combustion calorimetry. There are four major problems: (1) various phosphorus acids with different energies of dilution are formed in various concentrations throughout the oxygen bomb, (2) the combustion products contain different types of phosphorus oxyacids, each one of which has a different heat of formation, (3) the burning compound gets covered by phosphorus oxides and acids, which inhibit further combustion and (4) the bomb calorimeter walls are attacked and metal phosphates are formed, so that the recommended wall materials should be corundum or gold, since Pyrex glass, quartz, stainless steel titanium, porcelain and platinum all suffered heavy weight losses. For example, depending on whether a rotating bomb or a static bomb is used, the fraction of pyrophosphoric acid formed varied from 10 to 18% and that of triphosphoric acid from 1 to 3%.

7. Auxiliary combustion material: When an auxiliary material is used for assessing the heat of combustion, a 1% error in the assessment of the heat of combustion of the auxiliary material (such as benzoic acid), which is typically used in the order of 20% energy loading, corresponds to a 5% error in the total energy/heat measured. Thus, at a value of 1500 kJ/kg that would be an error of 75 kJ/kg, and this would be a systematic error for that series of experiments.

8. Moisture content: the moisture content of the building material is critical, because the combustion reaction considered in the oxygen bomb is that to convert to gaseous water. Thus, if a

material contains water, the water will have reaction to vaporize the water content. Thus, results must be expressed as a function of the original moisture content for them to be valid. This matters, of course, for materials that absorb moisture when exposed to the atmosphere.

Bibliography on oxygen bomb calorimetry:

* Mansson, Margret, "Determination of Calorific Values of Building Materials - A Guide", SP Nordtest Report Project 871-90, Swedish National Testing and Research Institute, Boras, Sweden, 1991.

* Head, Arthur J, and Good, William D., "Combustion of Liquid/Solid Compounds with Non-Metallic Hetero Atoms", Chapter 9 in "Combustion Calorimetry", "Volume 1, Experimental Chemical thermodynamics", Eds. Stig Sunner & Margret M. Mansson), Pergamon Press, Oxford, UK (for Int. Union Pure & Applied Chemistry, IUPAC), 1979.

* Mansson, Margret and Hubbard, Ward N., "Strategies in the Calculation of Standard-State Energies of Combustion from the Experimentally Determined Quantities", Chapter 5 in "Combustion Calorimetry", "Volume 1, Experimental Chemical thermodynamics", Eds. Stig Sunner & Margret M. Mansson), Pergamon Press, Oxford, UK (for Int. Union Pure & Applied Chemistry, IUPAC), 1979.

* Hu, Andrew T., Sinke, G.C., Mansson, Margret and Ringner, Birgitta, "Test Substances for Bomb Combustion Calorimetry, p-Chlorobenzoic Acid". J. Chem. Thermodynamics, 4, 283-99 (1972).

* Mansson, Margret, "Thermochemistry - Some Recent Lines of Development", Pure & Applied Chemistry, 55(3), 417-26 (1983).

* Mansson, Margret, "A 4.5 cm^3 Bomb Combustion Calorimeter and an Ampoule Technique for 5 to 10 mg Samples with Vapour Pressures Below Approximately 3 kPa (20 Torr)", J. Chem. Thermodynamics, 5, 7232 (1973).

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

PANEL ACTION: Reject.

PANEL STATEMENT: Refer to panel action and statement on Comment 16-98.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22

VOTE ON PANEL ACTION:

AFFIRMATIVE: 19
NEGATIVE: 2
ABSTENTION: 1

EXPLANATION OF NEGATIVE:

JOHNSON: See my explanation of negative vote on Comment 16-88.

WADEHRA: See my explanation of negative vote on Comment 16-88.

COMMENT ON AFFIRMATIVE:

KAHN: See my comment on affirmative vote on Comment 16-88.

KAUFMAN: See my comment on affirmative vote on Comment 16-88.

EXPLANATION OF ABSTENTION:

CAUDILL: The Society of the Plastics Industries could not reach a consensus position on this issue.

(Log #1082)

16- 98 - (725-71(b) (New)): Reject

Note: It was the action of the Technical Correlating Committee that Comments 16-76, 85, 88, 89, 90, 93, 94, 95, 96, 98, 99, 100, 103, 104, 105, 106, 107, 108, 109, 110, 112, 158, 164, 165, 167, 171, 172, 173, 174, 175, 176, 177, 178, 179, 180, 181, 182, 184, 186, 187, 213, 214, 216, 217, 218, 219, 220, 221, 222, 223, 224, 225, 226, 227, 228, 236, 238, 239, 278, 279, 283, 284, 285, 286, 287, 288, 289, 290, 291, 292, 293, 294, 297, 305, 308, 309, 310, 344, 346, 347, 348, 349, 350, 351, 352, 353, 354, 355, 363, 364, 365 and related Proposals 16-75, 82, 85, 89, 140, 145, 149, 152, 162, 164, 169, 177, 191, 224, 226, 231, 232, 243, 254, 260, 297, 298, 302, 316, 7-23 and 8-16 be reported as "Reject" because the panel's action contains no requirements or specifications for the use of limited combustible cable versus the general cables already specified. Code-Making Panel 16 is directed to address the addition of the cable at an appropriate time when a requirement or unique application limitation for the use of the cable has been established in the NEC. The Technical Correlating Committee notes that it is inappropriate to attempt to include references to all products that do not have a need for specific application rules or products that are permitted but not required by the NEC. Further, the Technical Correlating Committee notes that the NEC does not prohibit the use of limited combustible cable.

SUBMITTER: Marcelo M. Hirschler, GBH International/Rep. Plenum Cable Association and Fire Retardent Chemicals Assoc.

COMMENT ON PROPOSAL NO: 16-89

RECOMMENDATION: This proposal should be rejected, the new section 725-71(b) should not be created and the CL2P-50 and CL3P-50 classifications should not be created.

SUBSTANTIATION: The CL2P-50 and CL3P-50 classifications are unnecessary classifications because they are not justified either by requirements for reduction in fire hazard in plenums (fire hazard is the potential for harm associated with fire) or a general reduction in fire risk (fire risk is the combination of fire hazard and the probability of fires resulting in undesirable outcomes). Furthermore, they are based on a research project which is incomplete (according to the Interim Report issued) and they are based on flawed testing technology, as represented by the oxygen bomb calorimeter.

The Plenum Cable Association endorses use of fire hazard assessment and fire risk assessment in order to further develop technically supportable standards, codes and regulations, that ensure reasonable and justifiable classification and control of plastic and other combustible products. The creation of the (CXP-50) marking is not justified based on fire hazard or on fire risk and is simply an effort for one type of material to gain market share at the expense of others. If a search for better fire performance is continued indefinitely, without taking into account the overall fire safety required by the application, clearly the use of plastics and other combustible materials should be discontinued, as a non combustible material can always be found which outperforms any plastic material. Thus, if the National Electrical Code were to support unjustified improvements in fire performance, eventually any use of plastic or other combustible materials would be in jeopardy.

Thus, there are 4 reasons to oppose the CXP-50 classifications: (i) no justification based on fire risk, (ii) no justification based on fire hazard, (iii) the study for the development of the classification by the proponents is incomplete, and (iv) the technique of oxygen bomb calorimetry, and the concept of limited combustible, are technically flawed. These concerns are exemplified as follows:

(i) An analysis of fire performance of cables addresses fire hazard.

Fire hazard analysis: Traditional CMP-rated cables will not cause significant flame spread or smoke obscuration unless the fire source is very large. For example, a CMP cable with a PVC jacket and FEP insulation was shown to have no significant flame spread (out of a possible flame spread of 20 feet) and a peak optical density of much less than 0.2 when exposed to a fire of approximately 1 MW, from a wood crib, in a full scale facility, that simulated a room and plenum [Reference: L.M. Caudill, J.R. Hoover, J.T. Walnock and J.T. Chapin, "Fire Performance of Communications Cables in Concealed Spaces", pages 277-285, NFPRF Fire Risk and Hazard Assessment Symposium, June 26-28, 1996, San Francisco, CA]. The same cable also showed approximately 2 feet flame spread in the NFPA 262 plenum cable test, with a peak optical density not exceeding 0.3, according to the same reference. Clearly, if a cable does not spread flame significantly when a 1 MW fire source is applied, it does not represent any severe fire hazard. In a different scenario, a similar type of cable was studied by the European research project FIPEC, and found to release 42 kW and less than 6 MJ, to spread flame vertically for only 1.1 m, and to give low smoke release when tested in a severe vertical cable tray test (30 kW input at high air flow rate) [Reference: Fire Performance of Electric Cables Report, Interscience Communications, UK, 1999]. This indicates that the fire hazard associated with traditional CMP cables (and this with traditional CL2P and CL3P cables) is very low.

(ii) Analysis of NFPA statistics serves to illustrate fire risk. NFPA statistics address the following types of fires:

* "Non residential concealed space structure fires involving ignition of fixed wiring in ceiling/roof assemblies" {Roof plenums are examples of these spaces}
* "Non residential concealed space structure fires involving ignition of fixed wiring in ceiling/floor assemblies" {Floor plenums are examples of these spaces}

In each case, the statistics can distinguish whether wire and cable insulation was or was not the item first ignited, giving four sets of statistics relevant to plenum cables. These statistics are relevant to the fire risk from plenum cables, as plenum cables are the typical type of wire and cable insulation present in roof plenums or in floor plenums.

Fire risk analysis: The statistics indicate that, between 1980 and 1996, there have been an average of only 584 fires per year, and of those only 171 have started with ignition of a wire and cable product, and the trend has been downwards (see the attached Tables with fire statistics and the attached charts, indicating a similar type of downward trend for both concealed roof spaces and concealed floor spaces). In fact, over the entire period between 1980 and 1996 the total number of fires in concealed roof spaces involving ignition of fixed wiring has been 0.29% of the total number of non residential structure fires (of which less than 30%

started in wire and cable) and the total number of fires in concealed floor spaces involving ignition of fixed wiring has been 0.10% of the total number of non residential structure fires (of which ca. 32% started in wire and cable). With regard to fatalities or injuries: out of 3,734 fatalities in non residential structure fires, only 7 occurred in concealed roof or floor spaces involving ignition of fixed wiring (less than 0.19%), and out of 60,950 injuries in non residential structure fires, only 85 occurred in concealed roof or floor spaces involving ignition of fixed wiring (less than 0.14%). At least 4 of the 7 fatalities have been shown not to have resulted from plenum cable fires with the other 3 unknown. Thus, the fire record in a period when the amount of installed plenum cables increased from virtually none to some 20 billion feet, indicates that the fire risk is minimal.

(iii) The classifications of CXP-50 are not yet ready for application, since the NFPA Fire Protection Research Foundation Project developing the classification has not yet issued its final report. The Interim Report (International Limited Combustible Plenum Cable Fire Test Project, Interim Report, by F.B. Clarke and R.G. Gewain, June 2000) is the source of our [Plenum Cable Association] concerns. The first objective of this project was to: "Develop harmonized Steiner Tunnel listing protocols for permanent plenum cables related to NFPA 262/UL 910 and NFPA 255." The Interim Report describes part of Phase I of the project, wherein no harmonized listing protocol has been developed. The Interim Report addresses NFPA 255 and NFPA 259 and states, among other things:

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* NFPA 255, smoke index, or SDI: "... With respect to the smoke measurements, multiple determinations of the SDI by a given laboratory on a given cable agree with one another quite closely *but the SDI's reported by the two labs for the same cables do not appear to be close at all*. The results reported by Laboratory 2 are, with one exception, systematically higher than those of Laboratory 1. ..." {Emphasis added, but statement comes verbatim from report}

* NFPA 255 precision: " ... The flame spread and smoke measurements in NFPA 255 show ... *relatively poor reproducibility*, i.e. the result for a cable in a given laboratory can be repeated with precision but the difference in results between laboratories is on average considerably larger than the repeatability error. ..." {Emphasis added, but statement comes verbatim from report}

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"B-7 Plastics. B-7.1 The term plastics includes foams, reinforced panels, laminates, grids, and transparent or translucent sheets.

B-7.2 Where any plastic remains in position in the tunnel during a fire test, no additional support is necessary. Thermoplastic materials and other plastics that do not remain in place should be supported by 1/4-in. (6.3-mm) round metal rods or 3/16 in. (4.8 mm) thick 2 in. (51 mm) wide steel bars, or 2-in. (51-mm) galvanized hexagonal wire mesh supported with metal bars or rods spanning the width of the tunnel."

It is interesting to compare this with the statements in NFPA 262, as follows:

"1-1.3* Although this test uses equipment similar to that used in NFPA 255, Standard Method of Test of Surface Burning Characteristics of Building Materials, and ASTM E 84, Standard Test Method for Surface Burning Characteristics of Building Materials, sufficient changes have been made to the chamber so that a test conducted in the apparatus used for NFPA 255 or ASTM E 84 cannot be considered identical or produce comparable results.

A-1-1.3 The changes made in equipment for this test were deemed necessary in order to obtain proper precision from the test when the equipment is used for small quantities of wire and cable, which produce much smaller quantities of heat release and smoke obscuration."

* NFPA 259: "... NFPA 259 has traditionally been carried out on individual materials, and so the potential heat of a finished product like a cable would be calculated as the um of the contributions of each component, each contribution being the potential heat of the component multiplied by the mass fraction of that component in the cable. To produce such a measurement it would be necessary to disassemble the cable into its different components – insulation, jacket, shielding, rip cord and the like – and measure the potential heat of each component. *An obvious question is whether such a cumbersome procedure is necessary* ..." {Emphasis added, but statement comes verbatim from report}.

* Observations on NFPA 259: "One of the labs (Laboratory 2) had both more experience and more advanced equipment ..."

* Procedure for NFPA 259: "... The procedure followed was NFPA 259, Standard Test Method for Potential Heat of Building Materials, 1998 Edition, with modifications to the following sections: ... *This modification should be viewed provisionally since it so far has only been tested on 4-pair unshielded twisted pair (UTP) plenum cable*." {Emphasis added, but statement comes verbatim from report}

(iv) The oxygen bomb calorimeter test used to assess "limited combustible" classifications is severely flawed. NFPA 259 uses the oxygen bomb calorimeter as part of its testing to assess potential heat. The term "limited combustible" was developed for "building construction materials", with the intent of applying it to materials of construction of the plenum and not to cables. NFPA 90A defines "limited combustible" as follows:

"Limited-Combustible Material. A building construction material not complying with the definition of noncombustible material that in the form in which it is used, has a potential heat value not exceeding 3500 Btu/lb (8141 kJ/kg) where tested in accordance with NFPA 259, Standard Test Method for Potential Heat of Building Materials, and complies with (a) or (b):

(a) Materials having a structural base of noncombustible material, with a surfacing not exceeding a thickness of 1/8 in. (3.2 mm), that has a flame spread index not greater than 50; (b) Materials, in the form and thickness used, other than as described in (a), having neither a flame spread index greater than 25 nor evidence of continued progressive combustion, and of such composition that surfaces that would be exposed by cutting through the material on any plane would have neither a flame spread index greater than 25 nor evidence of continued progressive combustion. Materials subject to increase in combustibility or flame spread index beyond the limits herein established through the effects of age, moisture, or other atmospheric condition shall be considered combustible."

The oxygen bomb calorimeter is a method for determining the theoretical (or complete or absolute) calorific energy (or heat of combustion), as opposed to the effective (or practical) values. The reason such instruments are used is to ensure that the correct value is chosen. As such they represent the following chemical equations for combustible fuels containing only carbon, hydrogen and oxygen:

$$C + O_2 = CO_2$$

$$4\,H + O_2 = 2\,H_2O$$

For hydrocarbon fuels: $- C\,H_2 - + O_2 = CO_2 + H_2O$

However, when building materials are more complex, because they contain other elements, there is a certain inconsistency in the equation and in the energy calculated.

1. Cl: Thus, for example, when PVC is burnt in an oxygen bomb, depending on the fraction of hydrogen atoms present, there will be different proportions of the following two equations:

$$(C_2\,H_3\,Cl)_n + 2.5\,n\,O_2 = 2\,n\,CO_2 + n\,H_2O + n\,HCl$$

$$(C_2\,H_3\,Cl)_n + 2.75\,n\,O_2 = 2\,n\,CO_2 + 1.5\,n\,H_2O + 0.5\,n\,Cl_2$$

where the two equations differ by 380 kJ/kg.

2. S: Combustion of materials containing sulphur also depends on the final product. Typically the combustion bomb generates sulphuric acid as the final sulphur containing product, while furnace combustion generates sulphur dioxide (with the sulphur less fully oxidized). Therefore, the convention in bomb calorimetry is to determine values of calorific value of fuels (including coal), by referring to the quantitative conversion to sulphur dioxide, and ignoring the conversion to sulphuric acid (or sulphur trioxide) that occurs, by using a conversion factor based on the sulphur content. Interestingly, gypsum (which is calcium sulphate dihydrate), is a building material containing sulphur. The typical fuel containing sulphur is coal. The difference between conversion to sulphur dioxide and sulphuric acid is 9410 kJ/kg.

3. N: Combustion of materials containing nitrogen also has a convention: the heat of convention is normally calculated assuming that all the nitrogen is converted into molecular nitrogen. However, that is not what happens in oxygen bomb calorimetry, where nitrogen oxides and nitric acid are actually formed. Thus, a correction is applied to account for the following equation:
$HNO_3 = 0.5\ H_2O + 0.5\ N_2 + 1.25\ O_2$, with a net heat of reaction of 1017 kJ/kg.

4. F: Combustion of materials containing fluorine is generally represented as ending in the formation of carbon tetrafluoride (CF_4) and of hydrogen fluoride (HF), in varying proportions. The equation is as follows:

$$C_a\ H_b\ O_c\ F_e + (a+b/4-c/2-e/4)\ O_2 + (n+1/2)*e*(1-x) - b/2)\ H_2O = (a-ex/4)\ CO_2 + ex/4\ CF_4 + e(1-x)\ (HF) + e(1-x)\ n\ H_2O$$

where x is the fraction of fluorine atoms converted to CF_4 as opposed to converted to HF. The energy of the conversion of CF_4 to HF is approximately 192 kJ/kg. Moreover, fluorine materials will attack the walls of the bomb calorimeter.

5. Si: Compounds containing silicon are impossible to convert completely to their final oxidation product, which is silica (SiO_2), by conventional means because as burning proceeds, the material becomes covered by a layer of silica which prevents access of oxygen and leads to the formation of a residue. The only way to obtain a reliable result of heat of combustion of materials containing silicon (such as silicones) is by a method which combines the material with an organic fluorine compound (the value of which has been accurately assessed in advance) in rotating bomb containing also water and aqueous HF. This converts all the Si into fluorosilicic acid, and the results can then be calculated back.

6. P: Compounds containing phosphorus are exceedingly difficult to assess by oxygen bomb combustion calorimetry. There are four major problems: (1) various phosphorus acids with different energies of dilution are formed in various concentrations throughout the oxygen bomb, (2) the combustion products contain different types of phosphorus oxyacids, each one of which has a different heat of formation, (3) the burning compound gets covered by phosphorus oxides and acids, which inhibit further combustion and (4) the bomb calorimeter walls are attacked and metal phosphates are formed, so that the recommended wall materials should be corundum or gold, since Pyrex glass, quartz, stainless steel titanium, porcelain and platinum all suffered heavy weight losses. For example, depending on whether a rotating bomb or a static bomb is used, the fraction of pyrophosphoric acid formed varied from 10 to 18% and that of triphosphoric acid from 1 to 3%.

7. Auxiliary combustion material: When an auxiliary material is used for assessing the heat of combustion, a 1% error in the assessment of the heat of combustion of the auxiliary material (such as benzoic acid), which is typically used in the order of 20% energy loading, corresponds to a 5% error in the total energy/heat measured. Thus, at a value of 1500 kJ/kg that would be an error of 75 kJ/kg, and this would be a systematic error for that series of experiments.

8. Moisture content: the moisture content of the building material is critical, because the combustion reaction considered in the oxygen bomb is that to convert to gaseous water. Thus, if a material contains water, the water will have reaction to vaporize the water content. Thus, results must be expressed as a function of the original moisture content for them to be valid. This matters, of course, for materials that absorb moisture when exposed to the atmosphere.

Bibliography on oxygen bomb calorimetry:

* Mansson, Margret, "Determination of Calorific Values of Building Materials - A Guide", SP Nordtest Report Project 871-90, Swedish National Testing and Research Institute, Boras, Sweden, 1991.

* Head, Arthur J, and Good, William D., "Combustion of Liquid/Solid Compounds with Non-Metallic Hetero Atoms", Chapter 9 in "Combustion Calorimetry", "Volume 1, Experimental Chemical thermodynamics", Eds. Stig Sunner & Margret M. Mansson), Pergamon Press, Oxford, UK (for Int. Union Pure & Applied Chemistry, IUPAC), 1979.

* Mansson, Margret and Hubbard, Ward N., "Strategies in the Calculation of Standard-State Energies of Combustion from the Experimentally Determined Quantities", Chapter 5 in "Combustion Calorimetry", "Volume 1, Experimental Chemical thermodynamics", Eds. Stig Sunner & Margret M. Mansson), Pergamon Press, Oxford, UK (for Int. Union Pure & Applied Chemistry, IUPAC), 1979.

* Hu, Andrew T., Sinke, G.C., Mansson, Margret and Ringner, Birgitta, "Test Substances for Bomb Combustion Calorimetry, p-Chlorobenzoic Acid". J. Chem. Thermodynamics, 4, 283-99 (1972).

* Mansson, Margret, "Thermochemistry - Some Recent Lines of Development", Pure & Applied Chemistry, 55(3), 417-26 (1983).

* Mansson, Margret, "A 4.5 cm^3 Bomb Combustion Calorimeter and an Ampoule Technique for 5 to 10 mg Samples with Vapour Pressures Below Approximately 3 kPa (20 Torr)", J. Chem. Thermodynamics, 5, 7232 (1973).

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

PANEL ACTION: Reject.

PANEL STATEMENT:

The continued acceptance of limited combustible cable will make improved fire safe cable available as an option for users who want an enhanced level of fire safety regardless of whether or not a fire hazard analysis indicates such a cable is needed. These cables will be an option, an option that correlates with basic rule in NFPA 90A, Standard for the Installation of Air-Conditioning and Ventilating Systems for installations in ceiling cavity and raised floor plenums. The basic rule in section 2-3.10.2 Ceiling Cavity Plenum and section 2-3.10.6 Raised Floor Plenum is:

" All materials exposed to the airflow shall be noncombustible or limited combustible and have a maximum smoke developed index of 50."

Continued acceptance of the proposals establishing limited combustible cable in the NEC will not require the installation of limited combustible cable.

The objections to the test methods are an issue for the NFPA Technical Committee on Air Conditioning (90A committee), the NFPA Fire Tests Committee and testing labs, because the definition of limited combustible is in the 90A standard and because testing labs and the Fire Tests committee have to deal with testing issues. The Panel is aware that several testing laboratories are listing limited combustible cables and that at least two companies offer listed limited combustible cable for sale. See comment 16-101 for test data comparing limited combustible versus conventional plenum cable.

Limited combustible cable is available as an option. Limited combustible cable is significantly better than conventional plenum cable. Inclusion of limited combustible cable correlates with NFPA 90A. Consistency between NFPA codes is beneficial. It is in the interest of fire safety to include limited combustible cable in the Code.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22

VOTE ON PANEL ACTION:

AFFIRMATIVE: 19
NEGATIVE: 2
ABSTENTION: 1

EXPLANATION OF NEGATIVE:

JOHNSON: See my explanation of negative vote on Comment 16-88.

WADEHRA: See my explanation of negative vote on Comment 16-88.

COMMENT ON AFFIRMATIVE:

KAHN: See my comment on affirmative vote on Comment 16-88.

KAUFMAN: See my comment on affirmative vote on Comment 16-88.

EXPLANATION OF ABSTENTION:

CAUDILL: The Society of the Plastics Industries could not reach a consensus position on this issue.

(Log #1275)

16- 99 - (725-71(b) (New)): Accept

Note: "See Technical Correlating Committee action on Comment 16-98."

SUBMITTER: Allen C. Weidman, The Society of the Plastics Industry, Inc.

COMMENT ON PROPOSAL NO: 16-89

RECOMMENDATION: We support the action of the Panel.

SUBSTANTIATION: None given.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22

VOTE ON PANEL ACTION:

AFFIRMATIVE: 21
ABSTENTION: 1

EXPLANATION OF ABSTENTION:

CAUDILL: The Society of the Plastics Industries could not reach a consensus position on this issue.

(Log #1332)

16- 100 - (725-71(b)): Accept

Note: "See Technical Correlating Committee action on Comment 16-98."

SUBMITTER: Jeffrey S. Deckman, SyNet Inc.
COMMENT ON PROPOSAL NO: 16-89
RECOMMENDATION: SyNet recommends that Code Panel 16 continue to accept this proposal.
SUBSTANTIATION: SyNet supports the acceptance and use of limited combustible cable. The NFPRF research project demonstrated that cable can be tested and listed for full compliance to the NFPA 255 and 259 test methods. Limited combustible cable is consistent with the full requirements of NFPA 90A and its originally intended fire safety performance. We believe this cable design would provide a significant improvement in fire safety and protect lives and property.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21
ABSTENTION: 1
EXPLANATION OF ABSTENTION:
CAUDILL: The Society of the Plastics Industries could not reach a consensus position on this issue.

(Log #1435)

16- 101 - (725-71(b), 760-71 (b) (new), 770-51 (b), 800-51 (h), 820-51 (b) (New)): Accept

SUBMITTER: Andrew A. Bushelman, Avaya
COMMENT ON PROPOSAL NO: 16-89, 16-149, 16-169, 16-232, & 16-302
RECOMMENDATION: Continue to accept the proposals establishing limited combustible cable.
SUBSTANTIATION: Avaya supports the introduction of limited combustible cable because limited combustible cables exhibit significantly less smoke production than conventional combustible plenum cables. Avaya has an Underwriters Laboratories listing for limited combustible cable. The superior fire protection performance of the limited combustible versus a conventional combustible plenum cable is shown in the table below.

UL 910/NFPA 262 Test Parameters	Combustible Plenum Cable (CMP)	Limited Combustible Plenum Cable (CMP-50)
Peak Flame Spread range	0.5 – 2.0 feet	0.5
Average Optical Density range	0.10 – 0.13	0.05 – 0.07
Peak Optical Density range	0.27 – 0.34	0.1

Both cables consist of a 4-pair, 24 AWG FEP (fluorinated ethylene propylene)insulated core and thermoplastic jacket. The constructions are UTP (unshielded, twisted pair) with a nominal outside diameter of 0.22 inches. The combustible plenum cable has a low smoke PVC jacket and the limited combustible cable has a FEP jacket.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21
ABSTENTION: 1
EXPLANATION OF ABSTENTION:
CAUDILL: The Society of the Plastics Industries could not reach a consensus position on this issue.

(Log #1436)

16- 102 - (725-71(b), 760-71 (b), 770-51(b), 800-51(h), 820-51(b) (New)): Accept

SUBMITTER: James R. Hoover, DuPont
COMMENT ON PROPOSAL NO: 16-89, 16-149, 16-169, 16-232, & 16-302
RECOMMENDATION: Dupont recommends that the National Electrical Code Panel 16 continue to accept the proposals establishing the limited combustible (-50) cable "option".
SUBSTANTIATION: DuPont supports introduction of limited combustible (-50) cable because it will correlate the National Electrical Code requirements for plenum cable with the basic requirement for material (including cables) in ceiling cavity plenums and raised floor plenums now in NFPA 90A sections 2-3.10.2(a) and 2-3.10.6(a).

Overall, the introduction of the limited combustible (-50) cable "option" is broadly beneficial to everyone because it recognizes that:

1. Limited combustible cables represent a significant improvement in fire safety.
2. Authorities Having Jurisdiction (AHJs) and end users have already requested it.
3. UL is now providing Limited Combustible cable listings based on AHJ requests.
4. Several cable companies have announced commercial availability of UL Listed limited combustible (CMP-50) cable products.
5. AHJs, building owners, and end users will have the option to specify higher fire performance products for special HIGH-RISK, HIGH-HAZARD, high-concentration cable situations where fire load, smoke load, life safety, electronic damage, function continuity, mission completion, and business outage are unresolved concerns.
6. Overall, competition and innovation are increased. The proposals provide "additional options", not "exclusive requirements".

All existing materials and products are still allowed. New, higher performance, safer, cheaper, thinner, lighter, eco-friendly, re-usable cable materials and cable products are emerging.

7. NFPA's National Fire Protection Research Foundation (NFPRF) research also now provides data to support these proposals. The initial NFPRF Limited Combustible Project work is complete and published in an Interim Report (copies available to Code Panel Members upon request). The report validates the use of the NFPA 255 Tunnel Test and the NFPA 259 Oxygen Bomb test standards for cables utilizing procedures already published in the existing standards. The results were quite good when compared to previous ASTM ISR Round Robin work utilizing the Steiner Tunnel.
8. The Oxygen Bomb was found to work very well to test either cables or cable components. Counter to recent claims, The Cone Calorimeter "won't and can't" measure the potential heat (i.e. gross heat of combustion) required to meet the primary requirements on NFPA 90A. Due to limitations in its design, test methods and operating limits, the Cone Calorimeter has been unable to assess the FULL potential thermal hazard of many (complex composite) datacom plenum cable constructions used today. Please see more details in the National Fire Protection Research Foundation "Fire Risk and Hazard Assessment Symposium" Proceedings, June 26-28, 1996, "Wire and Cable Combustion Efficiency Determinations Using Cone Calorimetry and the Oxygen Bomb", J. Hoover et al.
9. The Cone Calorimeter was also recently found to have major repeatability problems and difficulties in predicting fire hazards (i.e., measuring key heat release related combustion parameters) observed in real-scale cable tests according to a recently published UK Government Research Programme based on US and UK sourced commercial plenum cables, conducted by the DETR and entitled, "Study of Cable Insulation Fires in Hidden Voids", P. Fardell et al, copyright BRE and DETR May 2000. This work and the preceding companion PEP and PIT studies are the only recent large scale datacom plenum cable studies involving the Steiner Tunnel and Cone Calorimeter with direct BRE real-scale validation. Oxygen Bomb data was subsequently found to relate well to hazard characterization and real-scale fire experience. Scatter in the published Cone Calorimeter data made it of questionable value for any reliable fire performance predictions or fire hazard assessments.
10. The NFPRF Limited Combustible Project Report also provides validating data that indicates that conventional CMP rated combustible Exception cables can generate up to 1700% more smoke and 200-300% higher polymer fuel load than the primary requirements of NFPA 90A allow. The CMP-50 rated Limited Combustible cables tested can meet ALL of the much more extensive NFPA 90A primary requirements. AHJs and end users have already begun requesting these cables for use in certain HIGH-RISK, HIGH-HAZARD installations to protect life, property and critical functions (i.e., national defense, emergency services, finance and banking, air traffic control, fossil and atomic energy, telecom exchange, stock exchange, critical business operations, etc.).
11. Data from the NFPRF Limited Combustible Report and cable manufacturers can now help provide inputs for fire safety engineering based assessments to show that the much higher fire performance limited combustible (-50) cables can make significant contributions to reducing the hazards and risks associated with fires involving cables as large fire loads, fire paths, or fire sources, etc.

12. Real-scale evaluations of certain US sourced commercial combustible CMP Listed plenum cables (presented at the December 1998 NFPA 90A meeting) indicated these listed cables can cause significant flame spread and fire growth. Therefore, higher performance limited combustible (-50) cable "options" are needed for certain HIGH-RISK and HIGH-HAZARD installation situations. The proposed "correlation" of the NEC with the existing primary requirements of NFPA 90A will fulfill these existing fire safety needs.

13. Finally, various reports and charts have been circulating recently purporting to illustrate NFPA Fire Statistics involving plenum cables and plenum spaces. There are no NFPA "Plenum" Fire Statistics per se. The terms "plenum" and "plenum cable" do not exist in the NFPA data base. Upon inquiry to this point, NFPA personnel replied: "Your understanding that we do not have incident data coded as plenum fires is correct. What has been circulating, we believe, is data that has been relabeled … We do not assume that all or even most of these two areas of (fire) origin are plenums, and did not use the word "plenum" in the tables." (copies of this NFPA letter are available to Code Panel Members upon request).

PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22
VOTE ON PANEL ACTION:
AFFIRMATIVE: 19
NEGATIVE: 2
ABSTENTION: 1
EXPLANATION OF NEGATIVE:
JOHNSON: See my explanation of negative vote on Comment 16-88.
WADEHRA: See my explanation of negative vote on Comment 16-88.
COMMENT ON AFFIRMATIVE:
KAHN: See my comment on affirmative vote on Comment 16-88.
KAUFMAN: See my comment on affirmative vote on Comment 16-88.
EXPLANATION OF ABSTENTION:
CAUDILL: The Society of the Plastics Industries could not reach a consensus position on this issue.

(Log #1483)

16- 103 - (725-71(b)): Accept
Note: "See Technical Correlating Committee action on Comment 16-98."
SUBMITTER: George Thorning, Yale University
COMMENT ON PROPOSAL NO: 16-89
RECOMMENDATION: Yale recommends that Code Making Panel 16 continue to accept this proposal.
SUBSTANTIATION: We believe this cable design would provide a significant improvement in fire safety and protect lives and property. Yale supports the NFPA's acceptance and recognition of limited combustible cable in the 2002 NEC. The NFPRF research project demonstrates that cable can be tested and listed for full compliance to the NFPA 255 and 259 test methods. Limited combustible cable is consistent with the full requirements of NFPA 90A and its originally intended fire safety performance.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21
ABSTENTION: 1
EXPLANATION OF ABSTENTION:
CAUDILL: The Society of the Plastics Industries could not reach a consensus position on this issue.

(Log #1493)

16- 104 - (725-71(b)): Accept
Note: "See Technical Correlating Committee action on Comment 16-98."
SUBMITTER: John Moseley, Suddath Van Lines, Inc.
COMMENT ON PROPOSAL NO: 16-89
RECOMMENDATION: Suddath Van Lines, Inc. recommends that Code Making Panel 16 continue to accept this proposal.
SUBSTANTIATION: Suddath Van Lines, Inc. advocates the endorsement and application of limited combustible cable. This cable design supplies a major upgrade in fire safety offerings. Cable can be tested and listed for full compliance to the NFPA 255 and 259 protocols; the NFPRF has already established this information. Limited combustible cable observes and applies the current guidelines of NFPA 90A, without the exception, and its fire safety performance tenet.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21
ABSTENTION: 1
EXPLANATION OF ABSTENTION:
CAUDILL: The Society of the Plastics Industries could not reach a consensus position on this issue.

(Log #1498)

16- 105 - (725-71(b)): Accept
Note: "See Technical Correlating Committee action on Comment 16-98."
SUBMITTER: Michael Lohr, Staples Communications
COMMENT ON PROPOSAL NO: 16-89
RECOMMENDATION: Staples Communications recommends that Code Making Panel 16 continue to accept this proposal.
SUBSTANTIATION: Staples Communications endorses the acceptance and application of limited combustible cable. This cable design presents a considerable improvement in fire safety. The NFPRF has shown that cable can be tested and listed for full compliance to NFPA 255 and 259 protocols. Limited combustible cable is consistent with the NFPA 90A's full, original requirements and its intended fire safety performance.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21
ABSTENTION: 1
EXPLANATION OF ABSTENTION:
CAUDILL: The Society of the Plastics Industries could not reach a consensus position on this issue.

(Log #1503)

16- 106 - (725-71(b)): Accept
Note: "See Technical Correlating Committee action on Comment 16-98."
SUBMITTER: Scott Paulov, Cabling Business Institute
COMMENT ON PROPOSAL NO: 16-89
RECOMMENDATION: Cabling Business Institute recommends that Code Making Panel 16 continue to accept this proposal.
SUBSTANTIATION: Cabling Business Institute encourages the acceptance and utilization of limited combustible cable. This cable design offers a substantial advancement in fire safety. The NFPRF has verified that cable can be tested and listed for complete compliance with the NFPA 255 and 259 protocols. Limited combustible cable is totally consistent with the provisions of NFPA 90A, without the exception, and its desired fire safety performance.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21
ABSTENTION: 1
EXPLANATION OF ABSTENTION:
CAUDILL: The Society of the Plastics Industries could not reach a consensus position on this issue.

(Log #1586)

16- 107 - (725-71(b)): Reject
Note: "See Technical Correlating Committee action on Comment 16-98."
SUBMITTER: Wayne G. Carson, Carson Assoc. Inc.
COMMENT ON PROPOSAL NO: 16-89
RECOMMENDATION: Delete proposed section 725-71(b) and associated notes.
SUBSTANTIATION: The introduction of a new class of cable ("Limited Combustible Cable") is premature at this time for the following reasons:

A. The note to the definition section 725.71(B), FPN No. 1 references NFPA 90A, Standard for the Installation of Air-Conditioning and Ventilating Systems for the definition of limited combustible. That definition is as follows:

"Limited-Combustible Material. A building construction material not complying with the definition of noncombustible material that in the form in which it is used, has a potential heat value not exceeding 3500 Btu/lb (8141J/kg) where tested in accordance with NFPA 259, Standard Test Method for Potential Heat of Building Materials, and complies with (a) or (b):

a. Materials having a structural base of noncombustible material, with a surfacing not exceeding a thickness of 1/8 in. (3.2 mm), that has a flame spread index not greater than 50;

b. Materials, in the form and thickness used, other than as described in (a), having neither a flame spread index greater than 25 nor evidence of continued progressive combustion, and of such composition that surfaces that would be exposed by cutting through the material on any plane would have neither a flame spread index greater than 25 nor evidence of continued progressive combustion. Materials subject to increase in combustibility or flame spread index beyond the limits herein established through the effects of age, moisture, or other atmospheric condition shall be combustible."

This definition was established and is applied to building construction materials and not to specific wiring methods or technologies for use in buildings. NFPA 255 and NFPA 259 were never intended for the evaluation of multi-component systems such as electrical and optical cable. More current test methods (other than NFPA 255 and 259), such as NFPA 262, the cone calorimeter, etc. provide reproducible smoke obscuration, flame spread, or heat release (not heat value) information and are more appropriate for measuring the fire hazards of cable. Not all parts of this "Limited Combustible" definition have been applied to the broad scope of cables. Until this definition can be shown as appropriate for cables (attainable and reproducible) it should not be deemed credible and supported by the National Electrical Code at this time. Referencing this inappropriate definition in the National Electrical Code is misleading and bad code.

B. The note references NFPA 255 as the test standard for smoke developed index. This test is not an appropriate test for cables for the following reasons:

a. NFPA 255 has not been harmonized, as has NFPA 262. NFPA 262 has a proven record, unlike NFPA 255.

b. NFPA 255 is not reproducible, whereas NFPA 262 has been shown to be reproducible. This lack of reproducibility has been demonstrated numerous times in round-robin testing of building materials among multiple labs.

The most recent example of this reproducibility problem has been demonstrated in the Interim Report of the Fire Protection Research Foundation (FPRF) "Limited Combustible Cable" (ex. "Permanent Plenum Cable") project, dated June 2000. This report states "The flame spread and smoke measurements in NFPA 255 show good repeatability but relatively poor reproducibility, i.e., the result for a cable in a given laboratory can be repeated with precision but the difference in results between laboratories is on average considerably larger than the repeatability error." (Page 9, section 4.1.2). In this case, with only two laboratories participating, errors in reproducibility were in the range of 100 percent. Given that numerous fire-testing tunnels exist, the range of error can be expected to be even larger.

This test is inappropriate for cables as the cables are installed against the top of the tunnel. This orientation is not similar to normal cable installations, and cable placement on top of the wire mesh is random in the tunnel.

C. Cable installed above ceilings does not become involved in the fire until near or at flashover. At that point in the fire development, the ceiling tile is falling to expose the cable. Cables in walls or below floors are generally exposed to the fire conditions even later in the fire development. These cables do not spread flame more than 5 ft when tested in accordance with NFPA 262. The proposed restrictions on cable appear excessive based on the fire record.

D. There is not a need established (fire record or hazard analysis) for a new cable category. There are two research projects that are intended to provide information on the fire hazard of cables. The ASHRAE project has not yet begun. This ASHRAE Project is being conducted by the National Research Council of Canada and is a broad based fire hazard assessment program developed to evaluate the hazard presented by the accumulation of plenum cables. This question has not yet been answered and developing cable categories to address a hazard that has not yet been defined is premature. The project when completed will assist in developing appropriate language for NFPA 90A and/or the National Electrical Code.

The FPRF project has only issued an interim report dated June 2000. This project has only accomplished a cursory review of one cable type in NFPA 255 and NFPA 259 and has just begun the experimental work on broader aspects of the "limited combustible" definition.

The proposals for the National Electrical Code that have been accepted by Code Making Panel 16 for the removal of all abandoned cable broadly addresses this problem now. The adoption of these proposals for removing all abandoned cable will significantly reduce the fuel load created by excessive cable accumulation.

E. The International Mechanical Code (IMC), the Uniform Mechanical Code (UMC), and the NFPA 90A (the membership and the NFPA Standards Council) have each recently rejected similar provisions to the ones being proposed for the National Electrical Code. These proposals for "limited combustible cables" have been rejected for several reasons including:

a. They will present confusion in the field;

b. They are not good code based on sound engineering principles;

c. They are not based on good fire hazard assessment information; and

d. Questions regarding the appropriateness and accuracy of the test protocols NFPA 255 and NFPA 259.

PANEL ACTION: Reject.
PANEL STATEMENT: Refer to panel action and statement on Comment 16-98.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22
VOTE ON PANEL ACTION:
AFFIRMATIVE: 19
NEGATIVE: 2
ABSTENTION: 1
EXPLANATION OF NEGATIVE:
JOHNSON: See my explanation of negative vote on Comment 16-88.
WADEHRA: See my explanation of negative vote on Comment 16-88.
COMMENT ON AFFIRMATIVE:
KAHN: See my comment on affirmative vote on Comment 16-88.
KAUFMAN: See my comment on affirmative vote on Comment 16-88.
EXPLANATION OF ABSTENTION:
CAUDILL: The Society of the Plastics Industries could not reach a consensus position on this issue.

(Log #1746)

16- 108 - (725-71(b)): Accept
Note: "See Technical Correlating Committee action on Comment 16-98."
SUBMITTER: Francis W. Peri, Communications Design Corporation
COMMENT ON PROPOSAL NO: 16-89
RECOMMENDATION: Association of Cabling Professionals (ACP) recommends that Code Panel 16 continue to accept this proposal.
SUBSTANTIATION: ACP supports the acceptance and use of limited combustible cable. This cable design provides a significant improvement in fire safety. The NFPRF has demonstrated that cable can be tested and listed for full compliance to the NFPA 255 and 259 protocols. Limited combustible cable is consistent with the full requirements of NFPA 90A and its intended fire safety performance.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21
ABSTENTION: 1
EXPLANATION OF ABSTENTION:
CAUDILL: The Society of the Plastics Industries could not reach a consensus position on this issue.

(Log #1858)

16- 109 - (725-71(b)): Accept
Note: "See Technical Correlating Committee action on Comment 16-98."
SUBMITTER: Robert W. Jensen, dbi-Telecommunications Infrastructure Design
COMMENT ON PROPOSAL NO: 16-89
RECOMMENDATION: BICSI recommends that Code Panel 16 continue to accept this proposal.
SUBSTANTIATION: BICSI supports the introduction of limited combustible cable and recognizes that it represents a significant improvement in fire safety.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21
ABSTENTION: 1

EXPLANATION OF ABSTENTION:
CAUDILL: The Society of the Plastics Industries could not reach a consensus position on this issue.

(Log #1932)

16- 110 - (725-71(b)): Accept
Note: "See Technical Correlating Committee action on Comment 16-98."
SUBMITTER: Jeffrey S. Deckman, SyNet Inc.
COMMENT ON PROPOSAL NO: 16-89
RECOMMENDATION: SyNet recommends that Code Panel 16 continue to accept this proposal.
SUBSTANTIATION: SyNet supports the acceptance and use of limited combustible cable. The NFPRF research project demonstrated that cable can be tested and listed for full compliance to the NFPA 255 and 259 test methods. Limited Combustible cable is consistent with the full requirements of NFPA 90A and its originally intended fire safety performance. We believe this cable design would provide a significant imporvement in fire safety and protect lives and property.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21
ABSTENTION: 1
EXPLANATION OF ABSTENTION:
CAUDILL: The Society of the Plastics Industries could not reach a consensus position on this issue.

(Log #2203)

16- 111 - (725-71(b), 760-71 (b) (new), 770-51 (b), 800-51 (h), 820-51 (b)): Accept
SUBMITTER: Loren M. Caudill, DuPont
COMMENT ON PROPOSAL NO: 16-89,16-149, 16-169, 16-232, & 16-302
RECOMMENDATION: DuPont supports the panel's action to establish a new level of fire performance (limited combustible) - 50 as an "option".
SUBSTANTIATION: This will correlate the National Electrical Code "option" with the primary requirements of NFPA 90A sections 2-3.10.2(a) and 2-3.10.6(a) and provide a new level of fire performance that has been requested. Listed cables of this type are commercially available. This marking is also justified by the work done within the Fire Protection Research Foundation.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21
ABSTENTION: 1
EXPLANATION OF ABSTENTION:
CAUDILL: The Society of the Plastics Industries could not reach a consensus position on this issue.

(Log #1024)

16- 112 - (725-71(b), FPN No. 2): Accept in Principle
Note: "See Technical Correlating Committee action on Comment 16-98."
SUBMITTER: Frederic B. Clarke, Benjamin Clarke Assoc., Inc.
COMMENT ON PROPOSAL NO: 16-89
RECOMMENDATION: Revise proposed FPN No. 2 to read:
FPN No. 2: For ~~further~~ information on the requirements for materials in ceiling cavity and raised floor plenums, see NFPA 90A-1999, Standard for the Installation of Air Conditioning and Ventilating Systems, Sections 2-3.10.1 Ceiling Cavity Plenum and 2-3.10.5 Raised Floor Plenum. Types CL2P and CL3P cables meet the basic requirements of this Section for materials for plenum use as well as those of Exception No. 1.
SUBSTANTIATION: The existing FPNs provide no information on material requirements in NFPA 90A-1999, so the word "further" is unnecessary.
The new text proposed in this comment distinguishes between materials allowable under the exceptions to Section 2-3.10.1 and 2-3.10.5 and those for general plenum use. This provides information for adopting jurisdictions, many of which do not now reference NFPA 90A and so may not otherwise recognize the distinction - and the potential difference in protection which it may provide.
PANEL ACTION: Accept in Principle.
Revise the text of the comment to read:
"Types CL2P-50 and CL3P-50 cables meet the basic requirements of this section for materials for plenum use as well as those of Exception No. 1."
PANEL STATEMENT: The revised text corrects an error in the comment.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22
VOTE ON PANEL ACTION:
AFFIRMATIVE: 22

(Log #1276)

16- 113 - (725-71(d)): Accept
SUBMITTER: Allen C. Weidman, The Society of the Plastics Industry, Inc.
COMMENT ON PROPOSAL NO: 16-90
RECOMMENDATION: We support the action of the Panel.
SUBSTANTIATION: None given.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21
ABSTENTION: 1
EXPLANATION OF ABSTENTION:
CAUDILL: The Society of the Plastics Industries could not reach a consensus position on this issue.

(Log #199)

16- 114 - (725-71(e)): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 16-91
RECOMMENDATION: The Technical Correlating Committee understands that the reference to "725-71(e)" in the Proposal is incorrect and should be "725-71(h)". The Technical Correlating Committee notes that this section will be renumbered "725-71(i)" based on the Action on Proposal 16-89. The Technical Correlating Committee directs that the action on this Proposal be revised to comply with the NEC Style Manual 3.1.4 regarding the use of an Exception within the same sentence as the main rule. The Technical Correlating Committee directs the Panel to refer to the action on similar Proposal 16-106 and correlate the wording of the two Proposals. A separate Exception may be appropriate. This action will be considered by the Panel as a Public Comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
Revise the first sentence of 725-71(F) to read as follows:
"Type PLTC nonmetallic-sheathed, power-limited tray cable shall be listed as being suitable for cable trays and shall consist of a factory assembly of two or more insulated conductors under a nonmetallic jacket."
Revise 725-71(I) to read as follows:
"725.71(I) Markings. Cables shall be marked in accordance with 310.11 (A) (2),(3),(4),(5) and Table 725.71. Voltage ratings shall not be marked on the cables."
PANEL STATEMENT: The text has been revised to comply with the Manual of Style in accordance with the Technical Correlating Committee directive. The panel has modified 727-7 for correlation. Refer to panel action and statements on Comments 16-127 and 16-128.
(The panel notes that 725-71(e) is now 725.71(F) per the action of another proposal.)
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22
VOTE ON PANEL ACTION:
AFFIRMATIVE: 22

(Log #200)

16- 115 - (725-71(f)): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 16-93
RECOMMENDATION: It was the action of the Technical Correlating Committee that further consideration be given to the comments expressed in the voting. This action will be considered by the panel as a public comment.

SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
PANEL STATEMENT: The panel reaffirms its original action to accept Proposal 16-93.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22
VOTE ON PANEL ACTION:
AFFIRMATIVE: 22

ARTICLE 727 — INSTRUMENTATION TRAY CABLE: TYPE ITC

(Log #1939)

16- 116 - (727): Accept
SUBMITTER: David Wechsler, Union Carbide Corp.
COMMENT ON PROPOSAL NO: 16-96
RECOMMENDATION: The Panel should accept the Technical Correlating Committee proposed action to reconsider this proposal with deepest appreciation for their efforts, but continue to reject this proposal.
SUBSTANTIATION: If the committee truly feels that combining Articles 725 and 727 serves a useful purpose, it is suggested that a subcommittee be formed to evaluate and develop a complete rewrite that addresses the significant problems and present installation problems that are found to exist. Combining as suggested in this proposal would not produce a more user friendly document nor would it resolve some of the known shortcomings, due mostly to the nature of the subject.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21

(Log #2069)

16- 117 - (727): Reject
SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc.
COMMENT ON PROPOSAL NO: 16-96
RECOMMENDATION: Accept the proposal.
SUBSTANTIATION: This is a correlating comment; refer to the principal comment on Proposal 16-56.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel has rejected the correlating comments 16-67 and 16-68. This comment is rejected for the same reason.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21

(Log #1938)

16- 118 - (727-2(6)): Accept in Principle
SUBMITTER: David Wechsler, Union Carbide Corp.
COMMENT ON PROPOSAL NO: 16-97
RECOMMENDATION: Delete the word "control rooms" and revise the test as follows:
This has been corrected to 727-4(7)
(6) Under raised floors and in rack rooms where arranged to prevent damage to the cable.
SUBSTANTIATION: With due respect to the Panel, the term "control room" meaning a manned location has become a problem where authorities having jurisdiction have read the current text and infer that only in these "control rooms" that have raised floors and in rack rooms, can ITC be used. As the primary developer of this chapter, I can tell you that it was never the intent to restrict the installation in this limited sense. Rather the intent was to address the complete installation which included the area into which instrumentation cabling had to be run to be terminated from the field runs for its final purpose. In hindsight, perhaps the use of the term "control room" was a poor choice in words. The submitter concedes that by its very nature, ITC would not be suitable for just anywhere. However, in industrial applications, where the ITC ends up, may be called a "termination building room", or a "computer room or building" or a "control building". These areas utilize raised floors and we need to be able to complete the ITC runs to its end points at some DCS, computerized data collection, or instrumentation control point. While defining "control room" could be one solution, elimination of this term which is not defined within the NEC, provides a simple correction without compromising any aspect of the installation design safety.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Refer to panel action and statement on Comment 16-123.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21

(Log #633)

16- 119 - (727-4): Accept in Principle
SUBMITTER: James M. Daly, BICC General
COMMENT ON PROPOSAL NO: 16-98
RECOMMENDATION: The proposal should be accepted in part in principle.
Accept the proposal as written through (4).
Revise (5) as follows:
(5) As open wiring <u>without a metallic sheath or armor</u> between cable tray and equipment in lengths not to exceed 50 ft (15.24 m), where the cable is supported and protected against physical damage using mechanical protection, such as dedicated struts, angles, or channels. The cable shall be supported and secured at intervals not exceeding 6 ft (1.83 m).
Add (6) to read:
<u>(6) As open wiring between cable tray and equipment in lengths not to exceed 50 ft (15.24 m), where the cable complies with the crush and impact requirements of Type MC cable and is identified for such use. The cable shall be supported and secured at intervals not exceeding 6 ft (1.83 m)</u>.
Renumber the remaining list items as follows:
(7) As aerial cable on a messenger.
(8) Direct buried where identified for the use.
(9) Under raised floors in control rooms and rack rooms where arranged to prevent damage to the cable.
The SI units and inch-pound units in this proposal and comment should also be changed to agree with the panel action on Proposal 16-101.
SUBSTANTIATION: This modification will convert the exceptions into positive text and addresses the panel's concern that the original proposal did not include the installation requirements specified in Exception No. 2.
PANEL ACTION: Accept in Principle.
Revise the recommendation to read as follows:
The proposal should be accepted in principle.
Accept the proposal as written through (4).
Revise (5) as follows:
(5) As open wiring without a metallic sheath or armor between cable tray and equipment in lengths not to exceed 15 m (50 ft), where the cable is supported and protected against physical damage using mechanical protection, such as struts, angles, or channels. The cable shall be supported and secured at intervals not exceeding 1.8 m (6 ft).
Add (6) to read:
(6) As open wiring between cable tray and equipment in lengths not to exceed 15 m (50 ft), where the cable complies with the crush and impact requirements of Type MC cable and is identified for such use. The cable shall be supported and secured at intervals not exceeding 1.8 m (6 ft).
Renumber the remaining list items as follows:
(7) As aerial cable on a messenger.
(8) Direct buried where identified for the use.
(9) Under raised floors in rooms containing industrial process control equipment and rack rooms where arranged to prevent damage to the cable.
PANEL STATEMENT: The panel has corrected the metric values in accordance with the Style Manual and Proposal 16-101. Item 5 was changed to delete the word "dedicated" to correlate with Panel Action on Comments 16-120 and 121. Item 9 was also revised to correlate with the panel action on Comment 16-123.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21

(Log #605)

16- 120 - (727-4 Exception No. 1): Accept in Principle
SUBMITTER: John E. Propst, Equilon Enterprises, LLC
COMMENT ON PROPOSAL NO: 16-99
RECOMMENDATION: The purpose for this comment is to support the following alternate proposal wording stated in Mr. Hughes' affirmative comment:

727-4 Exception No. 1 will read: Type ITC cable without a metallic sheath or armor shall be permitted to be installed as open wiring between cable tray and equipment in lengths not to exceed 50 ft (15.24 m), where the cable is supported and protected against physical damage using mechanical protection, such as ~~dedicated~~ struts, angles or channels. The cable shall be supported and secured at intervals not exceeding 6 ft (1.83 m).
SUBSTANTIATION: As a member of the original CMP 7 task force that drafted the original wording of 727, I do not believe that it was our intent to limit support incorporating struts to "dedicated" struts but rather to provide examples of methods that could be considered appropriate in providing protection against physical damage. With respect to the issue is protection, some segments of our industry such as offshore platforms and integrated process units have significant physical weight and space limitations. Through good engineering design structural and similar construction members can often provide physical protection as well as structural support for multiple systems. The deletion of the word "dedicated" would help clarify that the intent is to provide protection and not to overly prescribe how it is to be done.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Refer to the panel action and statement on Comment 16-119.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21

(Log #1414)

16- 121 - (727-4 Exception No. 1): Accept in Principle
SUBMITTER: Kari Barrett, American Chemistry Council
COMMENT ON PROPOSAL NO: 16-99
RECOMMENDATION: 727-4 Exception No. 1 will read:

Type ITC cable without a metallic sheath or armor shall be permitted to be installed as open wiring between cable tray and equipment in lengths not to exceed 50 ft. (15.24 m), where the cable is supported and protected against physical damage using mechanical protection, such as ~~dedicated~~ struts, angels or channels. The cable shall be supported and secured at intervals not exceeding 6 ft (1.83 m).
SUBSTANTIATION: I am the person who proposed Proposal 16-99. Due to copy/paste error on my part, the proposed text and substantiation obviously does not apply to 727-4 Exception 1. The wording in this comment was my intent with the proposal. My substantiation is as follows:

The examples cited for mechanical protection could already be part of the building or equipment infrastructure, and if so, are not solely dedicated for the purpose of protection of a wiring system. This change will clarify the exception, avoid the interpretation that the mechanical protection means can only be used for that purpose, and continue to provide protection of the wiring system as intended.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Refer to the panel action and statement on Comment 16-119.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21

(Log #868)

16- 122 - (727-4(4)): Reject
SUBMITTER: Frank H. Rocchio, The Okonite Co., Inc.
COMMENT ON PROPOSAL NO: 16-9
RECOMMENDATION: This proposal is for the removal of open wiring from 727-4(4) along with Exceptions No. 1 and No. 2 until such time as a test protocol exists where the cable tested must pass 100 percent of the impact tests performed.

Using a similar protocol for Type TC cable where only eleven feet of cable is tested and must pass 8 out of 10 impact tests at 1 ft intervals. This eleven ft of cable tested justifies the cable being permitted to go out of the tray for up to 50 ft. It would seem that any crush or impact failures in an unarmored cable should disallow the cable from leaving the tray.
SUBSTANTIATION: There is no test protocol for the testing of Type ITC open wiring. This type cable requires an uninsulated drain to be in contact with the Polyester - Aluminum tape shielded construction for pairs, triads, quads and other units. This uninsulated drain will not permit a Type ITC cable to pass a impact test. As such, the designation "open wiring" should not be permitted and the cable should not be permitted to leave the tray without overall armor for any distance.
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter has made no specific recommendation.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21

(Log #604)

16- 123 - (727-4(7)): Accept
SUBMITTER: John E. Propst, Equilon Enterprises, LLC
COMMENT ON PROPOSAL NO: 16-97
RECOMMENDATION: The purpose for this comment is to support the original proposal and to reject the action of the panel. Note that Proposal 16-97 incorrectly referenced Section 727-2(6) and should have referenced 727-4(7) as noted in the panel comment. I would like to suggest that the panel consider accepting this proposal in principle and reword 727-4(7) to read:

727-4(7). Under raised floors in ~~control~~ rooms containing industrial process control equipment and rack rooms where arranged to prevent damage to the cable.
SUBSTANTIATION: As Mr. Wechsler points out, there is confusion in the industry related to the interpretation of "control room". The panel is not quite correct in stating that it was never the intent to allow ITC cable under a raised floor anywhere in a building. Along with Mr. Wechsler and several other people, I was also a member of the original CMP 7 task group that drafted the ITC section. At that time it was our intent to allow the use of ITC cable under all raised floors in industrial buildings that housed equipment related to the industrial control. Within our company, these are typically large integrated buildings designed specifically for the remote operation of multiple process units. The buildings typically contain the "control rooms, rack rooms, and a variety of additional rooms for housing process, computers, process controllers, process training simulators, and similar process related equipment. This equipment is typically all installed on raised floors and connected with ITC cables. Since there is not a clear definition of "control room," industry could deal with this issue by calling the entire facility the "control room," but it would help industry clarify this issue by eliminating the reference to "control room" in this section.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21

(Log #1429)

16- 124 - (727-4(7)): Accept in Principle
SUBMITTER: Kari Barrett, American Chemistry Council
COMMENT ON PROPOSAL NO: 16-97
RECOMMENDATION: Delete the term "Control Rooms".
SUBSTANTIATION: The application of type ITC is already limited to industrial establishments where the conditions of maintenance and supervision ensure that only qualified persons will service the installation (727-4). The notion that deleting the term "control room" will result in abuse of the intent of this section is not valid. Since "Control Room" is not a term used by all industrial users, deleting it will allow more consistent application of this section.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Refer to panel action and statement on Comment 16-123.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21

(Log #1411)

16- 125 - (727-4(8) (New)): Accept
SUBMITTER: Kari Barrett, American Chemistry Council
COMMENT ON PROPOSAL NO: 16-102
RECOMMENDATION: The proposal should continue to be accepted if Proposal 12-105 action is reversed.
SUBSTANTIATION: The Technical Correlating Committee has directed panel 12 to consider the comments expressed in the voting. If action on Proposal 12-105 is reversed, then the direction to reject this proposal will be an error.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21

(Log #2353)

16- 126 - (727-4(8)): Accept
SUBMITTER: Paul S. Hamer, San Ramon, CA
COMMENT ON PROPOSAL NO: 16-102
RECOMMENDATION: This proposal should be accepted.
SUBSTANTIATION: The substantiation given in the proposal is adequate.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21

(Log #CC1600)

16- 126a - (727-7): Accept
SUBMITTER: CMP 16
COMMENT ON PROPOSAL NO: 16-106
RECOMMENDATION: Revise 727.7 to read as follows:
727.7 Marking. The cable shall be marked in accordance with Section 310.11(A)(2),(3),(4),and(5). Voltage ratings shall not be marked on the cable.
SUBSTANTIATION: Section 727.7 has been revised to comply with the Technical Correlating Committee directive of Comment 16-114. The minimum voltage rating for ITC is defined in UL-2250. The cable markings for ITC cable will be "the same marking requirements as other cables" under the jurisdiction of this code panel, with this change. The user will have the knowledge of the limitations of ITC because "Type ITC cable shall be permitted to be used in industrial establishments where the conditions of maintenance and supervision ensure that only qualified persons will service the installation."
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21

(Log #596)

16- 127 - (727-7): Reject
SUBMITTER: John E. Propst, Equilon Enterprises, LLC
COMMENT ON PROPOSAL NO: 16-106
RECOMMENDATION: The purpose for this comment is to reject the action of the panel and to reject the original proposal.
SUBSTANTIATION: While the requirements of 727 limits the application of ITC cable to circuits operating at 150 volts or less, there is still a need to define the minimum voltage rating of the conductor insulation. From a historical perspective, in the development of ITC cable, it was necessary to define the cable's requirements within the NEC in order to provide guidance to UL in the development of UL 2250. At that time, it was felt that ITC should comply with the same marking requirements as other cables. The removal of the cable voltage rating would set an unsafe practice of allowing cables without voltage ratings to be applied in industrial applications where 600 volt rated and higher cables ae very common. Without a clearly identified voltage rating on the cable, it would require that the user have knowledge of the limitations stated in 727, and could be misapplied to higher voltage systems.
PANEL ACTION: Reject.
PANEL STATEMENT: Surface marking "300 V" on a cable that in application serves circuits operating at 150 volts or less could be confusing to the user and authority having jurisdiction. Refer to the FPN in Section 725-71(h) of the 1999 edition of the code. The submitter does not provide technical substantiation for his statement "the removal of the cable voltage rating would set an unsafe practice of allowing cable without voltage ratings to be applied ...". The suitability of the cables is determined by the application as specified in the code, not the voltage rating of the cable.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21

(Log #1412)

16- 128 - (727-7): Reject
SUBMITTER: Kari Barrett, American Chemistry Council
COMMENT ON PROPOSAL NO: 16-106
RECOMMENDATION: Delete entire proposal and return wording to the original text which reads: "The cable shall be marked in accordance with Section 310-11."
SUBSTANTIATION: It is not uncommon for a cable to have a maximum rated voltage marked on the cable and yet use the cable for lower voltages. For example, Article 725 Class I cables are rated at 600 volts and yet many applications using Class I cables are less than 600 volts. The submitter presents no documentation or fact finding evidence that having a maximum voltage printed on the cable has resulted in an unsafe condition. Further, Article 725 which defines Type PLTC (Power-limited Tray Cable), which is an identical twin of Type ITC, has been used for years with a surface marking requirement referencing Section 310.11(a) and with the same voltage constraints (See Chapter 9, Table 11(a) for example). Lastly, Section 727-4 provides that "Type ITC cable shall be permitted to be used in industrial establishments where the conditions of maintenance and supervision ensure that only qualified persons will service the installation." The ITC cable voltage marking would NOT confuse a "qualified" person.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel agrees that there needs to be a specific reference to 310.11 but disagrees that all of 310.11 applies. Surface marking "300 V" on a cable that in application serves circuits operating at 150 volts or less could be confusing to the user and authority having jurisdiction. Refer to the FPN in 725-71(h) of the 1999 edition of the code. The submitter does not provide technical substantiation for his statement "the removal of the cable voltage rating would set an unsafe practice of allowing cable without voltage ratings to be applied ...". The suitability of the cables is determined by the application as specified in the code, not the voltage rating of the cable.
Refer also to panel action and statements on Comment 16-114 that removes the requirements for voltage marking on Type PLTC Cables.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21

ARTICLE 760 — FIRE ALARM SYSTEMS

(Log #299)

16- 129 - (760-2 Abandoned Cable (New)): Accept in Principle
SUBMITTER: Gerald Lee Dorna, Belden Wire & Cable Co.
COMMENT ON PROPOSAL NO: 16-109
RECOMMENDATION: The definition of "Abandoned Cable" should be the same here as what we accepted in Proposal 16-273. It should be:
"Cable that is neither terminated at ~~both ends, at a connector or other~~ equipment, not identified for future use with a tag."
This is the same wording we accepted for Proposal 16-273.
SUBSTANTIATION: The reason we took out the reference to connectors in Proposal 16-273 is because CATV cable usually has connectors attached. It was our concern that CATV cables would have connectors attached and then would not fall under the definition the panel had accepted in principal. If we make the definition the same as I have suggested above then it will make it irrelevant on whether the cable has connectors or not. I can foresee someone using the fact that the cable has a connector on it, therefore it does not fall under "abandoned cable" and does not need to be removed.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Refer to panel action and statement on Comment 16-131.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21

(Log #457)

16- 130 - (760-2, Abandoned Cable): Accept in Principle in Part
SUBMITTER: Technical Correlating Committee on Signaling Systems for the Protection of Life and Property
COMMENT ON PROPOSAL NO: 16-109
RECOMMENDATION: Revise the proposed definition of abandoned cable to read as follows:
"Cable that is neither terminated at equipment, nor identified for future use with a dated tag."

SUBSTANTIATION: The definition proposed for 820-2 by the Panel Action of Proposal 16-273 is clear and concise and should be used consistently in all Articles. This proposed definition has been modified in the above recommendation to add the word "dated" before the word "tag." The tag should be dated so the authority having jurisdiction can determine the date on which the cable was designated for future use. This will establish a means to allow the decision of abandonment to be re-evaluated periodically if the authority having jurisdiction so desires.
PANEL ACTION: Accept in Principle in Part.
PANEL STATEMENT: Refer to panel action and statement on Comment 16-131. Panel statement on Comment 16-246 includes the explanation for the rejected part.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21

(Log #1842)

16- 131 - (760-2): Accept in Principle
SUBMITTER: Robert W. Jensen, dbi-Telecommunications Infrastructure Design
COMMENT ON PROPOSAL NO: 16-109
RECOMMENDATION: New wording:
Abandoned Cable. Installed cable that is neither terminated at both ends at a connector or other equipment, nor identified for future use with a tag.
SUBSTANTIATION: BICSI added the word installed to show that the cable needs to be installed and not in the installers truck. We retained "terminated at both ends" because optical fiber cable is typically terminated at both ends when it is in use (i.e., when not abandoned). We removed the term "connectors" since the cable is typically connected directly to equipment.
PANEL ACTION: Accept in Principle.
Revise the recommendation to read as follows:
"Abandoned Fire Alarm Cable. Installed fire alarm cable that is not terminated at equipment other than a connector and not identified for future use with a tag."
PANEL STATEMENT: The revised text clearly expresses the intended definition, correlates with similar definitions in other articles and complies with the Manual of Style.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21

(Log #1278)

16- 132 - (760-2-Abandoned Cable (New)): Accept in Principle
SUBMITTER: Allen C. Weidman, The Society of the Plastics Industry, Inc.
COMMENT ON PROPOSAL NO: 16-109
RECOMMENDATION: We support the action of the Panel.
SUBSTANTIATION: None given.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Refer to panel action and statement on Comment 16-131.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
ABSTENTION: 1
EXPLANATION OF ABSTENTION:
CAUDILL: The Society of the Plastics Industries could not reach a consensus position on this issue.

(Log #1573)

16- 133 - (760-2-Abandoned Cable): Accept in Principle
SUBMITTER: Wayne G. Carson, Carson Assoc. Inc.
COMMENT ON PROPOSAL NO: 16-109
RECOMMENDATION: Revise text to read as follows:
Abandoned Cable: Cable that is not ~~neither~~ terminated at both ends, ~~at a connector or other~~ not connected to equipment, or not ~~nor~~ identified for future use with a tag.
SUBSTANTIATION: The term "terminated at a connector" may result in cables being left in place as many cables come with connectors or the installer could add crimp connectors and leave the cables in place. The present language can be easily misunderstood: does the cable have to be terminated and tagged, or is it a choice?
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Refer to panel action and statement on Comment 16-131.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21

(Log #1747)

16- 134 - (760-2-Abandoned Cable): Accept in Principle
SUBMITTER: Francis W. Peri, Communications Design Corporation
COMMENT ON PROPOSAL NO: 16-109
RECOMMENDATION: New wording:
Abandoned Cable. Installed cable that is neither terminated at both ends at equipment, nor identified for future use with a tag.
SUBSTANTIATION: The word "installed" shows that the cable needs to be installed and not in the installer's truck. The words "terminated at both ends" are needed because fire alarm cable is typically terminated at both ends at equipment when it is in use (i.e., when not abandoned). The term "connectors" should be removed since the cable is typically connected directly to active equipment.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Refer to panel action and statement on Comment 16-131.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21

(Log #267)

16- 135 - (760-3(a)): Accept in Principle
SUBMITTER: Stanley Kaufman, Lucent Technologies
COMMENT ON PROPOSAL NO: 16-144
RECOMMENDATION: Delete "not intended for future use."
SUBSTANTIATION: It is redundant to state "Abandoned cables not intended for future use...", since abandoned cables are defined as not being intended for future use.
PANEL ACTION: Accept in Principle.
Revise the second sentence of 760-3(a) in the panel action of Proposal 16-144 to read as follows:
The accessible portion of abandoned fire alarm cables shall not be permitted to remain.
PANEL STATEMENT: The intent is not to remove cables where it would be extremely difficult or damaging to the building or the remaining cables.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21

(Log #1580)

16- 136 - (760-3(a)): Accept in Principle in Part
SUBMITTER: Wayne G. Carson, Carson Assoc. Inc.
COMMENT ON PROPOSAL NO: 16-144
RECOMMENDATION: Revise text to read as follows:
Spread of Fire or Products of Combustion. Installations in hollow spaces, vertical shafts, and ventilation or air-handling ducts shall be made so that the possible spread of fire or products of combustion will not be substantially increased. Openings around penetrations through fire resistance-rated walls, partitions, floors, or ceilings shall be firestopped using approved methods to maintain the fire resistance rating.
Abandoned cables not intended for future use shall not be permitted to remain.
FPN: Directories of electrical construction materials published by qualified testing laboratories contain many listing installation restrictions necessary to maintain the fire-resistive rating of assemblies where penetrations or openings are made.
SUBSTANTIATION: This definition under the section entitled "Spread of Fire or Products of Combustion" is not consistent throughout the Code. This comment uses language from ROP 16-250 [850-52(B)] to provide a consistent requirement throughout the code.
The same comment is being made for the following sections:
640-3A (ROP 16-1a)
645-5D6 (ROP 12-106)
725-3B (ROP 16-80)
770-3A (ROP 16-176)
820-3A (ROP 16-313)
820-52B (ROP 16-311)
8320-3A (ROP 16-364)
830-58B (ROP 16-368)
PANEL ACTION: Accept in Principle in Part.

PANEL STATEMENT: The panel accepts in principle the statement regarding abandoned cables. Refer to panel action on Comment 16-135. This satisfies the submitter's concerns.

The current reference to 300-21 satisfies the balance of the comment, which is rejected. That portion of the comment repeats the text of 300-21.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21

(Log #1415)

16- 137 - (760-3(b)): Reject
SUBMITTER: Kari Barrett, American Chemistry Council
COMMENT ON PROPOSAL NO: 16-144
RECOMMENDATION: Delete the following text:
~~Abandoned cables not intended for future use shall not be permitted to remain.~~
SUBSTANTIATION: Removal of abandoned cables in these areas is a "housekeeping" issue. Whether or not to remove them should be the owner's decision and not be mandated by the NEC.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel reaffirms that removal of abandoned cables addresses a significant fire safety issue. The term "housekeeping" is not applicable to abandoned cables. Fire safety and cable installation are within the scope of the NEC.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21

(Log #201)

16- 138 - (760-5): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 16-112
RECOMMENDATION: See Technical Correlating Committee action on Proposal 16-38. It was the action of the Technical Correlating Committee that further consideration be given to the comments expressed in the voting of a similar Proposal 16-192. The Technical Correlating Committee directs that the Action on this Proposal be revised to comply with the NEC Style Manual 3.2.1 relative to the use of the unenforceable terms "practicable" and "impracticable". This action will be considered by the Panel as a Public Comment. It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 3 for Comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
PANEL STATEMENT: Refer to the recommendation and substantiation on Comment 16-137a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21

(Log #703)

16- 139 - (760-5): Reject
SUBMITTER: Glenn W. Zieseniss, Crown Point, IN
COMMENT ON PROPOSAL NO: 16-112
RECOMMENDATION: Change the "Accept in Principle" to "Reject".
SUBSTANTIATION: I agree with Mr. Egesdal's and Mr. Speer's negative vote and comment on Proposal 16-192. This proposal is giving a "blanket okay for any type of ceiling tile to support the possible added weight of 3 cables of less than 1/2 in. in diameter on each ceiling tile. The proposal does not affirm that the ceiling tile industry was contacted of adding weight to lay on their product. This product is not part of the building structure, and is not designed to be suitable for supporting cables. I have seen ceiling tiles which look as if made of fiber glass insulation which has a finished surface on the exposed side of the ceiling. It is my belief that this ceiling tile would not accept additional weight upon it. I have contacted three ceiling tile companies or organizations on this proposal. They all suggested that their ceiling tiles are not to support additional weight. I have provided copies of my e-mail contacts.

NOTE: Supporting Material is available at NFPA Headquarters.
PANEL ACTION: Reject.
PANEL STATEMENT: The recommendation of Comment 16-137a provides a reasonable, safe, and practical solution to placing a limited number of unsupported signaling and communications cables in existing construction. The restrictions contained in Comment 16-137a limit both the number and size of wires and cables permitted on each ceiling panel, thereby controlling weight and accumulation so that cables can be easily moved aside to permit access. The submitter's concern about weight is addressed by decreasing the size of the cable to 1/4 inch and limiting the number of cables to three per each 10 ft x 10 ft area.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
SPEER: See my explanation of negative vote on Comment 16-27a.

(Log #859)

16- 140 - (760-5): Accept in Principle in Part
SUBMITTER: Larry F. Miller, National Electrical Manufacturers Association (NEMA)
COMMENT ON PROPOSAL NO: 16-112
RECOMMENDATION: The Panel should continue to Accept the proposal in Principle but revise the Panel action text to read as follows:

760-5. Access to electrical Equipment Behind Panels Designed to Allow Access.

Access to electrical equipment shall not be denied by an accumulation of wires and cables that prevents removal of panels. Cables shall be installed in such a manner that the cable will not be damaged by normal building use <u>or maintenance.</u> Access to electrical equipment behind ceilings designed to allow access shall comply with (a) or (b).

a. New building construction (e.g., renovation, remodeling, new spaces). Installation of cables shall comply with Section 300.11.

b.<u>1. Installation of cables in suspended lay-in type ceiling spaces shall comply with 300.11.</u>

<u>2. Installation of cables in other than suspended lay-in type ceiling spaces shall comply with 300.11 where the space is accessible.</u>

<u>3.Where the ceiling is not the lay-in type, and the space is not accessible, three cables less than 13 mm (0.5 in.) shall be permitted to be installed unsupported by the building structure between access points or access panels.</u>

~~Buildings with existing cabling systems.~~

~~Where practicable, installation of cables shall comply with Section 300.11. Where impracticable to comply with Section 300.11, cables less than 13 mm (0.5 in) in diameter shall be permitted to be installed unsupported by the building structure in accordance with 1 or 2.~~

~~1. In areas having ceilings with access points or access panels, it shall be permissible to fish a maximum of three cables between access points in the ceiling.~~

~~2. In areas having suspended lay-in ceilings, it shall be permissible to install a maximum three supported cables on top of any one ceiling tile. The cables shall be run parallel to the ceiling grid."~~

SUBSTANTIATION: We agree with Mr. Egedsal's and Mr. Speer's negative comments that suspended ceilings are not intended to support electrical wires or cables.

Section 300-11(a)(1) (wiring located within the cavity of a fire-rated floor-ceiling or roof-ceiling) allows an exception for wiring that has been tested as part of the fire-rated assembly. This proposal could compromise the fire-rating of the ceiling by overriding that requirement. The words "or maintenance" have been added because so much of the damage occurs in ceiling spaces as various trades perform maintenance.

The submitter states that he has submitted companion proposals for Articles 725 760, 770, 820 and 830. If each of these articles will allow three cables per ceiling tile, this could result in a total of 18 cables per ceiling tile, which appears to be approaching the "excessive accumulation" the submitter agrees could be a hazard. Limiting the size and quantity of cable permitted to be fished in non-lay-in ceiling spaces will help control the weight of cable (combined with that permitted in the other articles referenced above) on these ceilings.
PANEL ACTION: Accept in Principle in Part.
PANEL STATEMENT: The panel rejects the recommended addition of the word "maintenance." The term "normal building use" includes "maintenance." The balance of the recommendation

is accepted in principle. Refer to the recommendation and substantiation on Comment 16-137a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
SPEER: See my explanation of negative vote on Comment 16-27a.

(Log #978)

16- 141 - (760-5): Accept in Part
SUBMITTER: Palmer Hickman, Royersford, PA
COMMENT ON PROPOSAL NO: 16-112
RECOMMENDATION: Reject Proposal 16-112 and retain present 760-5 as it appears in the 1999 NEC.
SUBSTANTIATION: I would strongly urge Code-Making Panel 16 to reconsider their action on this proposal. The proposed 725.5(B)(2) would now permit three cables to be installed on the tile of a suspended ceiling, without providing any technical substantiation for this allowance.

I offer the following reasons against accepting this proposal.

1) Chapters 1-4 apply except as amended by Chapters 5, 6, and 7. Sections 300-11(a)(1) and (2) state wiring shall not be supported by ceiling assembly.

2) Section 725-5 deals with access to electrical equipment, not support of wiring

3) Code-Making Panel 3 reaffirmed their prohibition of ceiling assemblies being used beyond the manufacturers design parameters in the Panel Statement to Comments 3-53 and 3-57 of the 1998 ROC, and Proposal 3-68 of the 2001 ROP. In the later reference, Code-Making Panel 3 states: "The panel reaffirms its position that an independent means of support shall be provided for all wiring, not just branch circuit wiring...".

I understand that this proposed allowance of ceiling support only applies to buildings with existing cabling systems where it is "impracticable" to comply with 300-11. Impracticability does not provide technical substantiation to allow a ceiling assembly that has not been evaluated to support the potential additional load of three cables on each and every ceiling tile. Essentially, the ceiling assembly is expected to carry the additional load of potentially hundreds of cables installed directly on it. As an example, a 100 ft X 100 ft room with a suspended ceiling using 2 ft x 2 ft tiles, would be expected to carry the full weight of 150 cables.

The substantiation offered by the submitter of this proposal does not even support the proposed change. He claims that "a limited amount of wiring or cabling laid directly on a suspended ceiling is permitted..." without stating where this permission is given, and by whom. The entire substantiation of the submitter seems contrary to the action of the panel. He begins his substantiation by stating "Section 725-5 may be misinterpreted to mean that conductors and cables may not be placed directly on suspended ceiling." He notes that the 1999 NEC Handbook "Figures 725-2 and 725-3 lead the reader to conclude that no wires or cables are permitted to rest directly on the suspended ceiling." The submitter also stated Code-Making Panel 16 responded to a proposal to Article 725 (1992 TCD Comment 16-18) that the proposed requirement "...would still allow some cabling of a limited quantity above the ceiling tile, but not an excessive amount." Note the words "above the ceiling tile", not on the ceiling tile. I feel these examples are not misinterpretations, but rather correct interpretations, and substantiation to reject this proposal.

In conclusion, I respectfully disagree with the Panel Action on this Proposal. I feel the implications are quite serious. I find no technical substantiation to warrant such a dramatic change. The substantiation of the submitter does not appear to support this change, but rather the rejection of it.
PANEL ACTION: Accept in Part.
The panel accepts the portion of the comment to retain Section 760.5, and rejects the portion of the comment to reject Proposal 16-112.
PANEL STATEMENT: Refer to the recommendation and substantiation on Comment 16-137a. Also refer to the panel action and statement on Comment 16-139.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
SPEER: See my explanation of negative vote on Comment 16-27a.

(Log #1149)

16- 142 - (760-5): Accept in Principle
SUBMITTER: James E. Brunssen, Telcordia Technologies, Inc.
COMMENT ON PROPOSAL NO: 16-112
RECOMMENDATION: Revise as follows:

760-5. Access to Electrical Equipment Behind Panels Designed to Allow Access. Access to electrical equipment shall not be denied by an accumulation of wires and cables that prevents removal of panels. Cables shall be installed in such a manner that the cable will not be damaged by normal building use. Access to electrical equipment behind ceilings designed to allow access shall comply with (a) or (b).

a. New building construction (e.g., renovation, remodeling, new spaces). Installation of cables shall comply with Section 300.11.

b. Buildings with existing cabling systems. Where practicable, installation of cables shall comply with Section 300-11. Where impracticable to comply with Section 300-11, cables less than 13 mm (0.5 in.) in diameter shall be permitted to be installed unsupported by the building structure in accordance with 1 or 2.

1. In areas having ceilings with access points or access panels, it shall be permissible to fish a maximum of three cables between access points in the ceiling.

2. In areas having suspended lay-in ceilings, it shall be permissible to install a maximum <u>of</u> three unsupported cables on top of ~~any one~~ <u>each</u> ceiling tile, <u>i.e., up to three wires and cables are permitted to lay on a ceiling tile.</u> The cables shall be run parallel to the ceiling grid.

SUBSTANTIATION: Proposed Section 760-5(b)(2), as presently written in Proposal 16-112, panel action, is confusing and could be interpreted as permitting a total of only three unsupported wires and cables above a suspended ceiling. The intent of the panel was that up to a maximum of three unsupported wires and cables may be routed across each and every ceiling tile. The revision proposed in this comment clarifies and accomplishes the intent of the panel. This is a companion comment and is intended to correlate with comments on Proposals 16-38, 16-159, 16-192, 16-276, and 16-332.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Refer to the recommendation and substantiation on Comment 16-137a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
SPEER: See my explanation of negative vote on Comment 16-27a.

(Log #1164)

16- 143 - (760-5): Accept in Principle
SUBMITTER: James E. Brunssen, Telcordia Technologies, Inc.
COMMENT ON PROPOSAL NO: 16-112
RECOMMENDATION: Revise as follows:

760-5. Access to Electrical Equipment Behind Panels Designed to Allow Access. Access to electrical equipment shall not be denied by an accumulation of wires and cables that prevents removal of panels. Cables shall be installed in such a manner that the cable will not be damaged by normal building use. Access to electrical equipment behind ceilings designed to allow access shall comply with (a) or (b).

a. New building construction (e.g., renovation, remodeling, new spaces). Installation of cables shall comply with Section 300.11.

b. Buildings with existing cabling systems. ~~Where practicable, installation of cables shall comply with Section 300-11. Where impracticable to comply with Section 300-11,~~Cables less than 13 mm (0.5 in.) in diameter shall be permitted to be installed unsupported by the building structure in accordance with 1 or 2.

1. In areas having ceilings with access points or access panels, it shall be permissible to fish a maximum of three cables between access points in the ceiling.

2. In areas having suspended lay-in ceilings, it shall be permissible to install a maximum of three unsupported cables on top of any one ceiling tile. The cables shall be run parallel to the ceiling grid.

<u>Where the maximum number of cables permitted in 1 or 2 will be exceeded, installation of cables shall comply with Section 300.11.</u>

SUBSTANTIATION: The Technical Correlating Committee has directed that Proposal 16-112 be revised to comply with the NEC Style Manual 3.2.1 relative to the use of unenforceable terms. The proposed revision contained in this comment removes the unenforceable terms "practicable" and "impracticable"; the remaining text is in agreement with the NEC Style Manual 3.1.2 using the phrase "shall be permitted" to indicate allowed optional

or alternate methods. The added text (final sentence) provides direction on how to proceed if the limits of 760-5(b)(1) or (2) will be exceeded. This is a companion comment and is intended to correlate with comments on Proposals 16-38, 16-159, 16-192, 16-276, and 16-332.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Refer to the recommendation and substantiation on Comment 16-137a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
SPEER: See my explanation of negative vote on Comment 16-27a.

(Log #1170)

16- 144 - (760-5): Accept in Principle
SUBMITTER: James E. Brunssen, Telcordia Technologies, Inc.
COMMENT ON PROPOSAL NO: 16-112
RECOMMENDATION: Continue to accept in principle.
SUBSTANTIATION: Panel 16 should continue to accept this proposal in principle as it provides a reasonable and safe solution to placing a limited number of signaling and communications wires and cables in existing construction. The restrictions contained in the proposed change limit both the number and size of wires and cables permitted on each suspended ceiling panel. In this manner additional weight, as well as an accumulation of wires and cables that would otherwise restrict access above suspended ceiling panels, is controlled and limited. The limited number of cables permitted can easily be moved aside to permit access. Some concern has also been expressed that cables placed directly on the ceiling panels would degrade the fire rating of the ceiling. The suspended ceiling, part of a membrane that is intended to retard fire from spreading into the ceiling cavity, would be unaffected in its ability to retard the spread of fire by a limited number of wires and cables resting on top of the panels. This is a companion comment and is intended to correlate with comments on Proposals 16-38, 16-159, 16-192, 16-276, and 16-332.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Refer to the substantiation on Comment 16-137. This action meets the intent of the submitter.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
SPEER: See my explanation of negative vote on Comment 16-27a.

(Log #CC1603)

16- 137a - (760-5, 6, 7, 8, 9): Accept
Note: The Technical Correlating Committee directs that the references to Articles 640 and 650 be deleted because the panel did not accept similar requirements in those articles. The Technical Correlating Committee also directs that the FPN which contains a mandatory requirement be deleted to comply with the NEC Style Manual.
SUBMITTER: CMP 16
COMMENT ON PROPOSAL NO: 16-112
RECOMMENDATION: Renumber current Section 760-6 as 760-9.
Renumber current Section 760-7 as 760-11.
Renumber current Section 760-8 as 760-6.
Retain the existing 1999 code text for Section 760-5 (unmodified).
Add new Section 760.7 to read as follows:
760.7 Installation of Circuits.
Non-power-limited fire alarm and power-limited fire alarm circuits shall be installed in compliance with A or B.
A. New Ceiling Construction. The installation of cables in new ceiling construction shall comply with Section 300-11.
B. Existing Ceilings.
1. Fire-Rated Ceilings. The installation of cables in the cavity of an existing fire-rated ceiling assembly shall comply with Section 300-11.
2. Non-Fire-Rated Ceilings. For installations in the cavity of an existing non-fire-rated ceiling assembly, cables less than 6 mm (0.25 in) in diameter shall be permitted to be installed unsupported from the building structure in accordance with the following:
a. Fixed or Hard Ceilings. In areas having fixed or hard ceilings with access points or access panels, a combined total of three cables from Articles 640, 650, 725, 760, 770, 800, 820 and 830, shall be permitted to be placed between access points or access panels in the ceiling. Additional cables shall be installed in accordance with 300.11.
b. Suspended Lay-In Ceilings. In areas having suspended lay-in ceilings, in any 3 m by 3m (10 ft. x 10 ft) ceiling area, a combined total of three cables from Articles 640, 650, 725, 760, 770, 800, 820 and 830, shall be permitted to be installed directly on the ceiling grid. Additional cables shall be installed in accordance with 300.11.
FPN. Cables of all types are included in the total limit of three cables, not three cables from each article.
SUBSTANTIATION: Proposal 16-112 was accepted in principle to permit the installation of unsupported cables under limited conditions. Proposal 16-112 text, however, was too broad and unclear. The text of this comment clarifies the original intent. The new text includes requirements to comply with 300.11. Permitted installation conditions will not compromise the integrity of fire-rated ceilings. For non-fire-rated ceilings, the permitted relief from Section 300.11 is limited to very specific conditions. Section 760.5 is not being modified because the accessibility requirements should remain.
The sections have been renumbered so that they appear in a logical order.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
SPEER: See my explanation of negative vote on Comment 16-27a.

(Log #1748)

16- 145 - (760-5): Accept in Principle
SUBMITTER: Francis W. Peri, Communications Design Corporation
COMMENT ON PROPOSAL NO: 16-112
RECOMMENDATION: Association of Cabling Professionals (ACP) recommends that Code Panel 16 continue to accept this proposal.
SUBSTANTIATION: ACP supports the introduction of complying with 300-11. It represents a major improvement in providing safe cabling pathways.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Refer to the substantiation on Comment 16-137a. This action meets the intent of the submitter.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 19
NEGATIVE: 1
ABSTENTION: 1
EXPLANATION OF NEGATIVE:
SPEER: See my explanation of negative vote on Comment 16-27a.
EXPLANATION OF ABSTENTION:
CAUDILL: The Society of the Plastics Industries could not reach a consensus position on this issue.

(Log #1843)

16- 146 - (760-5): Accept in Principle
SUBMITTER: Robert W. Jensen, dbi-Telecommunications Infrastructure Design
COMMENT ON PROPOSAL NO: 16-112
RECOMMENDATION: BICSI recommends that Code Panel 16 continue to accept this proposal.
SUBSTANTIATION: BICSI supports the introduction of complying with Section 300-11 and recognizes that it represents a significant improvement in providing safe cabling pathways.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Refer to the substantiation on Comment 16-137a. This action meets the intent of the submitter.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 19
NEGATIVE: 1
ABSTENTION: 1
EXPLANATION OF NEGATIVE:
SPEER: See my explanation of negative vote on Comment 16-27a.
COMMENT ON AFFIRMATIVE:
CAUDILL: The Society of the Plastics Industries could not reach a consensus position on this issue.

(Log #741)

16- 147 - (760-5(b)): Accept in Principle in Part
SUBMITTER: Richard P. Owen, City of St. Paul, Electrical Inspection
COMMENT ON PROPOSAL NO: 16-112
RECOMMENDATION: Replace (b) of the proposal with the following text:

(b) Buildings not Covered Under (a) Above. In areas having ceilings with access points or panels and having 900 mm (3 ft) or less vertical clearance above the ceiling, it shall be permissible to fish a maximum of 3 cables, each less than 13 mm (0.5 in.) in diameter, between access points in the ceiling.

SUBSTANTIATION: The Technical Correlating Committee directed Panel 3 Chair Raymond Weber to form a Task Group to review these proposals and to submit the results as comments to Panel 16. Task Group 3-16, consisting of Chair Weber, members Steven Speer; Lee Hewitt; Richard Owen and Ron Maassen held a conference call on October 3, 2000 and developed the above language as a comment. The Task Group was concerned with allowing unsupported cabling above suspended ceilings, since companion proposals for Articles 725, 760, 770, 800, 820 and 830 would also allow this limited cabling without support. The possible accumulation of cable allowed by all these articles would be excessive and would both limit access to a ceiling and conflict with Section 300.11. Rewording of (b) also eliminated the unenforceable terms "practicable" and "impracticable" as directed by the Technical Correlating Committee.
PANEL ACTION: Accept in Principle in Part.

The panel rejects the specific limitations in the comment but accepts the principle of permitting a limited number of cables.
PANEL STATEMENT: The recommendation of Comment 16-137a provides a reasonable, safe, and practical solution to placing a limited number of unsupported fire alarm cables in existing construction.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
SPEER: See my explanation of negative vote on Comment 16-27a.

(Log #1255)

16- 148 - (760-5(b)(2)): Reject
SUBMITTER: J. Paul Spinn, USG Research & Technology Center
COMMENT ON PROPOSAL NO: 16-112
RECOMMENDATION: Delete the following text:

In areas having suspended lay in ceiling, it shall be permissible to install a maximum of three unsupported cables on top of any one ceiling tile. The cables shall be run parallel to the ceiling grid.

SUBSTANTIATION: By allowing a maximum of three unsupported cables on top of any one (or more) ceiling tiles, the fire-rating of the assembly and the Class A surface burning characteristic requirement, which includes flame spread and smoke development, could be jeopardized. By decreasing the fire-rating of the plenum assembly and the surface burning characteristic of the ceiling tile, the life safety of the occupants can be negatively affected. By rejecting this proposal, these problems can be eliminated.

To substantiate the comment made for the proposal, four key points are provided:

[1] For a fire rated floor/ceiling or roof/ceiling assembly, placement of unsupported cables on top of any one ceiling tile or a row of ceiling tiles could invalidate the fire-rating for a particular assembly. The rationale for this argument are:
(a) The weight of the cables could cause premature tile fallout leading to an early failure of the assembly, which is tested in accordance with NFPA 251 or ASTM E 119.
(b) The increased heat of combustion associated with the cable jackets, which commonly use plastics, will add to the total fire load of an assembly. As the total fire load increases for an assembly, the fire endurance of the assembly will decrease, which could jeopardize an assembly's fire-rating.

[2] For a Class A ceiling, placement of unsupported cables on the ceiling can effect flame spread and smoke development performance and jeopardize the required Class A rating for the ceiling tiles. The rationale for this argument are:
(a) The flame spread will increase due to the increased total heat load, which is caused by the plastic on the cable jacket.
(b) The smoke development will increase due to the cable jackets, which are usually plastic such as PVC or CPVC.

[3] The placement of unsupported cables on top of any one or more ceiling tiles presents potential life safety issues for occupants due to the decreased fire-rating of the floor/ceiling or roof/ceiling or an increase in the ceiling surface burning characteristics.

[4] Placement of unsupported cables on top of any one ceiling tile or a row of ceiling tiles would increase ceiling tile sag due to increased weight of the cables on the ceiling tiles, and would impair the accessibility of the ceiling plenum.
PANEL ACTION: Reject.
PANEL STATEMENT: The recommendation of Comment 16-137a provides a reasonable, safe, and practical solution to placing a limited number of unsupported signaling and communications cables in existing construction. The restrictions contained in Comment 16-137a limit both the number and size of cables permitted on each ceiling panel, thereby controlling weight and accumulation so that cables can be easily moved aside to permit access. The submitter's concern about weight is addressed by decreasing the size of the cable to 1/4 inch and limiting the number of cables to three per each 10 ft x 10 ft area. The revised text precludes the installation of cables in all fire-rated ceiling assemblies.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
SPEER: See my explanation of negative vote on Comment 16-27a.

(Log #2084)

16- 149 - (760-5(b)(2) (New)): Accept in Principle in Part
SUBMITTER: Marcelo M. Hirschler, GBH International
COMMENT ON PROPOSAL NO: 16-112
RECOMMENDATION: Revise text as follows:

760-5. Access to Electrical Equipment Behind Panels Designed to Allow Access

Access to equipment shall not be denied by an accumulation of wires and cables that prevents removal of panels. Cables shall be installed in such a manner that the cable will not be damaged by normal building use. Access to electrical equipment behind ceilings designed to allow access shall comply with (a) or (b).

a. New building construction (e.g. renovation, remodeling, new spaces). Installation of cables shall comply with Section 300.11.

b. Buildings with existing cable systems. Where practicable, installation of cables shall comply with Section 300.11. Where impracticable to comply with Section 300.11, in those areas having ceilings with access points or access panels, it shall be permissible to fish a maximum of three cables less than 13 mm (0.5 in) in diameter, between access points in the ceiling. ~~cables less than 13 mm (0.5 in) in diameter shall be permitted to be installed unsupported by the building structure in accordance with 1 or 2.~~

~~1. In areas having ceilings with access points or access panels, it shall be permissible to fish a maximum of three cables between access points in the ceiling.~~

~~2. In areas having suspended lay-in ceilings, it shall be permissible to install a maximum of three unsupported cables on top of any one ceiling tile. The cables shall be run parallel to the ceiling grid.~~

SUBSTANTIATION: The permission granted by the panel to install cables on suspended ceiling tiles should be rescinded. Neither cables nor any other item should be installed on top of a suspended ceiling tile. The support systems of suspended ceilings are not designed to resist any significant amount of weight without being deflected or broken.

This issue has been raised on Proposal 16-192 (log 1665) in negative comments by two panel members, Mr Egesdal and Mr Speer, who both correctly point out that suspended ceiling tiles are not intended to support the weight of electrical cables. Mr. Sandy Egesdal repeats his negative comment on this proposal.

The point made by the Technical Correlating Committee on proposal 16-38 that such use would constitute an exposed use of cables is an additional consideration to rejecting this part of the proposal.
PANEL ACTION: Accept in Principle in Part.
PANEL STATEMENT: The panel accepts the principle of permitting a limited number of cables to be installed in a fixed or hard ceiling. The panel rejects the balance of the submitter's recommendation including the limiting of the installation of cables in a suspended lay-in ceiling . The recommendation of Comment 16-137a provides a reasonable, safe, and practical solution to placing a limited number of unsupported signaling and communications cables in existing construction.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
SPEER: See my explanation of negative vote on Comment 16-27a.

(Log #1156)

16- 150 - (760-8): Reject
SUBMITTER: James E. Brunssen, Telcordia Technologies, Inc.
COMMENT ON PROPOSAL NO: 16-115
RECOMMENDATION: Delete 760-8 and incorporate the information in 760-5 as follows:

760-5. ~~Access to Electrical Equipment Behind Panels Designed to Allow Access,~~ Mechanical Execution of Work. Fire alarm circuits shall be installed in a neat and workmanlike manner. Access to electrical equipment shall not be denied by an accumulation of ~~wires and~~ cables and conductors that prevents removal of panels, cables and conductors shall be installed in such a manner that ~~the cable~~ they will not be damaged by normal building use. ~~Access to electrical equipment behind ceilings designed to allow access~~ Cables and conductors installed exposed shall comply with (a) or (b).

a. New building construction (e.g., renovation, remodeling, new spaces). Installation of cables and conductors shall comply with Section 300.11. Cables and conductors shall be supported by structural components of the building. Such cables and conductors shall be attached to structural components at intervals not exceeding 1.52 m (5 ft) and within 305 mm (12 in.) from every cabinet, box or fitting by straps, staples, hangers or similar fittings designed and installed so as not to damage the cable or conductors. The installation shall also conform with Section 300-4(d).

b. Buildings with existing cabling systems. Where practicable, installation of cables and conductors shall comply with ~~Section 300-11~~ 760-5(a). Where impracticable to comply with ~~Section 300-11~~ 760-5(a), cables less than 13 mm (0.5 in.) in diameter shall be permitted to be installed unsupported by the building structure in accordance with 1 or 2.

1. In areas having ceilings with access points or access panels, it shall be permissible to fish a maximum of three cables between access points in the ceiling.

2. In areas having suspended lay-in ceilings, it shall be permissible to install a maximum of three unsupported cables on top of any one ceiling tile. The cables shall be run parallel to the ceiling grid.

SUBSTANTIATION: This is a companion comment and is intended to correlate with similar comments on Proposals 16-39, 16-159a, 16-192a, 16-276a, and 16-333a. Sections 760-5 and 760-8 actually address the same issue, the mechanical execution of work. Accessibility behind panels designed to allow access is really an "execution of work" issue. Additionally, the Technical Correlating Committee has identified a potential conflict between the panel action on Proposals 16-38 and 16-39, that would also result here in 760. This comment editorially combines 760-5 and 760-8 into a single Section 760-5 requiring attachment to the building structure of exposed cables and conductors and, where impracticable to do so, permits a limited number of cables and conductors of specified maximum size to be placed on suspended ceiling tiles. It accommodates the intent of both proposals that cables and conductors should be supported by the building structure, but in extenuating circumstances in existing construction, a limited number and weight of cables and conductors may be placed on a suspended ceiling.
PANEL ACTION: Reject.
PANEL STATEMENT: The sections should not be combined. Refer to the recommendation and substantiation for Comment 16-137a where these recommendations are addressed.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21

(Log #1430)

16- 151 - (760-8): Accept in Part
SUBMITTER: Kari Barrett, American Chemistry Council
COMMENT ON PROPOSAL NO: 16-115
RECOMMENDATION: Delete the following text:
~~Such cables shall be attached to structural components at intervals not exceeding 1.52 m (5 ft) and within 305 mm (12 In.) from every cabinet, box or fitting by straps, staples, hangers or similar fittings designed and installed so as not to damage the cable. The installation shall also conform with Section 300-4(d).~~
SUBSTANTIATION: The addition of this text would make the mandatory requirements of this section overly specific. The present wording is sufficient guidance to both the installer and the authority having jurisdiction.
PANEL ACTION: Accept in Part.
Revise the third sentence of the panel action text of Proposal 16-115 to read as follows:
"Such cables shall be attached to structural components by straps, staples, hangers or similar fittings designed and installed so as not to damage the cable."
PANEL STATEMENT: The panel accepts the removal of specific distances for the attachment of the cable. The panel does not agree that the existing code wording is sufficient guidance to both the installer and the authority having jurisdiction.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
SPEER: The inclusion of specific distances for spacing attachment points if not "overly specific" in its guidance offered to installers or the authority having jurisdiction. The specific distances mentioned, merely ensure that cables installed will be properly supported and, thus, protected from damage.

(Log #1639)

16- 152 - (760-8): Reject
SUBMITTER: Andy Scott, National Cable Television Association
COMMENT ON PROPOSAL NO: 16-115
RECOMMENDATION: Reject Proposal 16-115.
SUBSTANTIATION: NCTA, on behalf of the cable television industry, strongly urges Panel 16 to reject these proposals. While attachment every 5 ft may be a practice in many cases, it also may be overly restrictive and unnecessary in others. The requirement to support cables every 5 ft is outside the scope of the code. The NCTA urges Panel 16 not to allow the NEC to serve as an Installation Manual.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel action on Comment 16-151 addresses the concerns in the submitter's substantiation.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21

(Log #1279)

16- 153 - (760-30(b)(2)): Accept in Principle
SUBMITTER: Allen C. Weidman, The Society of the Plastics Industry, Inc.
COMMENT ON PROPOSAL NO: 16-127
RECOMMENDATION: We support the action of the Panel.
SUBSTANTIATION: None given.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Refer to the panel action and statement on Comment 16-135.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
ABSTENTION: 1
EXPLANATION OF ABSTENTION:
CAUDILL: The Society of the Plastics Industries could not reach a consensus position on this issue.

(Log #887)

16- 154 - (760-52(c) (New)): Hold
SUBMITTER: Irving Mande, EST
COMMENT ON PROPOSAL NO: 16-132
RECOMMENDATION: Add a new subsection (c) to read as follows:

(c) PLFA and NPLFA Wiring Methods Used on the Same Power-limited Circuit. PLFA and NPLFA conductors and cables, as permitted by Exception No. 2 of (a) and by (b) above, shall be permitted to be used on different segments of the same power-limited circuit where installed in accordance with the requirements of 760-54.

SUBSTANTIATION: In a previous code cycle. CMP 16 approved Class 1 nonpower-limited conductors and cables to be used on

different segments of the same power-limited circuit with Class 2 and Class 3 power-limited conductors. Subsection (c) will allow the same rule to be applied to PLFA and NPLFA wiring.
PANEL ACTION: Hold.
PANEL STATEMENT: The panel is holding Comment 16-154 because it is new material and has not had public review.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21

(Log #442)

16- 155 - (760-54(c), Exception): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
COMMENT ON PROPOSAL NO: 16-138
RECOMMENDATION: Accept in principle, revise exception.
Exception: Attachment to a service mast in accordance with Exception No. 2 for 800-10(b) shall be permitted.
SUBSTANTIATION: Section 760-7 covers circuits extending beyond buildings and refers to Part B of Article 800 and Article 225. Sections 800-10(b) and 225-19 have exceptions for termination (support) at a service mast. The present text prohibiting support by any conduit or raceway appears to be in conflict.
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter correctly states that the requirements for circuits extending beyond buildings are in Articles 800 and 225. For that reason the proposed change is not appropriate for Article 760.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
TODD: The power service mast interface between NEC and NESC wiring does not need NEC ruling on attachments other than power conductors.
The submitter's comment is rejected for these reasons:
1. Panel 4 has continued to reject any attachments other than the power service conductors in article 230-28.
2. UL will not list this mast with unknowns of utility NESC span lengths, conductor loading levels (i.e., ice, wind, etc.) and multiple point sub-attachments, such as CATV and telephone service drop cables.
3. The electric utility industry has safety and subsequent liability concerns with power conductors on multiple attachment masts. This concern relates to the increased risk of snagging of the nonpower attachments and tearing down the power conductors.
This interface concern should be resolved between local power utility and telecommunication companies, not in the NEC. It is in the interest of fire and public safety to keep the power service mast for the exclusive safe environment of power conductors.
(See NEC Panel 16 statement to Proposal 16-202 from the October, 2000 Report on Proposals - ROP.)

(Log #1095)

16- 156 - (760-54(e)): Accept in Principle
SUBMITTER: Marcelo M. Hirschler, GBH International/Rep. Plenum Cable Association and Fire Retardent Chemicals Assoc.
COMMENT ON PROPOSAL NO: 16-144
RECOMMENDATION: Continue accepting this proposal in principle, by retaining the phrase: "Abandoned cables, not intended for future use shall not be permitted to remain."
SUBSTANTIATION: There is a potential for increased fire hazard or fire risk when any cable, irrespective of whether it is or is not limited combustible, remains as fuel load unnecessarily once it has been taken out of use. Materials that are limited combustible can also burn (i.e., they are not noncombustible) and also increase the fire load. Furthermore, all abandoned cables can also affect the safety of plenums because of their weight. There is, thus, no justification for permitting any cable to remain in a plenum once it is abandoned and not intended for future use.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Refer to panel action and statement on Comment 16-135.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21

(Log #1280)

16- 157 - (760-54(e) (New)): Accept in Principle
SUBMITTER: Allen C. Weidman, The Society of the Plastics Industry, Inc.
COMMENT ON PROPOSAL NO: 16-139
RECOMMENDATION: We support the action of the Panel.
SUBSTANTIATION: None given.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Refer to the panel action and statement on Comment 16-135.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
ABSTENTION: 1
EXPLANATION OF ABSTENTION:
CAUDILL: The Society of the Plastics Industries could not reach a consensus position on this issue.

(Log #1281)

16- 158 - (760-54(e) (New)): Accept in Principle
Note: "See Technical Correlating Committee action on Comment 16-98."
SUBMITTER: Allen C. Weidman, The Society of the Plastics Industry, Inc.
COMMENT ON PROPOSAL NO: 16-140
RECOMMENDATION: We support the action of the Panel.
SUBSTANTIATION: None given.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Refer to the panel action and statement on Comment 16-135.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
ABSTENTION: 1
EXPLANATION OF ABSTENTION:
CAUDILL: The Society of the Plastics Industries could not reach a consensus position on this issue.

(Log #1282)

16- 159 - (760-54(e) (New)): Accept in Principle
SUBMITTER: Allen C. Weidman, The Society of the Plastics Industry, Inc.
COMMENT ON PROPOSAL NO: 16-141
RECOMMENDATION: We support the action of the Panel.
SUBSTANTIATION: None given.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Refer to the panel action and statement on Comment 16-135.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
ABSTENTION: 1
EXPLANATION OF ABSTENTION:
CAUDILL: The Society of the Plastics Industries could not reach a consensus position on this issue.

(Log #1283)

16- 160 - (760-54(e) (New)): Accept in Principle
SUBMITTER: Allen C. Weidman, The Society of the Plastics Industry, Inc.
COMMENT ON PROPOSAL NO: 16-142
RECOMMENDATION: We support the action of the Panel.
SUBSTANTIATION: None given.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Refer to the panel action and statement on Comment 16-135.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
ABSTENTION: 1
EXPLANATION OF ABSTENTION:
CAUDILL: The Society of the Plastics Industries could not reach a consensus position on this issue.

(Log #1284)

16- 161 - (760-54(e) (New)): Accept in Principle
SUBMITTER: Allen C. Weidman, The Society of the Plastics Industry, Inc.
COMMENT ON PROPOSAL NO: 16-143
RECOMMENDATION: We support the action of the Panel.
SUBSTANTIATION: None given.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Refer to the panel action and statement on Comment 16-135.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
ABSTENTION: 1
EXPLANATION OF ABSTENTION:
CAUDILL: The Society of the Plastics Industries could not reach a consensus position on this issue.

(Log #1285)

16- 162 - (760-54(e)): Accept in Principle
SUBMITTER: Allen C. Weidman, The Society of the Plastics Industry, Inc.
COMMENT ON PROPOSAL NO: 16-144
RECOMMENDATION: We support the action of the Panel.
SUBSTANTIATION: None given.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Refer to panel action and statement on Comment 16-135.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
ABSTENTION: 1
EXPLANATION OF ABSTENTION:
CAUDILL: The Society of the Plastics Industries could not reach a consensus position on this issue.

(Log #1086)

16- 163 - (760-54(e), Exception): Accept
SUBMITTER: Marcelo M. Hirschler, GBH International/Rep. Plenum Cable Association and Fire Retardant Chemicals Assoc.
COMMENT ON PROPOSAL NO: 16-139
RECOMMENDATION: Continue rejecting the exception for permitting cable to be listed as limited combustible to remain in plenums, in particular FPLP-50.
SUBSTANTIATION: Materials that are limited combustible can burn (i.e. they are not noncombustible) and increase the fire load. Therefore, there is a potential for increased fire hazard or fire risk when any cable, irrespective of whether it is or is not limited combustible, remains as fuel load unnecessarily once it has been taken out of use. Furthermore, all abandoned cables can also affect the safety of plenums because of their weight. There is, thus, no justification for permitting a "limited combustible" cable to remain in a plenum once it is abandoned and not intended for future use.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
ABSTENTION: 1
EXPLANATION OF ABSTENTION:
CAUDILL: The Society of the Plastics Industries could not reach a consensus position on this issue.

(Log #1087)

16- 164 - (760-54(e), Exception): Accept
Note: "See Technical Correlating Committee action on Comment 16-98."
SUBMITTER: Marcelo M. Hirschler, GBH International/Rep. Plenum Cable Association and Fire Retardent Chemicals Assoc.
COMMENT ON PROPOSAL NO: 16-140
RECOMMENDATION: Continue rejecting the exception for permitting cable to be listed as limited combustible to remain in plenums, in particular FPLP-50.
SUBSTANTIATION: Materials that are limited combustible can burn (i.e. they are not noncombustible) and increase the fire load. Therefore, there is a potential for increased fire hazard or fire risk when any cable, irrespective of whether it is or is not limited combustible, remains as fuel load unnecessarily once it has been taken out of use. Furthermore, all abandoned cables can also affect the safety of plenums because of their weight. There is, thus, no justification for permitting a "limited combustible" cable to remain in a plenum once it is abandoned and not intended for future use.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
ABSTENTION: 1
EXPLANATION OF ABSTENTION:
CAUDILL: The Society of the Plastics Industries could not reach a consensus position on this issue.

(Log #1075)

16- 165 - (Table 760-61): Reject
Note: "See Technical Correlating Committee action on Comment 16-98."
SUBMITTER: Marcelo M. Hirschler, GBH International/Rep. Plenum Cable Association and Fire Retardent Chemicals Assoc.
COMMENT ON PROPOSAL NO: 16-145
RECOMMENDATION: This proposal should be rejected, the references to CMP-50 and MPP-50 should be deleted from the Table 760-61 and not incorporated into Figure 760-61 and the CMP-50 and MPP-50 classifications should not be created.
SUBSTANTIATION: The CMP-50 and MPP-50 classifications are unnecessary classification because they are not justified either by requirements for reduction in fire hazard in plenums (fire hazard is the potential for harm associated with fire) or a general reduction in fire risk (fire risk is the combination of fire hazard and the probability of fires resulting in undesirable outcomes). Furthermore, they are based on a research project which is incomplete (according to the Interim Report issued) and they are based on flawed testing technology, as represented by the oxygen bomb calorimeter.

The Plenum Cable Association endorses use of fire hazard assessment and fire risk assessment in order to further develop technically supportable standards, codes and regulations, that ensure reasonable and justifiable classification and control of plastic and other combustible products. The creation of the (CXP-50) marking is not justified based on fire hazard or on fire risk and is simply an effort for one type of material to gain market share at the expense of others. If a search for better fire performance is continued indefinitely, without taking into account the overall fire safety required by the application, clearly the use of plastics and other combustible materials should be discontinued, as a non combustible material can always be found which outperforms any plastic material. Thus, if the National Electrical Code were to support unjustified improvements in fire performance, eventually any use of plastic or other combustible materials would be in jeopardy.

Thus, there are 4 reasons to oppose the CXP-50 classifications: (i) no justification based on fire risk, (ii) no justification based on fire hazard, (iii) the study for the development of the classification by the proponents is incomplete, and (iv) the technique of oxygen bomb calorimetry, and the concept of limited combustible, are technically flawed. These concerns are exemplified as follows:

(i) An analysis of fire performance of cables addresses fire hazard.

Fire hazard analysis: Traditional CMP-rated cables will not cause significant flame spread or smoke obscuration unless the fire source is very large. For example, a CMP cable with a PVC jacket and FEP insulation was shown to have no significant flame spread (out of a possible flame spread of 20 feet) and a peak optical density of much less than 0.2 when exposed to a fire of approximately 1 MW, from a wood crib, in a full scale facility, that simulated a room and plenum [Reference: L.M. Caudill, J.R. Hoover, J.T. Walnock and J.T. Chapin, "Fire Performance of Communications Cables in Concealed Spaces", pages 277-285, NFPRF Fire Risk and Hazard Assessment Symposium, June 26-28, 1996, San Francisco, CA]. The same cable also showed approximately 2 feet flame spread in the NFPA 262 plenum cable test, with a peak optical density not exceeding 0.3, according to the same reference. Clearly, if a cable does not spread flame significantly when a 1 MW fire source is applied, it does not represent any severe fire hazard. In a different scenario, a similar type of cable was studied by the European research project FIPEC, and found to release 42 kW and less than 6 MJ, to spread flame vertically for only 1.1 m, and to give low smoke release when tested in a severe vertical cable tray test (30 kW input at high air flow rate) [Reference: Fire Performance of Electric Cables Report,

Interscience Communications, UK, 1999]. This indicates that the fire hazard associated with traditional CMP cables (and this with traditional CL2P and CL3P cables) is very low.

(ii) Analysis of NFPA statistics serves to illustrate fire risk. NFPA statistics address the following types of fires:

* "Non residential concealed space structure fires involving ignition of fixed wiring in ceiling/roof assemblies" {Roof plenums are examples of these spaces}
* "Non residential concealed space structure fires involving ignition of fixed wiring in ceiling/floor assemblies" {Floor plenums are examples of these spaces}

In each case, the statistics can distinguish whether wire and cable insulation was or was not the item first ignited, giving four sets of statistics relevant to plenum cables. These statistics are relevant to the fire risk from plenum cables, as plenum cables are the typical type of wire and cable insulation present in roof plenums or in floor plenums.

Fire risk analysis: The statistics indicate that, between 1980 and 1996, there have been an average of only 584 fires per year, and of those only 171 have started with ignition of a wire and cable product, and the trend has been downwards (see the attached Tables with fire statistics and the attached charts, indicating a similar type of downward trend for both concealed roof spaces and concealed floor spaces). In fact, over the entire period between 1980 and 1996 the total number of fires in concealed roof spaces involving ignition of fixed wiring has been 0.29% of the total number of non residential structure fires (of which less than 30% started in wire and cable) and the total number of fires in concealed floor spaces involving ignition of fixed wiring has been 0.10% of the total number of non residential structure fires (of which ca. 32% started in wire and cable). With regard to fatalities or injuries: out of 3,734 fatalities in non residential structure fires, only 7 occurred in concealed roof or floor spaces involving ignition of fixed wiring (less than 0.19%), and out of 60,950 injuries in non residential structure fires, only 85 occurred in concealed roof or floor spaces involving ignition of fixed wiring (less than 0.14%). At least 4 of the 7 fatalities have been shown not to have resulted from plenum cable fires with the other 3 unknown. Thus, the fire record in a period when the amount of installed plenum cables increased from virtually none to some 20 billion feet, indicates that the fire risk is minimal.

(iii) The classifications of CXP-50 are not yet ready for application, since the NFPA Fire Protection Research Foundation Project developing the classification has not yet issued its final report. The Interim Report (International Limited Combustible Plenum Cable Fire Test Project, Interim Report, by F.B. Clarke and R.G. Gewain, June 2000) is the source of our [Plenum Cable Association] concerns. The first objective of this project was to: "Develop harmonized Steiner Tunnel listing protocols for permanent plenum cables related to NFPA 262/UL 910 and NFPA 255." The Interim Report describes part of Phase I of the project, wherein no harmonized listing protocol has been developed. The Interim Report addresses NFPA 255 and NFPA 259 and states, among other things:

* NFPA 255, flame travel distance: "... The NFPA 255 flame travel distances appear to be highly repeatable {i.e. within one lab} in each laboratory, as evidenced by the small variance of the measurements, *but not particularly reproducible* {i.e. between labs}, as can be seen by comparing this variance with the interlaboratory results. ..." {Emphasis added, but statement comes verbatim from report}
* NFPA 255, smoke index, or SDI: "... With respect to the smoke measurements, multiple determinations of the SDI by a given laboratory on a given cable agree with one another quite closely *but the SDI's reported by the two labs for the same cables do not appear to be close at all*. The results reported by Laboratory 2 are, with one exception, systematically higher than those of Laboratory 1. ..." {Emphasis added, but statement comes verbatim from report}
* NFPA 255 precision: " ... The flame spread and smoke measurements in NFPA 255 show ... *relatively poor reproducibility*, i.e. the result for a cable in a given laboratory can be repeated with precision but the difference in results between laboratories is on average considerably larger than the repeatability error. ..." {Emphasis added, but statement comes verbatim from report}
* Procedure for NFPA 255: "It is possible to test wire and cable following the current NFPA 255 test procedure, using the mounting specified for plastics in Appendix B7 of the standard." Appendix B-7 of NFPA 255 states:

"B-7 Plastics. B-7.1 The term plastics includes foams, reinforced panels, laminates, grids, and transparent or translucent sheets.

B-7.2 Where any plastic remains in position in the tunnel during a fire test, no additional support is necessary. Thermoplastic materials and other plastics that do not remain in place should be supported by 1/4-in. (6.3-mm) round metal rods or 3/16 in. (4.8 mm) thick 2 in. (51 mm) wide steel bars, or 2-in. (51-mm) galvanized hexagonal wire mesh supported with metal bars or rods spanning the width of the tunnel."

It is interesting to compare this with the statements in NFPA 262, as follows:

"1-1.3* Although this test uses equipment similar to that used in NFPA 255, Standard Method of Test of Surface Burning Characteristics of Building Materials, and ASTM E 84, Standard Test Method for Surface Burning Characteristics of Building Materials, sufficient changes have been made to the chamber so that a test conducted in the apparatus used for NFPA 255 or ASTM E 84 cannot be considered identical or produce comparable results.

A-1-1.3 The changes made in equipment for this test were deemed necessary in order to obtain proper precision from the test when the equipment is used for small quantities of wire and cable, which produce much smaller quantities of heat release and smoke obscuration."

* NFPA 259: "... NFPA 259 has traditionally been carried out on individual materials, and so the potential heat of a finished product like a cable would be calculated as the um of the contributions of each component, each contribution being the potential heat of the component multiplied by the mass fraction of that component in the cable. To produce such a measurement it would be necessary to disassemble the cable into its different components – insulation, jacket, shielding, rip cord and the like – and measure the potential heat of each component. *An obvious question is whether such a cumbersome procedure is necessary* ..." {Emphasis added, but statement comes verbatim from report}.
* Observations on NFPA 259: "One of the labs (Laboratory 2) had both more experience and more advanced equipment ..."
* Procedure for NFPA 259: "... The procedure followed was NFPA 259, Standard Test Method for Potential Heat of Building Materials, 1998 Edition, with modifications to the following sections: ... *This modification should be viewed provisionally since it so far has only been tested on 4-pair unshielded twisted pair (UTP) plenum cable*." {Emphasis added, but statement comes verbatim from report}

(iv) The oxygen bomb calorimeter test used to assess "limited combustible" classifications is severely flawed. NFPA 259 uses the oxygen bomb calorimeter as part of its testing to assess potential heat. The term "limited combustible" was developed for "building construction materials", with the intent of applying it to materials of construction of the plenum and not to cables. NFPA 90A defines "limited combustible" as follows:

"Limited-Combustible Material. A building construction material not complying with the definition of noncombustible material that in the form in which it is used, has a potential heat value not exceeding 3500 Btu/lb (8141 kJ/kg) where tested in accordance with NFPA 259, Standard Test Method for Potential Heat of Building Materials, and complies with (a) or (b):

(a) Materials having a structural base of noncombustible material, with a surfacing not exceeding a thickness of 1/8 in. (3.2 mm), that has a flame spread index not greater than 50; (b) Materials, in the form and thickness used, other than as described in (a), having neither a flame spread index greater than 25 nor evidence of continued progressive combustion, and of such composition that surfaces that would be exposed by cutting through the material on any plane would have neither a flame spread index greater than 25 nor evidence of continued progressive combustion. Materials subject to increase in combustibility or flame spread index beyond the limits herein established through the effects of age, moisture, or other atmospheric condition shall be considered combustible."

The oxygen bomb calorimeter is a method for determining the theoretical (or complete or absolute) calorific energy (or heat of combustion), as opposed to the effective (or practical) values. The reason such instruments are used is to ensure that the correct value is chosen. As such they represent the following chemical equations for combustible fuels containing only carbon, hydrogen and oxygen:

$$C + O_2 = CO_2$$

$$4\,H + O_2 = 2\,H_2O$$

For hydrocarbon fuels: $- C H_2 - + O_2 = CO_2 + H_2O$

However, when building materials are more complex, because they contain other elements, there is a certain inconsistency in the equation and in the energy calculated.

1. Cl: Thus, for example, when PVC is burnt in an oxygen bomb, depending on the fraction of hydrogen atoms present, there will be different proportions of the following two equations:

$$(C_2 H_3 Cl)_n + 2.5\ n\ O_2 = 2\ n\ CO_2 + n\ H_2O + n\ HCl$$

$$(C_2 H_3 Cl)_n + 2.75\ n\ O_2 = 2\ n\ CO_2 + 1.5\ n\ H_2O + 0.5\ n\ Cl_2$$

where the two equations differ by 380 kJ/kg.

2. S: Combustion of materials containing sulphur also depends on the final product. Typically the combustion bomb generates sulphuric acid as the final sulphur containing product, while furnace combustion generates sulphur dioxide (with the sulphur less fully oxidized). Therefore, the convention in bomb calorimetry is to determine values of calorific value of fuels (including coal), by referring to the quantitative conversion to sulphur dioxide, and ignoring the conversion to sulphuric acid (or sulphur trioxide) that occurs, by using a conversion factor based on the sulphur content. Interestingly, gypsum (which is calcium sulphate dihydrate), is a building material containing sulphur. The typical fuel containing sulphur is coal. The difference between conversion to sulphur dioxide and sulphuric acid is 9410 kJ/kg.

3. N: Combustion of materials containing nitrogen also has a convention: the heat of convention is normally calculated assuming that all the nitrogen is converted into molecular nitrogen. However, that is not what happens in oxygen bomb calorimetry, where nitrogen oxides and nitric acid are actually formed. Thus, a correction is applied to account for the following equation:

$HNO_3 = 0.5\ H_2O + 0.5\ N_2 + 1.25\ O_2$, with a net heat of reaction of 1017 kJ/kg.

4. F: Combustion of materials containing fluorine is generally represented as ending in the formation of carbon tetrafluoride (CF_4) and of hydrogen fluoride (HF), in varying proportions. The equation is as follows:

$$C_a H_b O_c F_e + (a+b/4-c/2-e/4)\ O_2 + (n+1/2)*e*(1-x) - b/2)\ H_2O = (a-ex/4)\ CO_2 + ex/4\ CF_4 + e(1-x)\ (HF) + e(1-x)\ n\ H_2O$$

where x is the fraction of fluorine atoms converted to CF_4 as opposed to converted to HF. The energy of the conversion of CF_4 to HF is approximately 192 kJ/kg. Moreover, fluorine materials will attack the walls of the bomb calorimeter.

5. Si: Compounds containing silicon are impossible to convert completely to their final oxidation product, which is silica (SiO_2), by conventional means because as burning proceeds, the material becomes covered by a layer of silica which prevents access of oxygen and leads to the formation of a residue. The only way to obtain a reliable result of heat of combustion of materials containing silicon (such as silicones) is by a method which combines the material with an organic fluorine compound (the value of which has been accurately assessed in advance) in rotating bomb containing also water and aqueous HF. This converts all the Si into fluorosilicic acid, and the results can then be calculated back.

6. P: Compounds containing phosphorus are exceedingly difficult to assess by oxygen bomb combustion calorimetry. There are four major problems: (1) various phosphorus acids with different energies of dilution are formed in various concentrations throughout the oxygen bomb, (2) the combustion products contain different types of phosphorus oxyacids, each one of which has a different heat of formation, (3) the burning compound gets covered by phosphorus oxides and acids, which inhibit further combustion and (4) the bomb calorimeter walls are attacked and metal phosphates are formed, so that the recommended wall materials should be corundum or gold, since Pyrex glass, quartz, stainless steel titanium, porcelain and platinum all suffered heavy weight losses. For example, depending on whether a rotating bomb or a static bomb is used, the fraction of pyrophosphoric acid formed varied from 10 to 18% and that of triphosphoric acid from 1 to 3%.

7. Auxiliary combustion material: When an auxiliary material is used for assessing the heat of combustion, a 1% error in the assessment of the heat of combustion of the auxiliary material (such as benzoic acid), which is typically used in the order of 20% energy loading, corresponds to a 5% error in the total energy/heat measured. Thus, at a value of 1500 kJ/kg that would be an error of 75 kJ/kg, and this would be a systematic error for that series of experiments.

8. Moisture content: the moisture content of the building material is critical, because the combustion reaction considered in the oxygen bomb is that to convert to gaseous water. Thus, if a material contains water, the water will have reaction to vaporize the water content. Thus, results must be expressed as a function of the original moisture content for them to be valid. This matters, of course, for materials that absorb moisture when exposed to the atmosphere.

Bibliography on oxygen bomb calorimetry:

* Mansson, Margret, "Determination of Calorific Values of Building Materials - A Guide", SP Nordtest Report Project 871-90, Swedish National Testing and Research Institute, Boras, Sweden, 1991.

* Head, Arthur J, and Good, William D., "Combustion of Liquid/Solid Compounds with Non-Metallic Hetero Atoms", Chapter 9 in "Combustion Calorimetry", "Volume 1, Experimental Chemical thermodynamics", Eds. Stig Sunner & Margret M. Mansson), Pergamon Press, Oxford, UK (for Int. Union Pure & Applied Chemistry, IUPAC), 1979.

* Mansson, Margret and Hubbard, Ward N., "Strategies in the Calculation of Standard-State Energies of Combustion from the Experimentally Determined Quantities", Chapter 5 in "Combustion Calorimetry", "Volume 1, Experimental Chemical thermodynamics", Eds. Stig Sunner & Margret M. Mansson), Pergamon Press, Oxford, UK (for Int. Union Pure & Applied Chemistry, IUPAC), 1979.

* Hu, Andrew T., Sinke, G.C., Mansson, Margret and Ringner, Birgitta, "Test Substances for Bomb Combustion Calorimetry, p-Chlorobenzoic Acid". J. Chem. Thermodynamics, 4, 283-99 (1972).

* Mansson, Margret, "Thermochemistry - Some Recent Lines of Development", Pure & Applied Chemistry, 55(3), 417-26 (1983).

* Mansson, Margret, "A 4.5 cm^3 Bomb Combustion Calorimeter and an Ampoule Technique for 5 to 10 mg Samples with Vapour Pressures Below Approximately 3 kPa (20 Torr)", J. Chem. Thermodynamics, 5, 7232 (1973).

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

PANEL ACTION: Reject.

PANEL STATEMENT: Refer to panel action and statement on Comment 16-98.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21

VOTE ON PANEL ACTION:

AFFIRMATIVE: 20

ABSTENTION: 1

EXPLANATION OF ABSTENTION:

CAUDILL: The Society of the Plastics Industries could not reach a consensus position on this issue.

(Log #1593)

16- 166 - (Table 760-61): Reject

SUBMITTER: Wayne G. Carson, Carson Assoc. Inc.

COMMENT ON PROPOSAL NO: 1-145

RECOMMENDATION: Delete reference to CMP-50, MMP-50, and FPLP-50 cables in Table 760-61 and Figure 760-61.

SUBSTANTIATION: The new cable classification "Limited Combustible Cable" if deleted as recommended by comments to sections 725.71(b) [16-89]; 760-71(e) [16-149]; 770-51(b) [16-169]; 800-51(h) [16-232]; and 820-51(b) [16-302] will not be included in the Code. This type cable designation is not needed and is premature - see related comments for complete substantiation.

PANEL ACTION: Reject.

PANEL STATEMENT: Refer to panel action and statement on Comment 16-98.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21

VOTE ON PANEL ACTION:

AFFIRMATIVE: 20

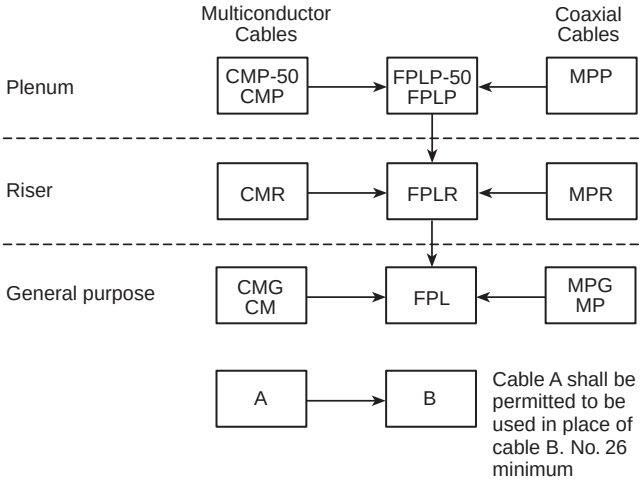
ABSTENTION: 1

EXPLANATION OF ABSTENTION:

CAUDILL: The Society of the Plastics Industries could not reach a consensus position on this issue.

(Log #273)

16- 167 - (Figure 760-61): Accept
Note: "See Technical Correlating Committee action on Comment 16-98."
SUBMITTER: Stanley Kaufman, Lucent Technologies
COMMENT ON PROPOSAL NO: 16-145
RECOMMENDATION: Revise Figure 760-61 as shown:



Revise Table 760-61 by deleting MPP50 where it appears (3 places).
SUBSTANTIATION: This comment corrects several errors in the table and adds a consistent revision of the cable substitution figure. Proposed Type MPP-50 was deleted from Proposal 16-232.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
ABSTENTION: 1
EXPLANATION OF ABSTENTION:
CAUDILL: The Society of the Plastics Industries could not reach a consensus position on this issue.

(Log #747)

16- 168 - (760-61(d)): Reject
SUBMITTER: Irving Mande, Edwards System Technology (EST)
COMMENT ON PROPOSAL NO: 16-147
RECOMMENDATION: Accept this proposal.
SUBSTANTIATION: This comment should also be accepted if my comment for Proposal 16-223 is accepted.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel's intent is to eliminate the listing of multipurpose cables while leaving intact the use and reuse of existing multipurpose cables.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21

(Log #1252)

16- 169 - (Figure 760-61(d)): Reject
SUBMITTER: Irving Mande, Edwards Systems Technology (EST)
COMMENT ON PROPOSAL NO: 16-147
RECOMMENDATION: Accept this Proposal after making the following revisions:
In Figure 760-61, delete all entries in "Coaxial Cables" column and the horizontal arrows directed toward the FPL type cables. Also revise the header for FPL column only, to read: "Multiconductor and Coaxial cables". Below the Figure, delete the line that reads Type MP-Multipurpose cables (coaxial cables only).
In Table 760-61, delete all of the "Coaxial" column under "Permitted Substitutions". Add "and Coaxial (FPL type cables only)" to the heading of the "Multiconductor" column.
SUBSTANTIATION: This comment should be accepted as revised in item 4 above, if my comment on 16-223 is accepted. FPL type coaxial cables are not required by the Code to have a substitute.
PANEL ACTION: Reject.
PANEL STATEMENT: Refer to the panel action and statement on Comment 16-168.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21

(Log #1286)

16- 170 - (760-71): Accept
SUBMITTER: Allen C. Weidman, The Society of the Plastics Industry, Inc.
COMMENT ON PROPOSAL NO: 16-148
RECOMMENDATION: We support the action of the panel.
SUBSTANTIATION: None.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
ABSTENTION: 1
EXPLANATION OF ABSTENTION:
CAUDILL: The Society of the Plastics Industries could not reach a consensus position on this issue.

(Log #463)

16- 171 - (760-71(b)): Accept
Note: "See Technical Correlating Committee action on Comment 16-98."
SUBMITTER: Technical Correlating Committee on Signaling Systems for the Protection of Life and Property
COMMENT ON PROPOSAL NO: 16-149
RECOMMENDATION: The Technical Correlating Committee on the National Fire Alarm Code recommends that Code Panel 16 continue to accept this proposal.
SUBSTANTIATION: The Technical Correlating Committee on the National Fire Alarm Code supports the introduction of limited combustible cable and recognizes that it represents a significant improvement in fire safety.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
ABSTENTION: 1
EXPLANATION OF ABSTENTION:
CAUDILL: The Society of the Plastics Industries could not reach a consensus position on this issue.

(Log #1287)

16- 172 - (760-71(b) (New)): Accept
Note: "See Technical Correlating Committee action on Comment 16-98."
SUBMITTER: Allen C. Weidman, The Society of the Plastics Industry, Inc.
COMMENT ON PROPOSAL NO: 16-149
RECOMMENDATION: We support the action of the panel.
SUBSTANTIATION: None.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
ABSTENTION: 1
EXPLANATION OF ABSTENTION:
CAUDILL: The Society of the Plastics Industries could not reach a consensus position on this issue.

(Log #1331)

16- 173 - (760-71(b)): Accept
Note: "See Technical Correlating Committee action on Comment 16-98."
SUBMITTER: Jeffrey S. Deckman, SyNet Inc.
COMMENT ON PROPOSAL NO: 16-149
RECOMMENDATION: SyNet recommends that Code Panel 16 continue to accept this proposal.
SUBSTANTIATION: SyNet supports the acceptance and use of limited combustible cable. The NFPRF research project demonstrated that cable can be tested and listed for full compliance to the NFPA 255 and 259 test methods. Limited combustible cable is consistent with the full requirements of NFPA 90A and its originally intended fire safety performance. We believe

this cable design would provide a significant improvement in fire safety and protect lives and property.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
ABSTENTION: 1
EXPLANATION OF ABSTENTION:
CAUDILL: The Society of the Plastics Industries could not reach a consensus position on this issue.

(Log #1482)

16- 174 - (760-71(b)): Accept
Note: "See Technical Correlating Committee action on Comment 16-98."
SUBMITTER: George Thorning, Yale University
COMMENT ON PROPOSAL NO: 16-149
RECOMMENDATION: Yale recommends that Code Making Panel 16 continue to accept this proposal.
SUBSTANTIATION: We believe this cable design would provide a significant improvement in fire safety and protect lives and property. Yale supports the NFPA's acceptance and recognition of limited combustible cable in the 2002 NEC. The NFPRF research project demonstrates that cable can be tested and listed for full compliance to the NFPA 255 and 259 test methods. Limited combustible cable is consistent with the full requirements of NFPA 90A and its originally intended fire safety performance.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
ABSTENTION: 1
EXPLANATION OF ABSTENTION:
CAUDILL: The Society of the Plastics Industries could not reach a consensus position on this issue.

(Log #1494)

16- 175 - (760-71(b)): Accept
Note: "See Technical Correlating Committee action on Comment 16-98."
SUBMITTER: John Moseley, Suddath Van Lines, Inc.
COMMENT ON PROPOSAL NO: 16-149
RECOMMENDATION: Suddath Van Lines, Inc. recommends that Code Making Panel 16 continue to accept this proposal.
SUBSTANTIATION: Suddath Van Lines, Inc. advocates the endorsement and application of limited combustible cable. This cable design supplies a major upgrade in fire safety offerings. Cable can be tested and listed for full compliance to the NFPA 255 and 259 protocols; the NFPRF has already established this information. Limited combustible cable observes and applies the current guidelines of NFPA 90A, without the exception, and its fire safety performance tenet.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
ABSTENTION: 1
EXPLANATION OF ABSTENTION:
CAUDILL: The Society of the Plastics Industries could not reach a consensus position on this issue.

(Log #1499)

16- 176 - (760-71(b)): Accept
Note: "See Technical Correlating Committee action on Comment 16-98."
SUBMITTER: Michael Lohr, Staples Communications
COMMENT ON PROPOSAL NO: 16-149
RECOMMENDATION: Staples Communications recommends that Code Making Panel 16 continue to accept this proposal.
SUBSTANTIATION: Staples Communications endorses the acceptance and application of limited combustible cable. This cable design presents a considerable improvement in fire safety. The NFPRF has shown that cable can be tested and listed for full compliance to NFPA 255 and 259 protocols. Limited combustible cable is consistent with the NFPA 90A's full, original requirements and its intended fire safety performance.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
ABSTENTION: 1
EXPLANATION OF ABSTENTION:
CAUDILL: The Society of the Plastics Industries could not reach a consensus position on this issue.

(Log #1504)

16- 177 - (760-71(b)): Accept
Note: "See Technical Correlating Committee action on Comment 16-98."
SUBMITTER: Scott Paulov, Cabling Business Institute
COMMENT ON PROPOSAL NO: 16-149
RECOMMENDATION: Cabling Business Institute recommends that Code Making Panel 16 continue to accept this proposal.
SUBSTANTIATION: Cabling Business Institute encourages the acceptance and utilization of limited combustible cable. This cable design offers a substantial advancement in fire safety. The NFPRF has verified that cable can be tested and listed for complete compliance with the NFPA 255 and 259 protocols. Limited combustible cable is totally consistent with the provisions of NFPA 90A, without the exception, and its desired fire safety performance.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
ABSTENTION: 1
EXPLANATION OF ABSTENTION:
CAUDILL: The Society of the Plastics Industries could not reach a consensus position on this issue.

(Log #1587)

16- 178 - (760-71(b)): Reject
Note: "See Technical Correlating Committee action on Comment 16-98."
SUBMITTER: Wayne G. Carson, Carson Assoc. Inc.
COMMENT ON PROPOSAL NO: 16-149
RECOMMENDATION: Delete proposed section 760-71(e) and associated notes.
SUBSTANTIATION: The introduction of a new class of cable ("Limited Combustible Cable") is premature at this time for the following reasons:
A. The note to the definition section 725.71(B), FPN No. 1 references NFPA 90A, Standard for the Installation of Air-Conditioning and Ventilating Systems for the definition of limited combustible. That definition is as follows:
"Limited-Combustible Material. A building construction material not complying with the definition of noncombustible material that in the form in which it is used, has a potential heat value not exceeding 3500 Btu/lb (8141J/kg) where tested in accordance with NFPA 259, Standard Test Method for Potential Heat of Building Materials, and complies with (a) or (b):
a. Materials having a structural base of noncombustible material, with a surfacing not exceeding a thickness of 1/8 in. (3.2 mm), that has a flame spread index not greater than 50;
b. Materials, in the form and thickness used, other than as described in (a), having neither a flame spread index greater than 25 nor evidence of continued progressive combustion, and of such composition that surfaces that would be exposed by cutting through the material on any plane would have neither a flame spread index greater than 25 nor evidence of continued progressive combustion. Materials subject to increase in combustibility or flame spread index beyond the limits herein established through the effects of age, moisture, or other atmospheric condition shall be combustible."
This definition was established and is applied to <u>building construction materials</u> and not to specific wiring methods or technologies for use in buildings. NFPA 255 and NFPA 259 were never intended for the evaluation of multi-component systems such as electrical and optical cable. More current test methods (other than NFPA 255 and 259), such as NFPA 262, the cone calorimeter, etc. provide reproducible smoke obscuration, flame spread, or heat release (not heat value) information and are more appropriate for measuring the fire hazards of cable. Not all parts of this "Limited Combustible" definition have been applied to the broad scope of cables. Until this definition can be shown as appropriate for cables (attainable and reproducible) it should not be deemed credible and supported by the National Electrical Code

at this time. Referencing this inappropriate definition in the National Electrical Code is misleading and bad code.

B. The note references NFPA 255 as the test standard for smoke developed index. This test is not an appropriate test for cables for the following reasons:

a. NFPA 255 has not been harmonized, as has NFPA 262. NFPA 262 has a proven record, unlike NFPA 255.

b. NFPA 255 is not reproducible, whereas NFPA 262 has been shown to be reproducible. This lack of reproducibility has been demonstrated numerous times in round-robin testing of building materials among multiple labs.

The most recent example of this reproducibility problem has been demonstrated in the Interim Report of the Fire Protection Research Foundation (FPRF) "Limited Combustible Cable" (ex. "Permanent Plenum Cable") project, dated June 2000. This report states "The flame spread and smoke measurements in NFPA 255 show good repeatability but relatively poor reproducibility, i.e., the result for a cable in a given laboratory can be repeated with precision but the difference in results between laboratories is on average considerably larger than the repeatability error." (Page 9, section 4.1.2). In this case, with only two laboratories participating, errors in reproducibility were in the range of 100 percent. Given that numerous fire-testing tunnels exist, the range of error can be expected to be even larger.

This test is inappropriate for cables as the cables are installed against the top of the tunnel. This orientation is not similar to normal cable installations, and cable placement on top of the wire mesh is random in the tunnel.

C. Cable installed above ceilings does not become involved in the fire until near or at flashover. At that point in the fire development, the ceiling tile is falling to expose the cable. Cables in walls or below floors are generally exposed to the fire conditions even later in the fire development. These cables do not spread flame more than 5 ft when tested in accordance with NFPA 262. The proposed restrictions on cable appear excessive based on the fire record.

D. There is not a need established (fire record or hazard analysis) for a new cable category. There are two research projects that are intended to provide information on the fire hazard of cables. The ASHRAE project has not yet begun. This ASHRAE Project is being conducted by the National Research Council of Canada and is a broad based fire hazard assessment program developed to evaluate the hazard presented by the accumulation of plenum cables. This question has not yet been answered and developing cable categories to address a hazard that has not yet been defined is premature. The project when completed will assist in developing appropriate language for NFPA 90A and/or the National Electrical Code.

The FPRF project has only issued an interim report dated June 2000. This project has only accomplished a cursory review of one cable type in NFPA 255 and NFPA 259 and has just begun the experimental work on broader aspects of the "limited combustible" definition.

The proposals for the National Electrical Code that have been accepted by Code Making Panel 16 for the removal of all abandoned cable broadly addresses this problem now. The adoption of these proposals for removing all abandoned cable will significantly reduce the fuel load created by excessive cable accumulation.

E. The International Mechanical Code (IMC), the Uniform Mechanical Code (UMC), and the NFPA 90A (the membership and the NFPA Standards Council) have each recently rejected similar provisions to the ones being proposed for the National Electrical Code. These proposals for "limited combustible cables" have been rejected for several reasons including:

a. They will present confusion in the field;

b. They are not good code based on sound engineering principles;

c. They are not based on good fire hazard assessment information; and

d. Questions regarding the appropriateness and accuracy of the test protocols NFPA 255 and NFPA 259.

PANEL ACTION: Reject.
PANEL STATEMENT: Refer to panel action and statement on Comment 16-98.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 18
NEGATIVE: 2
ABSTENTION: 1
EXPLANATION OF NEGATIVE:
JOHNSON: See my explanation of negative vote on Comment 16-88.
WADEHRA: See my explanation of negative vote on Comment 16-88.
COMMENT ON AFFIRMATIVE:
KAHN: See my comment on affirmative vote on Comment 16-88.
KAUFMAN: See my comment on affirmative vote on Comment 16-88.
EXPLANATION OF ABSTENTION:
CAUDILL: The Society of the Plastics Industries could not reach a consensus position on this issue.

(Log #1620)

16- 179 - (760-71(b)): Accept
Note: "See Technical Correlating Committee action on Comment 16-98."
SUBMITTER: Phil Brown, Communications Products Inc. (CP)
COMMENT ON PROPOSAL NO: 16-149
RECOMMENDATION: CPI recommends that Code Panel 16 continue to accept this proposal.
SUBSTANTIATION: CPI supports the NFPA's acceptance and recognition of limited combustible cable in the 2002 NEC. This cable design would provide a significant improvement in fire safety and protect lives and property. The NFPRF research project demonstrated that cable can be tested and listed for full compliance to the NFPA 255 and 259 test methods. Limited combustible cable is consistent with the full requirements of NFPA 90A and its originally intended fire safety performance.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
ABSTENTION: 1
EXPLANATION OF ABSTENTION:
CAUDILL: The Society of the Plastics Industries could not reach a consensus position on this issue.

(Log #1749)

16- 180 - (760-71(b)): Accept
Note: "See Technical Correlating Committee action on Comment 16-98."
SUBMITTER: Francis W. Peri, Communications Design Corporation
COMMENT ON PROPOSAL NO: 16-149
RECOMMENDATION: Association of Cabling Professionals (ACP) recommends that Code Panel 16 continue to accept this proposal.
SUBSTANTIATION: ACP supports the acceptance and use of limited combustible cable. This cable design provides a significant improvement in fire safety. The NFPRF has demonstrated that cable can be tested and listed for full compliance to the NFPA 255 and 259 protocols. Limited combustible cable is consistent with the full requirements of NFPA 90A and its intended fire safety performance.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
ABSTENTION: 1
EXPLANATION OF ABSTENTION:
CAUDILL: The Society of the Plastics Industries could not reach a consensus position on this issue.

(Log #1844)

16- 181 - (760-71(b)): Accept
Note: "See Technical Correlating Committee action on Comment 16-98."
SUBMITTER: Robert W. Jensen, dbi-Telecommunications Infrastructure Design
COMMENT ON PROPOSAL NO: 16-149
RECOMMENDATION: BICSI recommends that Code Panel 16 continue to accept this proposal.
SUBSTANTIATION: BICSI supports the introduction of limited combustible cable and recognizes that it represents a significant improvement in fire safety.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
ABSTENTION: 1

EXPLANATION OF ABSTENTION:
CAUDILL: The Society of the Plastics Industries could not reach a consensus position on this issue.

(Log #1931)

16- 182 - (760-71(b)): Accept
Note: **"See Technical Correlating Committee action on Comment 16-98."**
SUBMITTER: Jeffrey S. Deckman, SyNet Inc.
COMMENT ON PROPOSAL NO: 16-149
RECOMMENDATION: SyNet recommends that Code Panel 16 continue to accept this proposal.
SUBSTANTIATION: SyNet supports the acceptance and use of limited combustible cable. The NFPRF research project demonstrated that cable can be tested and listed for full compliance to the NFPA 255 and 259 test methods. Limited Combustible cable is consistent with the full requirements of NFPA 90A and its originally intended fire safety performance. We believe this cable design would provide a significant imporvement in fire safety and protect lives and property.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
ABSTENTION: 1
EXPLANATION OF ABSTENTION:
CAUDILL: The Society of the Plastics Industries could not reach a consensus position on this issue.

(Log #1067)

16- 183 - (760-71(e)): Reject
SUBMITTER: Marcelo M. Hirschler, GBH International/Rep. Plenum Cable Association and Fire Retardent Chemicals Assoc.
COMMENT ON PROPOSAL NO: 16-151
RECOMMENDATION: This proposal should be rejected, the new section 760-71(e) should not be created and the FPLP-50 classification should not be created.
SUBSTANTIATION: The FPLP-50 classification is an unnecessary classification because it is not justified either by requirements for reduction in fire hazard in plenums (fire hazard is the potential for harm associated with fire) or a general reduction in fire risk (fire risk is the combination of fire hazard and the probability of fires resulting in undesirable outcomes). Furthermore, they are based on a research project which is incomplete (according to the Interim Report issued) and they are based on flawed testing technology, as represented by the oxygen bomb calorimeter.

The Plenum Cable Association endorses use of fire hazard assessment and fire risk assessment in order to further develop technically supportable standards, codes and regulations, that ensure reasonable and justifiable classification and control of plastic and other combustible products. The creation of the (CXP-50) marking is not justified based on fire hazard or on fire risk and is simply an effort for one type of material to gain market share at the expense of others. If a search for better fire performance is continued indefinitely, without taking into account the overall fire safety required by the application, clearly the use of plastics and other combustible materials should be discontinued, as a non combustible material can always be found which outperforms any plastic material. Thus, if the National Electrical Code were to support unjustified improvements in fire performance, eventually any use of plastic or other combustible materials would be in jeopardy.

Thus, there are 4 reasons to oppose the CXP-50 classifications: (i) no justification based on fire risk, (ii) no justification based on fire hazard, (iii) the study for the development of the classification by the proponents is incomplete, and (iv) the technique of oxygen bomb calorimetry, and the concept of limited combustible, are technically flawed. These concerns are exemplified as follows:

(i) An analysis of fire performance of cables addresses fire hazard.

Fire hazard analysis: Traditional CMP-rated cables will not cause significant flame spread or smoke obscuration unless the fire source is very large. For example, a CMP cable with a PVC jacket and FEP insulation was shown to have no significant flame spread (out of a possible flame spread of 20 feet) and a peak optical density of much less than 0.2 when exposed to a fire of approximately 1 MW, from a wood crib, in a full scale facility, that simulated a room and plenum [Reference: L.M. Caudill, J.R. Hoover, J.T. Walnock and J.T. Chapin, "Fire Performance of Communications Cables in Concealed Spaces", pages 277-285, NFPRF Fire Risk and Hazard Assessment Symposium, June 26-28, 1996, San Francisco, CA]. The same cable also showed approximately 2 feet flame spread in the NFPA 262 plenum cable test, with a peak optical density not exceeding 0.3, according to the same reference. Clearly, if a cable does not spread flame significantly when a 1 MW fire source is applied, it does not represent any severe fire hazard. In a different scenario, a similar type of cable was studied by the European research project FIPEC, and found to release 42 kW and less than 6 MJ, to spread flame vertically for only 1.1 m, and to give low smoke release when tested in a severe vertical cable tray test (30 kW input at high air flow rate) [Reference: Fire Performance of Electric Cables Report, Interscience Communications, UK, 1999]. This indicates that the fire hazard associated with traditional CMP cables (and this with traditional CL2P and CL3P cables) is very low.

(ii) Analysis of NFPA statistics serves to illustrate fire risk. NFPA statistics address the following types of fires:

* "Non residential concealed space structure fires involving ignition of fixed wiring in ceiling/roof assemblies" {Roof plenums are examples of these spaces}
* "Non residential concealed space structure fires involving ignition of fixed wiring in ceiling/floor assemblies" {Floor plenums are examples of these spaces}

In each case, the statistics can distinguish whether wire and cable insulation was or was not the item first ignited, giving four sets of statistics relevant to plenum cables. These statistics are relevant to the fire risk from plenum cables, as plenum cables are the typical type of wire and cable insulation present in roof plenums or in floor plenums.

Fire risk analysis: The statistics indicate that, between 1980 and 1996, there have been an average of only 584 fires per year, and of those only 171 have started with ignition of a wire and cable product, and the trend has been downwards (see the attached Tables with fire statistics and the attached charts, indicating a similar type of downward trend for both concealed roof spaces and concealed floor spaces). In fact, over the entire period between 1980 and 1996 the total number of fires in concealed roof spaces involving ignition of fixed wiring has been 0.29% of the total number of non residential structure fires (of which less than 30% started in wire and cable) and the total number of fires in concealed floor spaces involving ignition of fixed wiring has been 0.10% of the total number of non residential structure fires (of which ca. 32% started in wire and cable). With regard to fatalities or injuries: out of 3,734 fatalities in non residential structure fires, only 7 occurred in concealed roof or floor spaces involving ignition of fixed wiring (less than 0.19%), and out of 60,950 injuries in non residential structure fires, only 85 occurred in concealed roof or floor spaces involving ignition of fixed wiring (less than 0.14%). At least 4 of the 7 fatalities have been shown not to have resulted from plenum cable fires with the other 3 unknown. Thus, the fire record in a period when the amount of installed plenum cables increased from virtually none to some 20 billion feet, indicates that the fire risk is minimal.

(iii) The classifications of CXP-50 are not yet ready for application, since the NFPA Fire Protection Research Foundation Project developing the classification has not yet issued its final report. The Interim Report (International Limited Combustible Plenum Cable Fire Test Project, Interim Report, by F.B. Clarke and R.G. Gewain, June 2000) is the source of our [Plenum Cable Association] concerns. The first objective of this project was to: "Develop harmonized Steiner Tunnel listing protocols for permanent plenum cables related to NFPA 262/UL 910 and NFPA 255." The Interim Report describes part of Phase I of the project, wherein no harmonized listing protocol has been developed. The Interim Report addresses NFPA 255 and NFPA 259 and states, among other things:

* NFPA 255, flame travel distance: "... The NFPA 255 flame travel distances appear to be highly repeatable {i.e. within one lab} in each laboratory, as evidenced by the small variance of the measurements, *but not particularly reproducible* {i.e. between labs}, as can be seen by comparing this variance with the interlaboratory results. ..." {Emphasis added, but statement comes verbatim from report}
* NFPA 255, smoke index, or SDI: "... With respect to the smoke measurements, multiple determinations of the SDI by a given laboratory on a given cable agree with one another quite closely *but the SDI's reported by the two labs for the same cables do not appear to be close at all*. The results reported by Laboratory 2 are, with one exception, systematically higher than those of Laboratory 1. ..." {Emphasis added, but statement comes verbatim from report}

* NFPA 255 precision: " ... The flame spread and smoke measurements in NFPA 255 show ... *relatively poor reproducibility*, i.e. the result for a cable in a given laboratory can be repeated with precision but the difference in results between laboratories is on average considerably larger than the repeatability error. ..." {Emphasis added, but statement comes verbatim from report}

* Procedure for NFPA 255: "It is possible to test wire and cable following the current NFPA 255 test procedure, using the mounting specified for plastics in Appendix B7 of the standard." Appendix B-7 of NFPA 255 states:

"B-7 Plastics. B-7.1 The term plastics includes foams, reinforced panels, laminates, grids, and transparent or translucent sheets.

B-7.2 Where any plastic remains in position in the tunnel during a fire test, no additional support is necessary. Thermoplastic materials and other plastics that do not remain in place should be supported by 1/4-in. (6.3-mm) round metal rods or 3/16 in. (4.8 mm) thick 2 in. (51 mm) wide steel bars, or 2-in. (51-mm) galvanized hexagonal wire mesh supported with metal bars or rods spanning the width of the tunnel."

It is interesting to compare this with the statements in NFPA 262, as follows:

"1-1.3* Although this test uses equipment similar to that used in NFPA 255, Standard Method of Test of Surface Burning Characteristics of Building Materials, and ASTM E 84, Standard Test Method for Surface Burning Characteristics of Building Materials, sufficient changes have been made to the chamber so that a test conducted in the apparatus used for NFPA 255 or ASTM E 84 cannot be considered identical or produce comparable results.

A-1-1.3 The changes made in equipment for this test were deemed necessary in order to obtain proper precision from the test when the equipment is used for small quantities of wire and cable, which produce much smaller quantities of heat release and smoke obscuration."

* NFPA 259: "... NFPA 259 has traditionally been carried out on individual materials, and so the potential heat of a finished product like a cable would be calculated as the um of the contributions of each component, each contribution being the potential heat of the component multiplied by the mass fraction of that component in the cable. To produce such a measurement it would be necessary to disassemble the cable into its different components – insulation, jacket, shielding, rip cord and the like – and measure the potential heat of each component. *An obvious question is whether such a cumbersome procedure is necessary* ..." {Emphasis added, but statement comes verbatim from report}.

* Observations on NFPA 259: "One of the labs (Laboratory 2) had both more experience and more advanced equipment ..."

* Procedure for NFPA 259: "... The procedure followed was NFPA 259, Standard Test Method for Potential Heat of Building Materials, 1998 Edition, with modifications to the following sections: ... *This modification should be viewed provisionally since it so far has only been tested on 4-pair unshielded twisted pair (UTP) plenum cable*." {Emphasis added, but statement comes verbatim from report}

(iv) The oxygen bomb calorimeter test used to assess "limited combustible" classifications is severely flawed. NFPA 259 uses the oxygen bomb calorimeter as part of its testing to assess potential heat. The term "limited combustible" was developed for "building construction materials", with the intent of applying it to materials of construction of the plenum and not to cables. NFPA 90A defines "limited combustible" as follows:

"Limited-Combustible Material. A building construction material not complying with the definition of noncombustible material that in the form in which it is used, has a potential heat value not exceeding 3500 Btu/lb (8141 kJ/kg) where tested in accordance with NFPA 259, Standard Test Method for Potential Heat of Building Materials, and complies with (a) or (b):

(a) Materials having a structural base of noncombustible material, with a surfacing not exceeding a thickness of 1/8 in. (3.2 mm), that has a flame spread index not greater than 50; (b) Materials, in the form and thickness used, other than as described in (a), having neither a flame spread index greater than 25 nor evidence of continued progressive combustion, and of such composition that surfaces that would be exposed by cutting through the material on any plane would have neither a flame spread index greater than 25 nor evidence of continued progressive combustion. Materials subject to increase in combustibility or flame spread index beyond the limits herein established through the effects of age, moisture, or other atmospheric condition shall be considered combustible."

The oxygen bomb calorimeter is a method for determining the theoretical (or complete or absolute) calorific energy (or heat of combustion), as opposed to the effective (or practical) values. The reason such instruments are used is to ensure that the correct value is chosen. As such they represent the following chemical equations for combustible fuels containing only carbon, hydrogen and oxygen:

$$C + O_2 = CO_2$$

$$4\,H + O_2 = 2\,H_2O$$

For hydrocarbon fuels: $-C\,H_2- + O_2 = CO_2 + H_2O$

However, when building materials are more complex, because they contain other elements, there is a certain inconsistency in the equation and in the energy calculated.

1. Cl: Thus, for example, when PVC is burnt in an oxygen bomb, depending on the fraction of hydrogen atoms present, there will be different proportions of the following two equations:

$$(C_2\,H_3\,Cl)_n + 2.5\,n\,O_2 = 2\,n\,CO_2 + n\,H_2O + n\,HCl$$

$$(C_2\,H_3\,Cl)_n + 2.75\,n\,O_2 = 2\,n\,CO_2 + 1.5\,n\,H_2O + 0.5\,n\,Cl_2$$

where the two equations differ by 380 kJ/kg.

2. S: Combustion of materials containing sulphur also depends on the final product. Typically the combustion bomb generates sulphuric acid as the final sulphur containing product, while furnace combustion generates sulphur dioxide (with the sulphur less fully oxidized). Therefore, the convention in bomb calorimetry is to determine values of calorific value of fuels (including coal), by referring to the quantitative conversion to sulphur dioxide, and ignoring the conversion to sulphuric acid (or sulphur trioxide) that occurs, by using a conversion factor based on the sulphur content. Interestingly, gypsum (which is calcium sulphate dihydrate), is a building material containing sulphur. The typical fuel containing sulphur is coal. The difference between conversion to sulphur dioxide and sulphuric acid is 9410 kJ/kg.

3. N: Combustion of materials containing nitrogen also has a convention: the heat of convention is normally calculated assuming that all the nitrogen is converted into molecular nitrogen. However, that is not what happens in oxygen bomb calorimetry, where nitrogen oxides and nitric acid are actually formed. Thus, a correction is applied to account for the following equation:

$HNO_3 = 0.5\,H_2O + 0.5\,N_2 + 1.25\,O_2$, with a net heat of reaction of 1017 kJ/kg.

4. F: Combustion of materials containing fluorine is generally represented as ending in the formation of carbon tetrafluoride (CF_4) and of hydrogen fluoride (HF), in varying proportions. The equation is as follows:

$$C_a\,H_b\,O_c\,F_e + (a+b/4-c/2-e/4)\,O_2 + (n+1/2)*e*(1-x) - b/2)\,H_2O = (a-ex/4)\,CO_2 + ex/4\,CF_4 + e(1-x)\,(HF) + e(1-x)\,n\,H_2O$$

where x is the fraction of fluorine atoms converted to CF_4 as opposed to converted to HF. The energy of the conversion of CF_4 to HF is approximately 192 kJ/kg. Moreover, fluorine materials will attack the walls of the bomb calorimeter.

5. Si: Compounds containing silicon are impossible to convert completely to their final oxidation product, which is silica (SiO_2), by conventional means because as burning proceeds, the material becomes covered by a layer of silica which prevents access of oxygen and leads to the formation of a residue. The only way to obtain a reliable result of heat of combustion of materials containing silicon (such as silicones) is by a method which combines the material with an organic fluorine compound (the value of which has been accurately assessed in advance) in rotating bomb containing also water and aqueous HF. This converts all the Si into fluorosilicic acid, and the results can then be calculated back.

6. P: Compounds containing phosphorus are exceedingly difficult to assess by oxygen bomb combustion calorimetry. There are four major problems: (1) various phosphorus acids with different energies of dilution are formed in various concentrations throughout the oxygen bomb, (2) the combustion products contain different types of phosphorus oxyacids, each one of which has a different heat of formation, (3) the burning compound gets covered by phosphorus oxides and acids, which inhibit further combustion and (4) the bomb calorimeter walls are attacked and metal phosphates are formed, so that the recommended wall materials should be corundum or gold, since Pyrex glass, quartz,

stainless steel titanium, porcelain and platinum all suffered heavy weight losses. For example, depending on whether a rotating bomb or a static bomb is used, the fraction of pyrophosphoric acid formed varied from 10 to 18% and that of triphosphoric acid from 1 to 3%.

7. Auxiliary combustion material: When an auxiliary material is used for assessing the heat of combustion, a 1% error in the assessment of the heat of combustion of the auxiliary material (such as benzoic acid), which is typically used in the order of 20% energy loading, corresponds to a 5% error in the total energy/heat measured. Thus, at a value of 1500 kJ/kg that would be an error of 75 kJ/kg, and this would be a systematic error for that series of experiments.

8. Moisture content: the moisture content of the building material is critical, because the combustion reaction considered in the oxygen bomb is that to convert to gaseous water. Thus, if a material contains water, the water will have reaction to vaporize the water content. Thus, results must be expressed as a function of the original moisture content for them to be valid. This matters, of course, for materials that absorb moisture when exposed to the atmosphere.

Bibliography on oxygen bomb calorimetry:

* Mansson, Margret, "Determination of Calorific Values of Building Materials - A Guide", SP Nordtest Report Project 871-90, Swedish National Testing and Research Institute, Boras, Sweden, 1991.

* Head, Arthur J, and Good, William D., "Combustion of Liquid/Solid Compounds with Non-Metallic Hetero Atoms", Chapter 9 in "Combustion Calorimetry", "Volume 1, Experimental Chemical thermodynamics", Eds. Stig Sunner & Margret M. Mansson), Pergamon Press, Oxford, UK (for Int. Union Pure & Applied Chemistry, IUPAC), 1979.

* Mansson, Margret and Hubbard, Ward N., "Strategies in the Calculation of Standard-State Energies of Combustion from the Experimentally Determined Quantities", Chapter 5 in "Combustion Calorimetry", "Volume 1, Experimental Chemical thermodynamics", Eds. Stig Sunner & Margret M. Mansson), Pergamon Press, Oxford, UK (for Int. Union Pure & Applied Chemistry, IUPAC), 1979.

* Hu, Andrew T., Sinke, G.C., Mansson, Margret and Ringner, Birgitta, "Test Substances for Bomb Combustion Calorimetry, p-Chlorobenzoic Acid". J. Chem. Thermodynamics, 4, 283-99 (1972).

* Mansson, Margret, "Thermochemistry - Some Recent Lines of Development", Pure & Applied Chemistry, 55(3), 417-26 (1983).

* Mansson, Margret, "A 4.5 cm^3 Bomb Combustion Calorimeter and an Ampoule Technique for 5 to 10 mg Samples with Vapour Pressures Below Approximately 3 kPa (20 Torr)", J. Chem. Thermodynamics, 5, 7232 (1973).

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

PANEL ACTION: Reject.

PANEL STATEMENT: Refer to panel action and statement on Comment 16-98.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21

VOTE ON PANEL ACTION:

AFFIRMATIVE: 18
NEGATIVE: 2
ABSTENTION: 1

EXPLANATION OF NEGATIVE:

JOHNSON: See my explanation of negative vote on Comment 16-88.

WADEHRA: See my explanation of negative vote on Comment 16-88.

COMMENT ON AFFIRMATIVE:

KAHN: See my comment on affirmative vote on Comment 16-88.

KAUFMAN: See my comment on affirmative vote on Comment 16-88.

EXPLANATION OF ABSTENTION:

CAUDILL: The Society of the Plastics Industries could not reach a consensus position on this issue.

(Log #1081)

16- 184 - (760-71(e)): Reject

Note: "See Technical Correlating Committee action on Comment 16-98."

SUBMITTER: Marcelo M. Hirschler, GBH International/Rep. Plenum Cable Association and Fire Retardent Chemicals Assoc.

COMMENT ON PROPOSAL NO: 16-149

RECOMMENDATION: This proposal should be rejected, the new section 760-71(e) should not be created and the FPLP-50 classification should not be created.

SUBSTANTIATION: The FPLP-50 classification is unnecessary classification because it is not justified either by requirements for reduction in fire hazard in plenums (fire hazard is the potential for harm associated with fire) or a general reduction in fire risk (fire risk is the combination of fire hazard and the probability of fires resulting in undesirable outcomes). Furthermore, they are based on a research project which is incomplete (according to the Interim Report issued) and they are based on flawed testing technology, as represented by the oxygen bomb calorimeter.

The Plenum Cable Association endorses use of fire hazard assessment and fire risk assessment in order to further develop technically supportable standards, codes and regulations, that ensure reasonable and justifiable classification and control of plastic and other combustible products. The creation of the (CXP-50) marking is not justified based on fire hazard or on fire risk and is simply an effort for one type of material to gain market share at the expense of others. If a search for better fire performance is continued indefinitely, without taking into account the overall fire safety required by the application, clearly the use of plastics and other combustible materials should be discontinued, as a non combustible material can always be found which outperforms any plastic material. Thus, if the National Electrical Code were to support unjustified improvements in fire performance, eventually any use of plastic or other combustible materials would be in jeopardy.

Thus, there are 4 reasons to oppose the CXP-50 classifications: (i) no justification based on fire risk, (ii) no justification based on fire hazard, (iii) the study for the development of the classification by the proponents is incomplete, and (iv) the technique of oxygen bomb calorimetry, and the concept of limited combustible, are technically flawed. These concerns are exemplified as follows:

(i) An analysis of fire performance of cables addresses fire hazard.

Fire hazard analysis: Traditional CMP-rated cables will not cause significant flame spread or smoke obscuration unless the fire source is very large. For example, a CMP cable with a PVC jacket and FEP insulation was shown to have no significant flame spread (out of a possible flame spread of 20 feet) and a peak optical density of much less than 0.2 when exposed to a fire of approximately 1 MW, from a wood crib, in a full scale facility, that simulated a room and plenum [Reference: L.M. Caudill, J.R. Hoover, J.T. Walnock and J.T. Chapin, "Fire Performance of Communications Cables in Concealed Spaces", pages 277-285, NFPRF Fire Risk and Hazard Assessment Symposium, June 26-28, 1996, San Francisco, CA]. The same cable also showed approximately 2 feet flame spread in the NFPA 262 plenum cable test, with a peak optical density not exceeding 0.3, according to the same reference. Clearly, if a cable does not spread flame significantly when a 1 MW fire source is applied, it does not represent any severe fire hazard. In a different scenario, a similar type of cable was studied by the European research project FIPEC, and found to release 42 kW and less than 6 MJ, to spread flame vertically for only 1.1 m, and to give low smoke release when tested in a severe vertical cable tray test (30 kW input at high air flow rate) [Reference: Fire Performance of Electric Cables Report, Interscience Communications, UK, 1999]. This indicates that the fire hazard associated with traditional CMP cables (and this with traditional CL2P and CL3P cables) is very low.

(ii) Analysis of NFPA statistics serves to illustrate fire risk. NFPA statistics address the following types of fires:

* "Non residential concealed space structure fires involving ignition of fixed wiring in ceiling/roof assemblies" {Roof plenums are examples of these spaces}
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In each case, the statistics can distinguish whether wire and cable insulation was or was not the item first ignited, giving four sets of statistics relevant to plenum cables. These statistics are relevant to the fire risk from plenum cables, as plenum cables are the typical type of wire and cable insulation present in roof plenums or in floor plenums.

Fire risk analysis: The statistics indicate that, between 1980 and 1996, there have been an average of only 584 fires per year, and of those only 171 have started with ignition of a wire and cable product, and the trend has been downwards (see the attached Tables with fire statistics and the attached charts, indicating a similar type of downward trend for both concealed roof spaces and concealed floor spaces). In fact, over the entire period between 1980 and 1996 the total number of fires in concealed roof spaces

involving ignition of fixed wiring has been 0.29% of the total number of non residential structure fires (of which less than 30% started in wire and cable) and the total number of fires in concealed floor spaces involving ignition of fixed wiring has been 0.10% of the total number of non residential structure fires (of which ca. 32% started in wire and cable). With regard to fatalities or injuries: out of 3,734 fatalities in non residential structure fires, only 7 occurred in concealed roof or floor spaces involving ignition of fixed wiring (less than 0.19%), and out of 60,950 injuries in non residential structure fires, only 85 occurred in concealed roof or floor spaces involving ignition of fixed wiring (less than 0.14%). At least 4 of the 7 fatalities have been shown not to have resulted from plenum cable fires with the other 3 unknown. Thus, the fire record in a period when the amount of installed plenum cables increased from virtually none to some 20 billion feet, indicates that the fire risk is minimal.

(iii) The classifications of CXP-50 are not yet ready for application, since the NFPA Fire Protection Research Foundation Project developing the classification has not yet issued its final report. The Interim Report (International Limited Combustible Plenum Cable Fire Test Project, Interim Report, by F.B. Clarke and R.G. Gewain, June 2000) is the source of our [Plenum Cable Association] concerns. The first objective of this project was to: "Develop harmonized Steiner Tunnel listing protocols for permanent plenum cables related to NFPA 262/UL 910 and NFPA 255." The Interim Report describes part of Phase I of the project, wherein no harmonized listing protocol has been developed. The Interim Report addresses NFPA 255 and NFPA 259 and states, among other things:

* NFPA 255, flame travel distance: "... The NFPA 255 flame travel distances appear to be highly repeatable {i.e. within one lab} in each laboratory, as evidenced by the small variance of the measurements, *but not particularly reproducible* {i.e. between labs}, as can be seen by comparing this variance with the interlaboratory results. ..." {Emphasis added, but statement comes verbatim from report}

* NFPA 255, smoke index, or SDI: "... With respect to the smoke measurements, multiple determinations of the SDI by a given laboratory on a given cable agree with one another quite closely *but the SDI's reported by the two labs for the same cables do not appear to be close at all*. The results reported by Laboratory 2 are, with one exception, systematically higher than those of Laboratory 1. ..." {Emphasis added, but statement comes verbatim from report}

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"B-7 Plastics. B-7.1 The term plastics includes foams, reinforced panels, laminates, grids, and transparent or translucent sheets.

B-7.2 Where any plastic remains in position in the tunnel during a fire test, no additional support is necessary. Thermoplastic materials and other plastics that do not remain in place should be supported by 1/4-in. (6.3-mm) round metal rods or 3/16 in. (4.8 mm) thick 2 in. (51 mm) wide steel bars, or 2-in. (51-mm) galvanized hexagonal wire mesh supported with metal bars or rods spanning the width of the tunnel."

It is interesting to compare this with the statements in NFPA 262, as follows:

"1-1.3* Although this test uses equipment similar to that used in NFPA 255, Standard Method of Test of Surface Burning Characteristics of Building Materials, and ASTM E 84, Standard Test Method for Surface Burning Characteristics of Building Materials, sufficient changes have been made to the chamber so that a test conducted in the apparatus used for NFPA 255 or ASTM E 84 cannot be considered identical or produce comparable results.

A-1-1.3 The changes made in equipment for this test were deemed necessary in order to obtain proper precision from the test when the equipment is used for small quantities of wire and cable, which produce much smaller quantities of heat release and smoke obscuration."

* NFPA 259: "... NFPA 259 has traditionally been carried out on individual materials, and so the potential heat of a finished product like a cable would be calculated as the um of the contributions of each component, each contribution being the potential heat of the component multiplied by the mass fraction of that component in the cable. To produce such a measurement it would be necessary to disassemble the cable into its different components – insulation, jacket, shielding, rip cord and the like – and measure the potential heat of each component. *An obvious question is whether such a cumbersome procedure is necessary* ..." {Emphasis added, but statement comes verbatim from report}.

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(iv) The oxygen bomb calorimeter test used to assess "limited combustible" classifications is severely flawed. NFPA 259 uses the oxygen bomb calorimeter as part of its testing to assess potential heat. The term "limited combustible" was developed for "building construction materials", with the intent of applying it to materials of construction of the plenum and not to cables. NFPA 90A defines "limited combustible" as follows:

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(a) Materials having a structural base of noncombustible material, with a surfacing not exceeding a thickness of 1/8 in. (3.2 mm), that has a flame spread index not greater than 50; (b) Materials, in the form and thickness used, other than as described in (a), having neither a flame spread index greater than 25 nor evidence of continued progressive combustion, and of such composition that surfaces that would be exposed by cutting through the material on any plane would have neither a flame spread index greater than 25 nor evidence of continued progressive combustion. Materials subject to increase in combustibility or flame spread index beyond the limits herein established through the effects of age, moisture, or other atmospheric condition shall be considered combustible."

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$$C + O_2 = CO_2$$

$$4\,H + O_2 = 2\,H_2O$$

For hydrocarbon fuels: $- C H_2 - + O_2 = CO_2 + H_2O$

However, when building materials are more complex, because they contain other elements, there is a certain inconsistency in the equation and in the energy calculated.

1. Cl: Thus, for example, when PVC is burnt in an oxygen bomb, depending on the fraction of hydrogen atoms present, there will be different proportions of the following two equations:

$$(C_2 H_3 Cl)_n + 2.5\,n\,O_2 = 2\,n\,CO_2 + n\,H_2O + n\,HCl$$

$$(C_2 H_3 Cl)_n + 2.75\,n\,O_2 = 2\,n\,CO_2 + 1.5\,n\,H_2O + 0.5\,n\,Cl_2$$

where the two equations differ by 380 kJ/kg.

2. S: Combustion of materials containing sulphur also depends on the final product. Typically the combustion bomb generates sulphuric acid as the final sulphur containing product, while furnace combustion generates sulphur dioxide (with the sulphur less fully oxidized). Therefore, the convention in bomb calorimetry is to determine values of calorific value of fuels (including coal), by referring to the quantitative conversion to sulphur dioxide, and ignoring the conversion to sulphuric acid (or sulphur trioxide) that occurs, by using a conversion factor based on the sulphur content. Interestingly, gypsum (which is calcium sulphate dihydrate), is a building material containing sulphur. The typical fuel containing sulphur is coal. The difference

between conversion to sulphur dioxide and sulphuric acid is 9410 kJ/kg.

3. N: Combustion of materials containing nitrogen also has a convention: the heat of convention is normally calculated assuming that all the nitrogen is converted into molecular nitrogen. However, that is not what happens in oxygen bomb calorimetry, where nitrogen oxides and nitric acid are actually formed. Thus, a correction is applied to account for the following equation:

$HNO_3 = 0.5\ H_2O + 0.5\ N_2 + 1.25\ O_2$, with a net heat of reaction of 1017 kJ/kg.

4. F: Combustion of materials containing fluorine is generally represented as ending in the formation of carbon tetrafluoride (CF_4) and of hydrogen fluoride (HF), in varying proportions. The equation is as follows:

$$C_a H_b O_c F_e + (a+b/4-c/2-e/4)\ O_2 + (n+1/2)*e*(1-x) -b/2)\ H_2O = (a-ex/4)\ CO_2 + + ex/4\ CF_4 + e(1-x)\ (HF) + e(1-x)\ n\ H_2O$$

where x is the fraction of fluorine atoms converted to CF_4 as opposed to converted to HF. The energy of the conversion of CF_4 to HF is approximately 192 kJ/kg. Moreover, fluorine materials will attack the walls of the bomb calorimeter.

5. Si: Compounds containing silicon are impossible to convert completely to their final oxidation product, which is silica (SiO_2), by conventional means because as burning proceeds, the material becomes covered by a layer of silica which prevents access of oxygen and leads to the formation of a residue. The only way to obtain a reliable result of heat of combustion of materials containing silicon (such as silicones) is by a method which combines the material with an organic fluorine compound (the value of which has been accurately assessed in advance) in rotating bomb containing also water and aqueous HF. This converts all the Si into fluorosilicic acid, and the results can then be calculated back.

6. P: Compounds containing phosphorus are exceedingly difficult to assess by oxygen bomb combustion calorimetry. There are four major problems: (1) various phosphorus acids with different energies of dilution are formed in various concentrations throughout the oxygen bomb, (2) the combustion products contain different types of phosphorus oxyacids, each one of which has a different heat of formation, (3) the burning compound gets covered by phosphorus oxides and acids, which inhibit further combustion and (4) the bomb calorimeter walls are attacked and metal phosphates are formed, so that the recommended wall materials should be corundum or gold, since Pyrex glass, quartz, stainless steel titanium, porcelain and platinum all suffered heavy weight losses. For example, depending on whether a rotating bomb or a static bomb is used, the fraction of pyrophosphoric acid formed varied from 10 to 18% and that of triphosphoric acid from 1 to 3%.

7. Auxiliary combustion material: When an auxiliary material is used for assessing the heat of combustion, a 1% error in the assessment of the heat of combustion of the auxiliary material (such as benzoic acid), which is typically used in the order of 20% energy loading, corresponds to a 5% error in the total energy/heat measured. Thus, at a value of 1500 kJ/kg that would be an error of 75 kJ/kg, and this would be a systematic error for that series of experiments.

8. Moisture content: the moisture content of the building material is critical, because the combustion reaction considered in the oxygen bomb is that to convert to gaseous water. Thus, if a material contains water, the water will have reaction to vaporize the water content. Thus, results must be expressed as a function of the original moisture content for them to be valid. This matters, of course, for materials that absorb moisture when exposed to the atmosphere.

Bibliography on oxygen bomb calorimetry:

* Mansson, Margret, "Determination of Calorific Values of Building Materials - A Guide", SP Nordtest Report Project 871-90, Swedish National Testing and Research Institute, Boras, Sweden, 1991.

* Head, Arthur J, and Good, William D., "Combustion of Liquid/Solid Compounds with Non-Metallic Hetero Atoms", Chapter 9 in "Combustion Calorimetry", "Volume 1, Experimental Chemical thermodynamics", Eds. Stig Sunner & Margret M. Mansson), Pergamon Press, Oxford, UK (for Int. Union Pure & Applied Chemistry, IUPAC), 1979.

* Mansson, Margret and Hubbard, Ward N., "Strategies in the Calculation of Standard-State Energies of Combustion from the Experimentally Determined Quantities", Chapter 5 in "Combustion Calorimetry", "Volume 1, Experimental Chemical thermodynamics", Eds. Stig Sunner & Margret M. Mansson), Pergamon Press, Oxford, UK (for Int. Union Pure & Applied Chemistry, IUPAC), 1979.

* Hu, Andrew T., Sinke, G.C., Mansson, Margret and Ringner, Birgitta, "Test Substances for Bomb Combustion Calorimetry, p-Chlorobenzoic Acid". J. Chem. Thermodynamics, 4, 283-99 (1972).

* Mansson, Margret, "Thermochemistry - Some Recent Lines of Development", Pure & Applied Chemistry, 55(3), 417-26 (1983).

* Mansson, Margret, "A 4.5 cm^3 Bomb Combustion Calorimeter and an Ampoule Technique for 5 to 10 mg Samples with Vapour Pressures Below Approximately 3 kPa (20 Torr)", J. Chem. Thermodynamics, 5, 7232 (1973).

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

PANEL ACTION: Reject.

PANEL STATEMENT: Refer to panel action and statement on Comment 16-98.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21

VOTE ON PANEL ACTION:

AFFIRMATIVE: 18
NEGATIVE: 2
ABSTENTION: 1

EXPLANATION OF NEGATIVE:

JOHNSON: See my explanation of negative vote on Comment 16-88.

WADEHRA: See my explanation of negative vote on Comment 16-88.

COMMENT ON AFFIRMATIVE:

KAHN: See my comment on affirmative vote on Comment 16-88.

KAUFMAN: See my comment on affirmative vote on Comment 16-88.

EXPLANATION OF ABSTENTION:

CAUDILL: The Society of the Plastics Industries could not reach a consensus position on this issue.

(Log #1288)

16- 185 - (760-71(e)): Accept

SUBMITTER: Allen C. Weidman, The Society of the Plastics Industry, Inc.

COMMENT ON PROPOSAL NO: 16-151

RECOMMENDATION: We support the action of the panel.

SUBSTANTIATION: None.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21

VOTE ON PANEL ACTION:

AFFIRMATIVE: 20
ABSTENTION: 1

EXPLANATION OF ABSTENTION:

CAUDILL: The Society of the Plastics Industries could not reach a consensus position on this issue.

(Log #1074)

16- 186 - (Table 760-71(i)): Reject

Note: "See Technical Correlating Committee action on Comment 16-98."

SUBMITTER: Marcelo M. Hirschler, GBH International/Rep. Plenum Cable Association and Fire Retardent Chemicals Assoc.

COMMENT ON PROPOSAL NO: 16-152

RECOMMENDATION: This proposal should be rejected, the references to FPLP-50 should be deleted from the Table 760-7(i) and the FPLP-50 classification should not be created.

SUBSTANTIATION: The FPLP-50 classification is an unnecessary classification because it is not justified either by requirements for reduction in fire hazard in plenums (fire hazard is the potential for harm associated with fire) or a general reduction in fire risk (fire risk is the combination of fire hazard and the probability of fires resulting in undesirable outcomes). Furthermore, they are based on a research project which is incomplete (according to the Interim Report issued) and they are based on flawed testing technology, as represented by the oxygen bomb calorimeter.

The Plenum Cable Association endorses use of fire hazard assessment and fire risk assessment in order to further develop technically supportable standards, codes and regulations, that ensure reasonable and justifiable classification and control of plastic and other combustible products. The creation of the (CXP-50) marking is not justified based on fire hazard or on fire risk and is simply an effort for one type of material to gain market share at the expense of others. If a search for better fire performance is continued indefinitely, without taking into account the overall fire safety required by the application, clearly the use of

plastics and other combustible materials should be discontinued, as a non combustible material can always be found which outperforms any plastic material. Thus, if the National Electrical Code were to support unjustified improvements in fire performance, eventually any use of plastic or other combustible materials would be in jeopardy.

Thus, there are 4 reasons to oppose the CXP-50 classifications: (i) no justification based on fire risk, (ii) no justification based on fire hazard, (iii) the study for the development of the classification by the proponents is incomplete, and (iv) the technique of oxygen bomb calorimetry, and the concept of limited combustible, are technically flawed. These concerns are exemplified as follows:

(i) An analysis of fire performance of cables addresses fire hazard.

Fire hazard analysis: Traditional CMP-rated cables will not cause significant flame spread or smoke obscuration unless the fire source is very large. For example, a CMP cable with a PVC jacket and FEP insulation was shown to have no significant flame spread (out of a possible flame spread of 20 feet) and a peak optical density of much less than 0.2 when exposed to a fire of approximately 1 MW, from a wood crib, in a full scale facility, that simulated a room and plenum [Reference: L.M. Caudill, J.R. Hoover, J.T. Walnock and J.T. Chapin, "Fire Performance of Communications Cables in Concealed Spaces", pages 277-285, NFPRF Fire Risk and Hazard Assessment Symposium, June 26-28, 1996, San Francisco, CA]. The same cable also showed approximately 2 feet flame spread in the NFPA 262 plenum cable test, with a peak optical density not exceeding 0.3, according to the same reference. Clearly, if a cable does not spread flame significantly when a 1 MW fire source is applied, it does not represent any severe fire hazard. In a different scenario, a similar type of cable was studied by the European research project FIPEC, and found to release 42 kW and less than 6 MJ, to spread flame vertically for only 1.1 m, and to give low smoke release when tested in a severe vertical cable tray test (30 kW input at high air flow rate) [Reference: Fire Performance of Electric Cables Report, Interscience Communications, UK, 1999]. This indicates that the fire hazard associated with traditional CMP cables (and this with traditional CL2P and CL3P cables) is very low.

(ii) Analysis of NFPA statistics serves to illustrate fire risk. NFPA statistics address the following types of fires:

* "Non residential concealed space structure fires involving ignition of fixed wiring in ceiling/roof assemblies" {Roof plenums are examples of these spaces}
* "Non residential concealed space structure fires involving ignition of fixed wiring in ceiling/floor assemblies" {Floor plenums are examples of these spaces}

In each case, the statistics can distinguish whether wire and cable insulation was or was not the item first ignited, giving four sets of statistics relevant to plenum cables. These statistics are relevant to the fire risk from plenum cables, as plenum cables are the typical type of wire and cable insulation present in roof plenums or in floor plenums.

Fire risk analysis: The statistics indicate that, between 1980 and 1996, there have been an average of only 584 fires per year, and of those only 171 have started with ignition of a wire and cable product, and the trend has been downwards (see the attached Tables with fire statistics and the attached charts, indicating a similar type of downward trend for both concealed roof spaces and concealed floor spaces). In fact, over the entire period between 1980 and 1996 the total number of fires in concealed roof spaces involving ignition of fixed wiring has been 0.29% of the total number of non residential structure fires (of which less than 30% started in wire and cable) and the total number of fires in concealed floor spaces involving ignition of fixed wiring has been 0.10% of the total number of non residential structure fires (of which ca. 32% started in wire and cable). With regard to fatalities or injuries: out of 3,734 fatalities in non residential structure fires, only 7 occurred in concealed roof or floor spaces involving ignition of fixed wiring (less than 0.19%), and out of 60,950 injuries in non residential structure fires, only 85 occurred in concealed roof or floor spaces involving ignition of fixed wiring (less than 0.14%). At least 4 of the 7 fatalities have been shown not to have resulted from plenum cable fires with the other 3 unknown. Thus, the fire record in a period when the amount of installed plenum cables increased from virtually none to some 20 billion feet, indicates that the fire risk is minimal.

(iii) The classifications of CXP-50 are not yet ready for application, since the NFPA Fire Protection Research Foundation Project developing the classification has not yet issued its final report. The Interim Report (International Limited Combustible Plenum Cable Fire Test Project, Interim Report, by F.B. Clarke and R.G. Gewain, June 2000) is the source of our [Plenum Cable Association] concerns. The first objective of this project was to: "Develop harmonized Steiner Tunnel listing protocols for permanent plenum cables related to NFPA 262/UL 910 and NFPA 255." The Interim Report describes part of Phase I of the project, wherein no harmonized listing protocol has been developed. The Interim Report addresses NFPA 255 and NFPA 259 and states, among other things:

* NFPA 255, flame travel distance: "... The NFPA 255 flame travel distances appear to be highly repeatable {i.e. within one lab} in each laboratory, as evidenced by the small variance of the measurements, *but not particularly reproducible* {i.e. between labs}, as can be seen by comparing this variance with the interlaboratory results. ..." {Emphasis added, but statement comes verbatim from report}
* NFPA 255, smoke index, or SDI: "... With respect to the smoke measurements, multiple determinations of the SDI by a given laboratory on a given cable agree with one another quite closely *but the SDI's reported by the two labs for the same cables do not appear to be close at all*. The results reported by Laboratory 2 are, with one exception, systematically higher than those of Laboratory 1. ..." {Emphasis added, but statement comes verbatim from report}
* NFPA 255 precision: " ... The flame spread and smoke measurements in NFPA 255 show ... *relatively poor reproducibility*, i.e. the result for a cable in a given laboratory can be repeated with precision but the difference in results between laboratories is on average considerably larger than the repeatability error. ..." {Emphasis added, but statement comes verbatim from report}

* Procedure for NFPA 255: "It is possible to test wire and cable following the current NFPA 255 test procedure, using the mounting specified for plastics in Appendix B7 of the standard." Appendix B-7 of NFPA 255 states:

"B-7 Plastics. B-7.1 The term plastics includes foams, reinforced panels, laminates, grids, and transparent or translucent sheets.

B-7.2 Where any plastic remains in position in the tunnel during a fire test, no additional support is necessary. Thermoplastic materials and other plastics that do not remain in place should be supported by 1/4-in. (6.3-mm) round metal rods or 3/16 in. (4.8 mm) thick 2 in. (51 mm) wide steel bars, or 2-in. (51-mm) galvanized hexagonal wire mesh supported with metal bars or rods spanning the width of the tunnel."

It is interesting to compare this with the statements in NFPA 262, as follows:

"1-1.3* Although this test uses equipment similar to that used in NFPA 255, Standard Method of Test of Surface Burning Characteristics of Building Materials, and ASTM E 84, Standard Test Method for Surface Burning Characteristics of Building Materials, sufficient changes have been made to the chamber so that a test conducted in the apparatus used for NFPA 255 or ASTM E 84 cannot be considered identical or produce comparable results.

A-1-1.3 The changes made in equipment for this test were deemed necessary in order to obtain proper precision from the test when the equipment is used for small quantities of wire and cable, which produce much smaller quantities of heat release and smoke obscuration."

* NFPA 259: "... NFPA 259 has traditionally been carried out on individual materials, and so the potential heat of a finished product like a cable would be calculated as the um of the contributions of each component, each contribution being the potential heat of the component multiplied by the mass fraction of that component in the cable. To produce such a measurement it would be necessary to disassemble the cable into its different components – insulation, jacket, shielding, rip cord and the like – and measure the potential heat of each component. *An obvious question is whether such a cumbersome procedure is necessary* ..." {Emphasis added, but statement comes verbatim from report}.
* Observations on NFPA 259: "One of the labs (Laboratory 2) had both more experience and more advanced equipment ..."
* Procedure for NFPA 259: "... The procedure followed was NFPA 259, Standard Test Method for Potential Heat of Building Materials, 1998 Edition, with modifications to the following sections: ... *This modification should be viewed provisionally since it so far has only been tested on 4-pair unshielded twisted pair (UTP) plenum cable*." {Emphasis added, but statement comes verbatim from report}

(iv) The oxygen bomb calorimeter test used to assess "limited combustible" classifications is severely flawed. NFPA 259 uses the oxygen bomb calorimeter as part of its testing to assess potential heat. The term "limited combustible" was developed for "building

construction materials", with the intent of applying it to materials of construction of the plenum and not to cables. NFPA 90A defines "limited combustible" as follows:

"Limited-Combustible Material. A building construction material not complying with the definition of noncombustible material that in the form in which it is used, has a potential heat value not exceeding 3500 Btu/lb (8141 kJ/kg) where tested in accordance with NFPA 259, Standard Test Method for Potential Heat of Building Materials, and complies with (a) or (b):

(a) Materials having a structural base of noncombustible material, with a surfacing not exceeding a thickness of 1/8 in. (3.2 mm), that has a flame spread index not greater than 50; (b) Materials, in the form and thickness used, other than as described in (a), having neither a flame spread index greater than 25 nor evidence of continued progressive combustion, and of such composition that surfaces that would be exposed by cutting through the material on any plane would have neither a flame spread index greater than 25 nor evidence of continued progressive combustion. Materials subject to increase in combustibility or flame spread index beyond the limits herein established through the effects of age, moisture, or other atmospheric condition shall be considered combustible."

The oxygen bomb calorimeter is a method for determining the theoretical (or complete or absolute) calorific energy (or heat of combustion), as opposed to the effective (or practical) values. The reason such instruments are used is to ensure that the correct value is chosen. As such they represent the following chemical equations for combustible fuels containing only carbon, hydrogen and oxygen:

$$C + O_2 = CO_2$$

$$4\,H + O_2 = 2\,H_2O$$

For hydrocarbon fuels: $- C\,H_2 - + O_2 = CO_2 + H_2O$

However, when building materials are more complex, because they contain other elements, there is a certain inconsistency in the equation and in the energy calculated.

1. Cl: Thus, for example, when PVC is burnt in an oxygen bomb, depending on the fraction of hydrogen atoms present, there will be different proportions of the following two equations:

$$(C_2\,H_3\,Cl)_n + 2.5\,n\,O_2 = 2\,n\,CO_2 + n\,H_2O + n\,HCl$$

$$(C_2\,H_3\,Cl)_n + 2.75\,n\,O_2 = 2\,n\,CO_2 + 1.5\,n\,H_2O + 0.5\,n\,Cl_2$$

where the two equations differ by 380 kJ/kg.

2. S: Combustion of materials containing sulphur also depends on the final product. Typically the combustion bomb generates sulphuric acid as the final sulphur containing product, while furnace combustion generates sulphur dioxide (with the sulphur less fully oxidized). Therefore, the convention in bomb calorimetry is to determine values of calorific value of fuels (including coal), by referring to the quantitative conversion to sulphur dioxide, and ignoring the conversion to sulphuric acid (or sulphur trioxide) that occurs, by using a conversion factor based on the sulphur content. Interestingly, gypsum (which is calcium sulphate dihydrate), is a building material containing sulphur. The typical fuel containing sulphur is coal. The difference between conversion to sulphur dioxide and sulphuric acid is 9410 kJ/kg.

3. N: Combustion of materials containing nitrogen also has a convention: the heat of convention is normally calculated assuming that all the nitrogen is converted into molecular nitrogen. However, that is not what happens in oxygen bomb calorimetry, where nitrogen oxides and nitric acid are actually formed. Thus, a correction is applied to account for the following equation:

$HNO_3 = 0.5\,H_2O + 0.5\,N_2 + 1.25\,O_2$, with a net heat of reaction of 1017 kJ/kg.

4. F: Combustion of materials containing fluorine is generally represented as ending in the formation of carbon tetrafluoride (CF_4) and of hydrogen fluoride (HF), in varying proportions. The equation is as follows:

$$C_a\,H_b\,O_c\,F_e + (a+b/4-c/2-e/4)\,O_2 + (n+1/2)*e*(1-x) - b/2)\,H_2O = (a-ex/4)\,CO_2 + ex/4\,CF_4 + e(1-x)\,(HF) + e(1-x)\,n\,H_2O$$

where x is the fraction of fluorine atoms converted to CF_4 as opposed to converted to HF. The energy of the conversion of CF_4 to HF is approximately 192 kJ/kg. Moreover, fluorine materials will attack the walls of the bomb calorimeter.

5. Si: Compounds containing silicon are impossible to convert completely to their final oxidation product, which is silica (SiO_2), by conventional means because as burning proceeds, the material becomes covered by a layer of silica which prevents access of oxygen and leads to the formation of a residue. The only way to obtain a reliable result of heat of combustion of materials containing silicon (such as silicones) is by a method which combines the material with an organic fluorine compound (the value of which has been accurately assessed in advance) in rotating bomb containing also water and aqueous HF. This converts all the Si into fluorosilicic acid, and the results can then be calculated back.

6. P: Compounds containing phosphorus are exceedingly difficult to assess by oxygen bomb combustion calorimetry. There are four major problems: (1) various phosphorus acids with different energies of dilution are formed in various concentrations throughout the oxygen bomb, (2) the combustion products contain different types of phosphorus oxyacids, each one of which has a different heat of formation, (3) the burning compound gets covered by phosphorus oxides and acids, which inhibit further combustion and (4) the bomb calorimeter walls are attacked and metal phosphates are formed, so that the recommended wall materials should be corundum or gold, since Pyrex glass, quartz, stainless steel titanium, porcelain and platinum all suffered heavy weight losses. For example, depending on whether a rotating bomb or a static bomb is used, the fraction of pyrophosphoric acid formed varied from 10 to 18% and that of triphosphoric acid from 1 to 3%.

7. Auxiliary combustion material: When an auxiliary material is used for assessing the heat of combustion, a 1% error in the assessment of the heat of combustion of the auxiliary material (such as benzoic acid), which is typically used in the order of 20% energy loading, corresponds to a 5% error in the total energy/heat measured. Thus, at a value of 1500 kJ/kg that would be an error of 75 kJ/kg, and this would be a systematic error for that series of experiments.

8. Moisture content: the moisture content of the building material is critical, because the combustion reaction considered in the oxygen bomb is that to convert to gaseous water. Thus, if a material contains water, the water will have reaction to vaporize the water content. Thus, results must be expressed as a function of the original moisture content for them to be valid. This matters, of course, for materials that absorb moisture when exposed to the atmosphere.

Bibliography on oxygen bomb calorimetry:

* Mansson, Margret, "Determination of Calorific Values of Building Materials - A Guide", SP Nordtest Report Project 871-90, Swedish National Testing and Research Institute, Boras, Sweden, 1991.

* Head, Arthur J, and Good, William D., "Combustion of Liquid/Solid Compounds with Non-Metallic Hetero Atoms", Chapter 9 in "Combustion Calorimetry", "Volume 1, Experimental Chemical thermodynamics", Eds. Stig Sunner & Margret M. Mansson), Pergamon Press, Oxford, UK (for Int. Union Pure & Applied Chemistry, IUPAC), 1979.

* Mansson, Margret and Hubbard, Ward N., "Strategies in the Calculation of Standard-State Energies of Combustion from the Experimentally Determined Quantities", Chapter 5 in "Combustion Calorimetry", "Volume 1, Experimental Chemical thermodynamics", Eds. Stig Sunner & Margret M. Mansson), Pergamon Press, Oxford, UK (for Int. Union Pure & Applied Chemistry, IUPAC), 1979.

* Hu, Andrew T., Sinke, G.C., Mansson, Margret and Ringner, Birgitta, "Test Substances for Bomb Combustion Calorimetry, p-Chlorobenzoic Acid". J. Chem. Thermodynamics, 4, 283-99 (1972).

* Mansson, Margret, "Thermochemistry - Some Recent Lines of Development", Pure & Applied Chemistry, 55(3), 417-26 (1983).

* Mansson, Margret, "A 4.5 cm^3 Bomb Combustion Calorimeter and an Ampoule Technique for 5 to 10 mg Samples with Vapour Pressures Below Approximately 3 kPa (20 Torr)", J. Chem. Thermodynamics, 5, 7232 (1973).

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

PANEL ACTION: Reject.

PANEL STATEMENT: Refer to panel action and statement on Comment 16-98.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21

VOTE ON PANEL ACTION:

AFFIRMATIVE: 20

ABSTENTION: 1

EXPLANATION OF ABSTENTION:
CAUDILL: The Society of the Plastics Industries could not reach a consensus position on this issue.

(Log #1594)

16- 187 - (Table 760-71(i)): Reject
Note: "See Technical Correlating Committee action on Comment 16-98."
SUBMITTER: Wayne G. Carson, Carson Assoc. Inc.
COMMENT ON PROPOSAL NO: 16-152
RECOMMENDATION: Delete reference to FPLP-50 cables in Table 760-71(i).
SUBSTANTIATION: The new cable classification "Limited Combustible Cable" if deleted as recommended by comments to sections 725.71(b) [16-89]; 760-71(e) [16-149]; 770-51(b) [16-169]; 800-51(h) [16-232]; and 820-51(b) [16-302] will not be included in the Code. This type cable designation is not needed and is premature - see related comments for complete substantiation.
PANEL ACTION: Reject.
PANEL STATEMENT: Refer to panel action and statement on Comment 16-98.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
ABSTENTION: 1
EXPLANATION OF ABSTENTION:
CAUDILL: The Society of the Plastics Industries could not reach a consensus position on this issue.

ARTICLE 770 — OPTICAL FIBER CABLES AND RACEWAYS

(Log #300)

16- 188 - (770-2 Abandoned Cable (New)): Accept in Principle
SUBMITTER: Gerald Lee Dorna, Belden Wire & Cable Co.
COMMENT ON PROPOSAL NO: 16-154
RECOMMENDATION: The definition of "Abandoned Cable" should be the same here as what we accepted in Proposal 16-273. It should be:
"Cable that is neither terminated at ~~both ends, at a connector or other~~ equipment, not identified for future use with a tag."
This is the same wording we accepted for Proposal 16-273.
SUBSTANTIATION: The reason we took out the reference to connectors in Proposal 16-273 is because CATV cable usually has connectors attached. It was our concern that CATV cables would have connectors attached and then would not fall under the definition the panel had accepted in principal. If we make the definition the same as I have suggested above then it will make it irrelevant on whether the cable has connectors or not. I can foresee someone using the fact that the cable has a connector on it, therefore it does not fall under "abandoned cable" and does not need to be removed.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Refer to panel action and statement on Comment 16-190.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21

(Log #458)

16- 189 - (770-2, Abandoned Cable): Accept in Principle in Part
SUBMITTER: Technical Correlating Committee on Signaling Systems for the Protection of Life and Property
COMMENT ON PROPOSAL NO: 16-154
RECOMMENDATION: Revise the proposed definition of abandoned cable to read as follows:
"Cable that is neither terminated at equipment, nor identified for future use with a dated tag."
SUBSTANTIATION: The definition proposed for 820-2 by the Panel Action of Proposal 16-273 is clear and concise and should be used consistently in all Articles. This proposed definition has been modified in the above recommendation to add the word "dated" before the word "tag." The tag should be dated so the authority having jurisdiction can determine the date on which the cable was designated for future use. This will establish a means to allow the decision of abandonment to be re-evaluated periodically if the authority having jurisdiction so desires.
PANEL ACTION: Accept in Principle in Part.
PANEL STATEMENT: Refer to panel action and statement on Comment 16-190. Panel statement on Comment 16-246 includes the explanation for the rejected part.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21

(Log #1845)

16- 190 - (770-2): Accept in Principle
SUBMITTER: Robert W. Jensen, dbi-Telecommunications Infrastructure Design
COMMENT ON PROPOSAL NO: 16-154
RECOMMENDATION: New wording:
Abandoned Cable. Installed cable that is neither terminated at both ends at a connector or other equipment, nor identified for future use with a tag.
SUBSTANTIATION: BICSI added the word installed to show that the cable needs to be installed and not in the installers truck. We retained "terminated at both ends" because optical fiber cable is typically terminated at both ends when it is in use (i.e., when not abandoned).
PANEL ACTION: Accept in Principle.
Revise the recommendation to read as follows:
"Abandoned Optical Fiber Cable. Installed optical fiber cable that is not terminated at equipment other than a connector and not identified for future use with a tag."
PANEL STATEMENT: The revised text clearly expresses the intended definition, correlates with similar definitions in other articles and complies with the Manual of Style.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21

(Log #1289)

16- 191 - (770-2-Abandoned Cable (New)): Accept in Principle
SUBMITTER: Allen C. Weidman, The Society of the Plastics Industry, Inc.
COMMENT ON PROPOSAL NO: 16-154
RECOMMENDATION: We support the action of the panel.
SUBSTANTIATION: None.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Refer to panel action and statement on Comment 16-190.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
ABSTENTION: 1
EXPLANATION OF ABSTENTION:
CAUDILL: The Society of the Plastics Industries could not reach a consensus position on this issue.

(Log #1574)

16- 192 - (770-2-Abandoned Cable): Accept in Principle
SUBMITTER: Wayne G. Carson, Carson Assoc. Inc.
COMMENT ON PROPOSAL NO: 16-154
RECOMMENDATION: Revise text to read as follows:
Abandoned Cable: Cable that is <u>not</u> ~~neither~~ terminated at both ends, ~~at a connector or other~~ <u>not connected to</u> equipment, <u>or not</u> ~~nor~~ identified for future use with a tag.
SUBSTANTIATION: The term "terminated at a connector" may result in cables being left in place as many cables come with connectors or the installer could add crimp connectors and leave the cables in place. The present language can be easily misunderstood: does the cable have to be terminated and tagged, or is it a choice?
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Refer to panel action and statement on Comment 16-190.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21

(Log #1750)

16- 193 - (770-2-Abandoned Cable): Accept in Principle
SUBMITTER: Francis W. Peri, Communications Design Corporation
COMMENT ON PROPOSAL NO: 16-154
RECOMMENDATION: New wording:
Abandoned Cable. Installed cable that is neither terminated at both ends at a connector or other equipment, nor identified for future use with a tag.
SUBSTANTIATION: The word "installed" shows that the cable needs to be installed and not in the installer's truck. The words "terminated at both ends" are accurate and descriptive since optical fiber cable is typically terminated at both ends when it is in use (i.e., when not abandoned).
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Refer to panel action and statement on Comment 16-190.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21

(Log #268)

16- 194 - (770-3(a)): Accept in Principle
SUBMITTER: Stanley Kaufman, Lucent Technologies
COMMENT ON PROPOSAL NO: 16-176
RECOMMENDATION: Delete "not intended for future use."
SUBSTANTIATION: It is redundant to state "Abandoned cables not intended for future use...", since abandoned cables are defined as not being intended for future use.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Refer to panel action and statement on Comment 16-195.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21

(Log #305)

16- 195 - (770-3(a)): Accept in Principle
SUBMITTER: Stanley Kaufman, Lucent Technologies
COMMENT ON PROPOSAL NO: 16-176
RECOMMENDATION: Revise 770-3 to read:
770-3. Locations and Other Articles. Circuits and equipment shall comply with (a) and (b). Only those sections of Article 300 referenced in this article shall apply to optical fiber cables and raceways.
(a) Spread of Fire or Products of Combustion. ~~See~~ The requirements of Section 300-21 for electrical installations shall also apply to installations of optical fiber cables and raceways. Abandoned cables shall not be permitted to remain.
(b) Ducts, Plenums, and Other Air-Handling Spaces. The requirements of Section 300-22 for electric wiring, shall also apply to installations of optical fiber cables and raceways where they are installed in ducts or plenums or other space used for environmental air.
Exception to (b): As permitted in Section 770-53(a).
SUBSTANTIATION: Sections 300-21 and 300-22 apply to electrical installations. The revised wording clarifies that the same principles should apply to optical fiber cable and raceways. Also, it is redundant to state "Abandoned cables not intended for future use...", since abandoned cables are defined as not being intended for future use.
PANEL ACTION: Accept in Principle.
In the submitter's recommendation change the second sentence of 770-3(a) to read:
"The accessible portion of abandoned optical fiber cables shall not be permitted to remain."
The balance of the recommendation remains unchanged.
PANEL STATEMENT: The text was revised to correlate with similar requirements in other sections (e.g. see Comment 16-83).
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21

(Log #1581)

16- 196 - (770-3(a)): Accept in Principle in Part
SUBMITTER: Wayne G. Carson, Carson Assoc. Inc.
COMMENT ON PROPOSAL NO: 16-176
RECOMMENDATION: Revise text to read as follows:
Spread of Fire or Products of Combustion. Installations in hollow spaces, vertical shafts, and ventilation or air-handling ducts shall be made so that the possible spread of fire or products of combustion will not be substantially increased. Openings around penetrations through fire resistance-rated walls, partitions, floors, or ceilings shall be firestopped using approved methods to maintain the fire resistance rating.
Abandoned cables not intended for future use shall not be permitted to remain.
FPN: Directories of electrical construction materials published by qualified testing laboratories contain many listing installation restrictions necessary to maintain the fire-resistive rating of assemblies where penetrations or openings are made.
SUBSTANTIATION: This definition under the section entitled "Spread of Fire or Products of Combustion" is not consistent throughout the Code. This comment uses language from ROP 16-250 [850-52(B)] to provide a consistent requirement throughout the code.
The same comment is being made for the following sections:
640-3A (ROP 16-1a)
645-5D6 (ROP 12-106)
725-3B (ROP 16-80)
760-3A (ROP 16-144)
820-3A (ROP 16-313)
820-52B (ROP 16-311)
830-3A (ROP 16-364)
830-58B (ROP 16-368)
PANEL ACTION: Accept in Principle in Part.
PANEL STATEMENT: The panel accepts in principle the statement regarding abandoned cables. Refer to panel action on Comment 16-195. This satisfies the submitter's concerns.
The current reference to 300-21 satisfies the balance of the comment, which is rejected. That portion of the comment repeats the text of 300-21.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21

(Log #1417)

16- 197 - (770-3(b)): Reject
SUBMITTER: Kari Barrett, American Chemistry Council
COMMENT ON PROPOSAL NO: 16-176
RECOMMENDATION: Delete the following text:
~~Abandoned cables not intended for future use shall not be permitted to remain.~~
SUBSTANTIATION: Removal of abandoned cables in these areas is a "housekeeping" issue. Whether or not to remove them should be the owner's decision and not be mandated by the NEC.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel reaffirms that removal of abandoned cables addresses a significant fire safety issue. The term "housekeeping" is not applicable to abandoned cables. Fire safety and cable installation are within the scope of the NEC.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21

(Log #2085)

16- 198 - (770-5(b)(2) (New)): Accept in Principle in Part
SUBMITTER: Marcelo M. Hirschler, GBH International
COMMENT ON PROPOSAL NO: 16-159
RECOMMENDATION: Revise text as follows:
770-5. Access to Electrical Equipment Behind Panels Designed to Allow Access
Access to equipment shall not be denied by an accumulation of wires and cables that prevents removal of panels. Cables shall be installed in such a manner that the cable will not be damaged by normal building use. Access to electrical equipment behind ceilings designed to allow access shall comply with (a) or (b).
a. New building construction (e.g. renovation, remodeling, new spaces). Installation of cables shall comply with Section 300.11.
b. Buildings with existing cable systems. Where practicable, installation of cables shall comply with Section 300.11. Where impracticable to comply with Section 300.11, in those areas having

ceilings with access points or access panels, it shall be permissible to fish a maximum of three cables less than 13 mm (0.5 in) in diameter, between access points in the ceiling. ~~cables less than 13 mm (0.5 in) in diameter shall be permitted to be installed unsupported by the building structure in accordance with 1 or 2.~~

~~1. In areas having ceilings with access points or access panels, it shall be permissible to fish a maximum of three cables between access points in the ceiling.~~

~~2. In areas having suspended lay-in ceilings, it shall be permissible to install a maximum of three unsupported cables on top of any one ceiling tile. The cables shall be run parallel to the ceiling grid.~~

SUBSTANTIATION: The permission granted by the panel to install cables on suspended ceiling tiles should be rescinded. Neither cables nor any other item should be installed on top of a suspended ceiling tile. The support systems of suspended ceilings are not designed to resist any significant amount of weight without being deflected or broken.

This issue has been raised on Proposal 16-192 (log 1665) in negative comments by two panel members, Mr Egesdal and Mr Speer, who both correctly point out that suspended ceiling tiles are not intended to support the weight of electrical cables. Mr. Sandy Egesdal repeats his negative comment on this proposal.

The point made by the Technical Correlating Committee on proposal 16-38 that such use would constitute an exposed use of cables is an additional consideration to rejecting this part of the proposal.

PANEL ACTION: Accept in Principle in Part.

The panel accepts the principle of permitting a limited number of cables to be installed in a fixed or hard ceiling. The panel rejects the balance of the submitter's recommendation including the limiting of the installation of cables in a suspended lay-in ceiling.

PANEL STATEMENT: The recommendation of Comment 16-199a provides a reasonable, safe, and practical solution to placing a limited number of unsupported optical fiber cables in existing construction.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21

VOTE ON PANEL ACTION:

AFFIRMATIVE: 20

NEGATIVE: 1

EXPLANATION OF NEGATIVE:

SPEER: See my explanation of negative vote on Comment 16-27a.

(Log #1638)

16- 199 - (770-6): Reject

SUBMITTER: Andy Scott, National Cable Television Association

COMMENT ON PROPOSAL NO: 16-159a

RECOMMENDATION: Reject Proposal 16-159a.

SUBSTANTIATION: NCTA, on behalf of the cable television industry, strongly urges Panel 16 to reject these proposals. While attachment every 5 ft may be a practice in many cases, it also may be overly restrictive and unnecessary in others. The requirement to support cables every 5 ft is outside the scope of the code. The NCTA urges Panel 16 not to allow the NEC to serve as an Installation Manual.

PANEL ACTION: Reject.

PANEL STATEMENT: The panel action on Comment 16-212 addresses the concerns in the submitter's substantiation.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21

VOTE ON PANEL ACTION:

AFFIRMATIVE: 21

(Log #CC1604)

16- 199a - (770-7): Accept

Note: The Technical Correlating Committee directs that the references to Articles 640 and 650 be deleted because the panel did not accept similar requirements in those articles. The Technical Correlating Committee also directs that the FPN which contains a mandatory requirement be deleted to comply with the NEC Style Manual.

SUBMITTER: CMP 16

COMMENT ON PROPOSAL NO: 16-159

RECOMMENDATION: Retain the existing 1999 code text for Section 770-7 (unmodified).

Add new Section 770.9 to read as follows:

770.9 Installation of Cables.

Optical fiber cables shall be installed in compliance with A or B.

A. New Ceiling Construction. The installation of cables in new ceiling construction shall comply with Section 300-11.

B. Existing Ceilings.

1. Fire-Rated Ceilings. The installation of cables in the cavity of an existing fire-rated ceiling assembly shall comply with Section 300-11.

2. Non-Fire-Rated Ceilings. For installations in the cavity of an existing non-fire-rated ceiling assembly, cables less than 6 mm (0.25 in) in diameter shall be permitted to be installed unsupported from the building structure in accordance with the following:

a. Fixed or Hard Ceilings. In areas having fixed or hard ceilings with access points or access panels, a combined total of three cables from Articles 640, 650, 725, 760, 770, 800, 820 and 830, shall be permitted to be placed between access points or access panels in the ceiling. Additional cables shall be installed in accordance with 300.11.

b. Suspended Lay-In Ceilings. In areas having suspended lay-in ceilings, in any 3 m by 3m (10 ft. x 10 ft) ceiling area, a combined total of three cables from Articles 640, 650, 725, 760, 770, 800, 820 and 830, shall be permitted to be installed directly on the ceiling grid. Additional cables shall be installed in accordance with 300.11.

FPN. Cables of all types are included in the total limit of three cables, not three cables from each article.

SUBSTANTIATION: Proposal 16-159 was accepted in principle to permit the installation of unsupported cables under limited conditions. Proposal 16-159 text, however, was too broad and unclear. The text of this comment clarifies the original intent. The new text includes requirements to comply with Section 300.11. Permitted installation conditions will not compromise the integrity of fire-rated ceilings. For non-fire-rated ceilings, the permitted relief from Section 300.11 is limited to very specific conditions. Section 770-7 is not being modified because the accessibility requirements should remain.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21

VOTE ON PANEL ACTION:

AFFIRMATIVE: 20

NEGATIVE: 1

EXPLANATION OF NEGATIVE:

SPEER: See my explanation of negative vote on Comment 16-27a.

(Log #202)

16- 200 - (770-7): Accept

SUBMITTER: Technical Correlating Committee National Electrical Code

COMMENT ON PROPOSAL NO: 16-159

RECOMMENDATION: See Technical Correlating Committee action on Proposal 16-38. It was the action of the Technical Correlating Committee that further consideration be given to the comments expressed in the voting of a similar proposal 16-192. The Technical Correlating Committee directs that the Action on this Proposal be revised to comply with the NEC Style Manual 3.2.1 relative to use of the unenforceable terms "practicable" and "impracticable". This action will be considered by the Panel as a Public Comment. It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 3 for Comment.

SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.

PANEL ACTION: Accept.

PANEL STATEMENT: Refer to the recommendation and substantiation on Comment 16-199a.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21

VOTE ON PANEL ACTION:

AFFIRMATIVE: 21

(Log #704)

16- 201 - (770-7): Reject

SUBMITTER: Glenn W. Zieseniss, Crown Point, IN

COMMENT ON PROPOSAL NO: 16-159

RECOMMENDATION: Change the "Accept in Principle" to "Reject".

SUBSTANTIATION: I agree with Mr. Egesdal's and Mr. Speer's negative vote and comment on Proposal 16-192. This proposal is giving a "blanket okay for any type of ceiling tile to support the possible added weight of 3 cables of less than 1/2 in. in diameter on each ceiling tile. The proposal does not affirm that the ceiling

tile industry was contacted of adding weight to lay on their product. This product is not part of the building structure, and is not designed to be suitable for supporting cables. I have seen ceiling tiles which look as if made of fiber glass insulation which has a finished surface on the exposed side of the ceiling. It is my belief that this ceiling tile would not accept additional weight upon it. I have contacted three ceiling tile companies or organizations on this proposal. They all suggested that their ceiling tiles are not to support additional weight. I have provided copies of my e-mail contacts.

NOTE: Supporting Material is available at NFPA Headquarters.

PANEL ACTION: Reject.

PANEL STATEMENT: The recommendation of Comment 16-199a provides a reasonable, safe, and practical solution to placing a limited number of unsupported optical fiber cables in existing construction. The restrictions contained in Comment 16-199a limit both the number and size of wires and cables permitted on each ceiling panel, thereby controlling weight and accumulation so that cables can be easily moved aside to permit access. The submitter's concern about weight is addressed by decreasing the size of the cable to 1/4 inch and limiting the number of cables to three per each 10 ft x 10 ft area.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21

VOTE ON PANEL ACTION:

AFFIRMATIVE: 20

NEGATIVE: 1

EXPLANATION OF NEGATIVE:

SPEER: See my explanation of negative vote on Comment 16-27a.

(Log #860)

16- 202 - (770-7): Accept in Principle in Part

SUBMITTER: Larry F. Miller, National Electrical Manufacturers Association (NEMA)

COMMENT ON PROPOSAL NO: 16-159

RECOMMENDATION: The panel should continue to Accept the proposal in Principle but revise the Panel Action text to read as follows:

770-7. Access to Electrical Equipment Behind Panels Designed to Allow Access.

Access to electrical equipment shall not be denied by an accumulation of wires and cables that prevents removal of panels. Cables shall be installed in such a manner that the cable will not be damaged by normal building use or maintenance. Access to electrical equipment behind ceilings designed to allow access shall comply with (a) or (b).

a. New building construction (e.g., renovation, remodeling, new spaces). Installation of cables shall comply with Section 300.11.

b1. Installation of cables in suspended lay-in type ceiling spaces shall comply with 300.11..

2. Installation of cables in other than suspended lay-in type ceiling spaces shall comply with 300.11 where the space is accessible.

3. Where the ceiling is not the lay-in type, and the space is not accessible, three cables less than 13 mm (0.5 in.) shall be permitted to be installed unsupported by the building structure between access points or access panels.

~~Buildings with existing cabling systems.~~

~~Where practicable, installation of cables shall comply with Section 300.11. Where impracticable to comply with Section 300.11, cables less than 13 mm (0.5 in) in diameter shall be permitted to be installed unsupported by the building structure in accordance with 1 or 2.~~

~~1. In areas having ceilings with access points or access panels, it shall be permissible to fish a maximum of three cables between access points in the ceiling.~~

~~2. In areas having suspended lay-in ceilings, it shall be permissible to install a maximum three supported cables on top of any one ceiling tile. The cables shall be run parallel to the ceiling grid."~~

SUBSTANTIATION: We agree with Mr. Egedsal's and Mr. Speer's negative comments that suspended ceilings are not intended to support electrical wires or cables.

Section 300-11(a)(1) (wiring located within the cavity of a fire-rated floor-ceiling or roof-ceiling) allows an exception for wiring that has been tested as part of the fire-rated assembly. This proposal could compromise the fire-rating of the ceiling by overriding that requirement. The words "or maintenance" have been added because so much of the damage occurs in ceiling spaces as various trades perform maintenance.

The submitter states that he has submitted companion proposals for Articles 725 760, 770, 820 and 830. If each of these articles will allow three cables per ceiling tile, this could result in a total of 18 cables per ceiling tile, which appears to be approaching the "excessive accumulation" the submitter agrees could be a hazard. Limiting the size and quantity of cable permitted to be fished in non-lay-in ceiling spaces will help control the weight of cable (combined with that permitted in the other articles referenced above) on these ceilings.

PANEL ACTION: Accept in Principle in Part.

The panel rejects the recommended addition of the word "maintenance." The balance of the recommendation is accepted in principle.

PANEL STATEMENT: The term "normal building use" includes "maintenance." Refer to the recommendation and substantiation on Comment 16-199a.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21

VOTE ON PANEL ACTION:

AFFIRMATIVE: 20

NEGATIVE: 1

EXPLANATION OF NEGATIVE:

SPEER: See my explanation of negative vote on Comment 16-27a.

(Log #967)

16- 203 - (770-7): Accept in Part

SUBMITTER: Palmer Hickman, Royersford, PA

COMMENT ON PROPOSAL NO: 16-159

RECOMMENDATION: Reject Proposal 16-159 and retain present 770-7 as it appears in the 1999 NEC.

SUBSTANTIATION: I would strongly urge Code-Making Panel 16 to reconsider their action on this proposal. The proposed 770.7(B)(2) would now permit three cables to be installed on the tiles of a suspended ceiling, without providing any technical substantiation for this allowance.

I offer the following reasons against accepting this proposal:

1) Chapters 1-4 apply except as amended by Chapters 5, 6 and 7. Sections 300-11(a)(1) and (2) state wiring shall not be supported by the ceiling assembly.

2) Section 770-7 deals with access to electrical equipment, not support of wiring.

3) Code-Making Panel 3 reaffirmed their prohibition of ceiling assemblies being used beyond the manufacturers design parameters in the Panel Statement to Comments 3-53 and 3-57 of the 1998 ROC, and Proposal 3-68 of the 2001 ROP. In the latter reference, Code-Making Panel 3 states: "The panel re-affirms its position that an independent means of support shall be provided for all wiring, not just branch circuit wiring...".

I understand that his proposed allowance of ceiling support only applies to buildings with existing cabling systems where it is "impracticable" to comply with 300-11. Impracticability does not provide technical substantiation to allow a ceiling assembly that has not been evaluated to support the potential additional load of three cables on each and every ceiling tile. Essentially, the ceiling assembly is expected to carry the additional load of potentially hundreds of cables installed directly on it. As an example, a 100'x100' room with a suspended ceiling using 2'x2' tiles, would be expected to carry the full weight of 150 cables.

The substantiation provided by Mr. Brunssen for his proposal does not support the proposed change as amended by Code-Making Panel 16. He claims that "a limited amount of cabling laid directly on a suspended ceiling is permitted..." without stating where this permission is given, and by whom. The entire substantiation of the submitter seems contrary to the action of the panel. I am not sure he would recognize the end result as the proposal he made. Mr. Brunssen begins his substantiation by stating "Section 770-7 may be misinterpreted to mean that cables may not be placed directly on suspended ceilings." He notes that the 1999 NEC Handbook "Figures 725-2 and 725-3 lead the reader to conclude that cables are permitted to rest directly on the suspended ceiling." The submitter also stated Code-Making Panel 16 responded to a proposal to Article 725 (1992 TCD Comment 16-18) that the proposed requirement "...would still allow some cabling of a limited quantity above the ceiling tile, but not to an excessive amount." Note the words "above the ceiling tile", not on the ceiling tile. I feel these examples are not misinterpretations, but rather correct interpretations, and substantiation to reject his proposal.

In conclusion, I respectfully disagree with the Panel Action on this Proposal. I find no technical substantiation to warrant such a dramatic change. Mr. Brunssen presented a well-researched proposal addressing access, not support. The substantiation of the

submitter does not support his change, nor does the Panel Statement.
PANEL ACTION: Accept in Part.
The panel accepts the portion of the comment to retain Section 770.7, and rejects the portion of the comment to reject Proposal 16-159.
PANEL STATEMENT: Refer to the recommendation and substantiation on Comment 16-199a. Also refer to the panel action and statement on Comment 16-201.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
SPEER: See my explanation of negative vote on Comment 16-27a.

(Log #1150)

16- 204 - (770-7): Accept in Principle
SUBMITTER: James E. Brunssen, Telcordia Technologies, Inc.
COMMENT ON PROPOSAL NO: 16-159
RECOMMENDATION: Revise as follows:
770-7. Access to Electrical Equipment Behind Panels Designed to Allow Access. Access to electrical equipment shall not be denied by an accumulation of wires and cables that prevents removal of panels. Cables shall be installed in such a manner that the cable will not be damaged by normal building use. Access to electrical equipment behind ceilings designed to allow access shall comply with (a) or (b).
a. New building construction (e.g., renovation, remodeling, new spaces). Installation of cables shall comply with Section 300.11.
b. Buildings with existing cabling systems. Where practicable, installation of cables shall comply with Section 300-11. Where impracticable to comply with Section 300-11, cables less than 13 mm (0.5 in.) in diameter shall be permitted to be installed unsupported by the building structure in accordance with 1 or 2.
1. In areas having ceilings with access points or access panels, it shall be permissible to fish a maximum of three cables between access points in the ceiling.
2. In areas having suspended lay-in ceilings, it shall be permissible to install a maximum of three unsupported cables on top of ~~any one~~ each ceiling tile, i.e., up to three wires and cables are permitted to lay on a ceiling tile. The cables shall be run parallel to the ceiling grid.
SUBSTANTIATION: Proposed Section 770-7(b)(2), as presently written in Proposal 16-159, panel action, is confusing and could be interpreted as permitting a total of only three unsupported wires and cables above a suspended ceiling. The intent of the panel was that up to a maximum of three unsupported wires and cables may be routed across each and every ceiling tile. The revision proposed in this comment clarifies and accomplishes the intent of the panel. This is a companion comment and is intended to correlate with comments on Proposals 16-38, 16-112, 16-192, 16-276, and 16-332.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Refer to the recommendation and substantiation on Comment 16-199a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
SPEER: See my explanation of negative vote on Comment 16-27a.

(Log #1151)

16- 205 - (770-7): Accept in Principle
SUBMITTER: James E. Brunssen, Telcordia Technologies, Inc.
COMMENT ON PROPOSAL NO: 16-159
RECOMMENDATION: Continue to accept in principle.
SUBSTANTIATION: Panel 16 should continue to accept in principle as it provides a reasonable and safe solution to placing a limited number of signaling and communications wires and cables in existing construction. The restrictions contained in the proposed change limit both the number and size of wires and cables permitted on each suspended ceiling panel. In this manner additional weight, as well as an accumulation of wires and cables that would otherwise restrict access above suspended ceiling panels, is controlled and limited. The limited number of cables permitted can easily be moved aside to permit access. Some concern has also been expressed that cables placed directly on the ceiling panels would degrade the fire rating of the ceiling. The suspended ceiling, part of a membrane that is intended to retard fire from spreading into the ceiling cavity, would be unaffected in its ability to retard the spread of fire by a limited number of wires and cables resting on top of the panels. This is a companion comment and is intended to correlate with comments on Proposals 16-38, 16-112, 16-192, 16-276, and 16-332.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Refer to the substantiation on Comment 16-199a. This action meets the intent of the submitter.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
SPEER: See my explanation of negative vote on Comment 16-27a.

(Log #1165)

16- 206 - (770-7): Accept in Principle
SUBMITTER: James E. Brunssen, Telcordia Technologies, Inc.
COMMENT ON PROPOSAL NO: 16-159
RECOMMENDATION: Revise as follows:
770-7. Access to Electrical Equipment Behind Panels Designed to Allow Access. Access to electrical equipment shall not be denied by an accumulation of wires and cables that prevents removal of panels. Cables shall be installed in such a manner that the cable will not be damaged by normal building use. Access to electrical equipment behind ceilings designed to allow access shall comply with (a) or (b).
a. New building construction (e.g., renovation, remodeling, new spaces). Installation of cables shall comply with Section 300.11.
b. Buildings with existing cabling systems. ~~Where practicable, installation of cables shall comply with Section 300-11. Where impracticable to comply with Section 300-11, c~~Cables less than 13 mm (0.5 in.) in diameter shall be permitted to be installed unsupported by the building structure in accordance with 1 or 2.
1. In areas having ceilings with access points or access panels, it shall be permissible to fish a maximum of three cables between access points in the ceiling.
2. In areas having suspended lay-in ceilings, it shall be permissible to install a maximum of three unsupported cables on top of any one ceiling tile. The cables shall be run parallel to the ceiling grid.
Where the maximum number of cables permitted in 1 or 2 will be exceeded, installation of cables shall comply with Section 300.11.
SUBSTANTIATION: The Technical Correlating Committee has directed that Proposal 16-159 be revised to comply with the NEC Style Manual 3.2.1 relative to the use of unenforceable terms. The proposed revision contained in this comment removes the unenforceable terms "practicable" and "impracticable"; the remaining text is in agreement with the NEC Style Manual 3.1.2. using the phrase "shall be permitted" to indicate allowed optional or alternate methods. The added text (final sentence) provides direction on how to proceed if the limits of 770-7(b)(1) or (2) will be exceeded. This is a companion comment and is intended to correlate with comments on Proposals 16-38, 16-112, 16-192, 16-276 and 16-332.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Refer to the recommendation and substantiation on Comment 16-199a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
SPEER: See my explanation of negative vote on Comment 16-27a.

(Log #1751)

16- 207 - (770-7): Accept in Principle
SUBMITTER: Francis W. Peri, Communications Design Corporation
COMMENT ON PROPOSAL NO: 16-159
RECOMMENDATION: Association of Cabling Professionals (ACP) recommends that Code Panel 16 continue to accept this proposal.
SUBSTANTIATION: ACP supports the introduction of complying with Section 300-11. It represents a major improvement in providing safe cabling pathways.

PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Refer to the substantiation on Comment 16-199a. This action meets the intent of the submitter.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
SPEER: See my explanation of negative vote on Comment 16-27a.

(Log #1846)

16- 208 - (770-7): Accept in Principle
SUBMITTER: Robert W. Jensen, dbi-Telecommunications Infrastructure Design
COMMENT ON PROPOSAL NO: 16-159
RECOMMENDATION: BICSI recommends that Code Panel 16 continue to accept this proposal.
SUBSTANTIATION: BICSI supports the introduction of complying with Section 300-11 and recognizes that it represents a significant improvement in providing safe cabling pathways.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Refer to the substantiation on Comment 16-199a. This action meets the intent of the submitter.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
SPEER: See my explanation of negative vote on Comment 16-27a.

(Log #742)

16- 209 - (770-7(b)): Accept in Principle in Part
SUBMITTER: Richard P. Owen, City of St. Paul, Electrical Inspection
COMMENT ON PROPOSAL NO: 16-159
RECOMMENDATION: Replace (b) of the proposal with the following text:

(b) Buildings not Covered Under (a) Above. In areas having ceilings with access points or panels and having 900 mm (3 ft) or less vertical clearance above the ceiling, it shall be permissible to fish a maximum of 3 cables, each less than 13 mm (0.5 in.) in diameter, between access points in the ceiling.

SUBSTANTIATION: The Technical Correlating Committee directed Panel 3 Chair Raymond Weber to form a Task Group to review these proposals and to submit the results as comments to Panel 16. Task Group 3-16, consisting of Chair Weber, members Steven Speer; Lee Hewitt; Richard Owen and Ron Maassen held a conference call on October 3, 2000 and developed the above language as a comment. The Task Group was concerned with allowing unsupported cabling above suspended ceilings, since companion proposals for Articles 725, 760, 770, 800, 820 and 830 would also allow this limited cabling without support. The possible accumulation of cable allowed by all these articles would be excessive and would both limit access to a ceiling and conflict with Section 300.11. Rewording of (b) also eliminated the unenforceable terms "practicable" and "impracticable" as directed by the Technical Correlating Committee.
PANEL ACTION: Accept in Principle in Part.
The panel rejects the specific limitations in the comment but accepts the principle of permitting a limited number of cables.
PANEL STATEMENT: The recommendation of Comment 16-199a provides a reasonable, safe, and practical solution to placing a limited number of unsupported optical fiber cables in existing construction.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
SPEER: See my explanation of negative vote on Comment 16-27a.

(Log #1256)

16- 210 - (770-7(b)(2)): Reject
SUBMITTER: J. Paul Spinn, USG Research & Technology Center
COMMENT ON PROPOSAL NO: 16-159
RECOMMENDATION: Delete the following text:

In areas having suspended lay in ceiling, it shall be permissible to install a maximum of three unsupported cables on top of any one ceiling tile. The cables shall be run parallel to the ceiling grid.

SUBSTANTIATION: By allowing a maximum of three unsupported cables on top of any one (or more) ceiling tiles, the fire-rating of the assembly and the Class A surface burning characteristic requirement, which includes flame spread and smoke development, could be jeopardized. By decreasing the fire-rating of the plenum assembly and the surface burning characteristic of the ceiling tile, the life safety of the occupants can be negatively affected. By rejecting this proposal, these problems can be eliminated.

To substantiate the comment made for the proposal, four key points are provided:

[1] For a fire rated floor/ceiling or roof/ceiling assembly, placement of unsupported cables on top of any one ceiling tile or a row of ceiling tiles could invalidate the fire-rating for a particular assembly. The rationale for this argument are:
(a) The weight of the cables could cause premature tile fallout leading to an early failure of the assembly, which is tested in accordance with NFPA 251 or ASTM E 119.
(b) The increased heat of combustion associated with the cable jackets, which commonly use plastics, will add to the total fire load of an assembly. As the total fire load increases for an assembly, the fire endurance of the assembly will decrease, which could jeopardize an assembly's fire-rating.

[2] For a Class A ceiling, placement of unsupported cables on the ceiling can effect flame spread and smoke development performance and jeopardize the required Class A rating for the ceiling tiles. The rationale for this argument are:
(a) The flame spread will increase due to the increased total heat load, which is caused by the plastic on the cable jacket.
(b) The smoke development will increase due to the cable jackets, which are usually plastic such as PVC or CPVC.

[3] The placement of unsupported cables on top of any one or more ceiling tiles presents potential life safety issues for occupants due to the decreased fire-rating of the floor/ceiling or roof/ceiling or an increase in the ceiling surface burning characteristics.

[4] Placement of unsupported cables on top of any one ceiling tile or a row of ceiling tiles would increase ceiling tile sag due to increased weight of the cables on the ceiling tiles, and would impair the accessibility of the ceiling plenum.

PANEL ACTION: Reject.
PANEL STATEMENT: The recommendation of Comment 16-199a provides a reasonable, safe, and practical solution to placing a limited number of unsupported optical fiber cables in existing construction. The restrictions contained in Comment 16-199a limit both the number and size of cables permitted on each ceiling panel, thereby controlling weight and accumulation so that cables can be easily moved aside to permit access. The submitter's concern about weight is addressed by decreasing the size of the cable to 1/4 inch and limiting the number of cables to three per each 10 ft x 10 ft area. The revised text precludes the installation of cables in all fire-rated ceiling assemblies.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
SPEER: See my explanation of negative vote on Comment 16-27a.

(Log #1157)

16- 211 - (770-8): Reject
SUBMITTER: James E. Brunssen, Telcordia Technologies, Inc.
COMMENT ON PROPOSAL NO: 16-159a
RECOMMENDATION: Delete 770-8 and incorporate the information in 770-7 as follows:

770-7. ~~Access to Electrical Equipment Behind Panels Designed to Allow Access.~~ Mechanical Execution of Work. Optical fiber cables shall be installed in a neat and workmanlike manner. Access to electrical equipment shall not be denied by an accumulation of ~~wires and~~ cables that prevents removal of panels. Cables shall be installed in such a manner that the cable will not be damaged by normal building use. ~~Access to electrical equipment behind ceilings designed to allow access~~Cables installed exposed shall comply with (a) or (b).

a. New building construction (e.g., renovation, remodeling, new spaces). Installation of cables shall comply with Section 300.11. Cables shall be supported by structural components of the building. Such cables shall be attached to structural components at intervals not exceeding 1.52 m (5 ft) and within 305 mm (12 in.) from every cabinet, box or fitting by straps, staples, hangers or similar fittings designed and installed so as not to damage the cable. The installation shall also conform with Section 300-4(d).

b. Buildings with existing cabling systems. Where practicable, installation of cables shall comply with ~~Section 300-11~~ 760-5(a). Where impracticable to comply with ~~Section 300-11~~ 770-7(a)., cables less than 13 mm (0.5 in.) in diameter shall be permitted to be installed unsupported by the building structure in accordance with 1 or 2.

1. In areas having ceilings with access points or access panels, it shall be permissible to fish a maximum of three cables between access points in the ceiling.

2. In areas having suspended lay-in ceilings, it shall be permissible to install a maximum of three unsupported cables on top of any one ceiling tile. The cables shall be run parallel to the ceiling grid.

Continue to delete the fine print note as proposed in Proposal 16-159a.

SUBSTANTIATION: This is a companion comment and is intended to correlate with similar comments on Proposals 16-39, 16-115, 16-192a, 16-276a, and 16-333a. Sections 770-7 and 770-8 actually address the same issue, the mechanical execution of work. Accessibility behind panels designed to allow access is really an "execution of work" issue. Additionally, the Technical Correlating Committee has identified a potential conflict between the panel action on Proposals 16-38 and 16-39, that would also result here in 770. This comment editorially combines 770-7 and 770-8 into a single Section 770-5 requiring attachment to the building structure of exposed cables and conductors and, where impracticable to do so, permits a limited number of cables of specified maximum size to be placed on suspended ceiling tiles. It accommodates the intent of both proposals that cables should be supported by the building structure, but in extenuating circumstances in existing construction, a limited number and weight of cables may be placed on a suspended ceiling. Further, in the first paragraph of 770-7, the phrase "wires and" is deleted as there are no optical fiber "wires".

PANEL ACTION: Reject.

PANEL STATEMENT: The sections should not be combined. Refer to the recommendation and substantiation for Comment 16-199a where these recommendations are addressed.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21

VOTE ON PANEL ACTION:

AFFIRMATIVE: 21

(Log #1416)

16- 212 - (770-8): Accept in Part

SUBMITTER: Kari Barrett, American Chemistry Council

COMMENT ON PROPOSAL NO: 16-159a

RECOMMENDATION: Delete the following text:

~~Such cables shall be attached to structural components at intervals not exceeding 1.52 m (5 ft) and within 305 mm (12 In.) from every cabinet, box or fitting by straps, staples, hangers or similar fittings designed and installed so as not to damage the cable. The installation shall also conform with Section 300-4(d).~~

SUBSTANTIATION: The addition of this text would make the mandatory requirements of this section overly specific. The present wording is sufficient guidance to both the installer and the authority having jurisdiction.

PANEL ACTION: Accept in Part.

Revise the third sentence of the panel action text of Proposal 16-159a to read as follows:

"Such cables shall be attached to structural components by straps, staples, hangers or similar fittings designed and installed so as not to damage the cable."

PANEL STATEMENT: The panel accepts the removal of specific distances for the attachment of the cable. The panel does not agree that the existing code wording is sufficient guidance to both the installer and the authority having jurisdiction.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21

VOTE ON PANEL ACTION:

AFFIRMATIVE: 21

(Log #1073)

16- 213 - (770-50): Reject

Note: "See Technical Correlating Committee action on Comment 16-98."

SUBMITTER: Marcelo M. Hirschler, GBH International/Rep. Plenum Cable Association and Fire Retardent Chemicals Assoc.

COMMENT ON PROPOSAL NO: 16-162

RECOMMENDATION: This proposal should be rejected, the references to OFNP-50 and OFCP-50 should be deleted from the Table 770-50 and the OFNP-50 and OFCP-50 classifications should not be created.

SUBSTANTIATION: The OFNP-50 and OFCP-50 classifications are unnecessary classification because they are not justified either by requirements for reduction in fire hazard in plenums (fire hazard is the potential for harm associated with fire) or a general reduction in fire risk (fire risk is the combination of fire hazard and the probability of fires resulting in undesirable outcomes). Furthermore, they are based on a research project which is incomplete (according to the Interim Report issued) and they are based on flawed testing technology, as represented by the oxygen bomb calorimeter.

The Plenum Cable Association endorses use of fire hazard assessment and fire risk assessment in order to further develop technically supportable standards, codes and regulations, that ensure reasonable and justifiable classification and control of plastic and other combustible products. The creation of the (CXP-50) marking is not justified based on fire hazard or on fire risk and is simply an effort for one type of material to gain market share at the expense of others. If a search for better fire performance is continued indefinitely, without taking into account the overall fire safety required by the application, clearly the use of plastics and other combustible materials should be discontinued, as a non combustible material can always be found which outperforms any plastic material. Thus, if the National Electrical Code were to support unjustified improvements in fire performance, eventually any use of plastic or other combustible materials would be in jeopardy.

Thus, there are 4 reasons to oppose the CXP-50 classifications: (i) no justification based on fire risk, (ii) no justification based on fire hazard, (iii) the study for the development of the classification by the proponents is incomplete, and (iv) the technique of oxygen bomb calorimetry, and the concept of limited combustible, are technically flawed. These concerns are exemplified as follows:

(i) An analysis of fire performance of cables addresses fire hazard.

Fire hazard analysis: Traditional CMP-rated cables will not cause significant flame spread or smoke obscuration unless the fire source is very large. For example, a CMP cable with a PVC jacket and FEP insulation was shown to have no significant flame spread (out of a possible flame spread of 20 feet) and a peak optical density of much less than 0.2 when exposed to a fire of approximately 1 MW, from a wood crib, in a full scale facility, that simulated a room and plenum [Reference: L.M. Caudill, J.R. Hoover, J.T. Walnock and J.T. Chapin, "Fire Performance of Communications Cables in Concealed Spaces", pages 277-285, NFPRF Fire Risk and Hazard Assessment Symposium, June 26-28, 1996, San Francisco, CA]. The same cable also showed approximately 2 feet flame spread in the NFPA 262 plenum cable test, with a peak optical density not exceeding 0.3, according to the same reference. Clearly, if a cable does not spread flame significantly when a 1 MW fire source is applied, it does not represent any severe fire hazard. In a different scenario, a similar type of cable was studied by the European research project FIPEC, and found to release 42 kW and less than 6 MJ, to spread flame vertically for only 1.1 m, and to give low smoke release when tested in a severe vertical cable tray test (30 kW input at high air flow rate) [Reference: Fire Performance of Electric Cables Report, Interscience Communications, UK, 1999]. This indicates that the fire hazard associated with traditional CMP cables (and this with traditional CL2P and CL3P cables) is very low.

(ii) Analysis of NFPA statistics serves to illustrate fire risk. NFPA statistics address the following types of fires:

* "Non residential concealed space structure fires involving ignition of fixed wiring in ceiling/roof assemblies" {Roof plenums are examples of these spaces}
* "Non residential concealed space structure fires involving ignition of fixed wiring in ceiling/floor assemblies" {Floor plenums are examples of these spaces}

In each case, the statistics can distinguish whether wire and cable insulation was or was not the item first ignited, giving four sets of statistics relevant to plenum cables. These statistics are relevant to the fire risk from plenum cables, as plenum cables are

the typical type of wire and cable insulation present in roof plenums or in floor plenums.

Fire risk analysis: The statistics indicate that, between 1980 and 1996, there have been an average of only 584 fires per year, and of those only 171 have started with ignition of a wire and cable product, and the trend has been downwards (see the attached Tables with fire statistics and the attached charts, indicating a similar type of downward trend for both concealed roof spaces and concealed floor spaces). In fact, over the entire period between 1980 and 1996 the total number of fires in concealed roof spaces involving ignition of fixed wiring has been 0.29% of the total number of non residential structure fires (of which less than 30% started in wire and cable) and the total number of fires in concealed floor spaces involving ignition of fixed wiring has been 0.10% of the total number of non residential structure fires (of which ca. 32% started in wire and cable). With regard to fatalities or injuries: out of 3,734 fatalities in non residential structure fires, only 7 occurred in concealed roof or floor spaces involving ignition of fixed wiring (less than 0.19%), and out of 60,950 injuries in non residential structure fires, only 85 occurred in concealed roof or floor spaces involving ignition of fixed wiring (less than 0.14%). At least 4 of the 7 fatalities have been shown not to have resulted from plenum cable fires with the other 3 unknown. Thus, the fire record in a period when the amount of installed plenum cables increased from virtually none to some 20 billion feet, indicates that the fire risk is minimal.

(iii) The classifications of CXP-50 are not yet ready for application, since the NFPA Fire Protection Research Foundation Project developing the classification has not yet issued its final report. The Interim Report (International Limited Combustible Plenum Cable Fire Test Project, Interim Report, by F.B. Clarke and R.G. Gewain, June 2000) is the source of our [Plenum Cable Association] concerns. The first objective of this project was to: "Develop harmonized Steiner Tunnel listing protocols for permanent plenum cables related to NFPA 262/UL 910 and NFPA 255." The Interim Report describes part of Phase I of the project, wherein no harmonized listing protocol has been developed. The Interim Report addresses NFPA 255 and NFPA 259 and states, among other things:

* NFPA 255, flame travel distance: "... The NFPA 255 flame travel distances appear to be highly repeatable {i.e. within one lab} in each laboratory, as evidenced by the small variance of the measurements, *but not particularly reproducible* {i.e. between labs}, as can be seen by comparing this variance with the interlaboratory results. ..." {Emphasis added, but statement comes verbatim from report}

* NFPA 255, smoke index, or SDI: "... With respect to the smoke measurements, multiple determinations of the SDI by a given laboratory on a given cable agree with one another quite closely *but the SDI's reported by the two labs for the same cables do not appear to be close at all*. The results reported by Laboratory 2 are, with one exception, systematically higher than those of Laboratory 1. ..." {Emphasis added, but statement comes verbatim from report}

* NFPA 255 precision: " ... The flame spread and smoke measurements in NFPA 255 show ... *relatively poor reproducibility*, i.e. the result for a cable in a given laboratory can be repeated with precision but the difference in results between laboratories is on average considerably larger than the repeatability error. ..." {Emphasis added, but statement comes verbatim from report}

* Procedure for NFPA 255: "It is possible to test wire and cable following the current NFPA 255 test procedure, using the mounting specified for plastics in Appendix B7 of the standard." Appendix B-7 of NFPA 255 states:

"B-7 Plastics. B-7.1 The term plastics includes foams, reinforced panels, laminates, grids, and transparent or translucent sheets.

B-7.2 Where any plastic remains in position in the tunnel during a fire test, no additional support is necessary. Thermoplastic materials and other plastics that do not remain in place should be supported by 1/4-in. (6.3-mm) round metal rods or 3/16 in. (4.8 mm) thick 2 in. (51 mm) wide steel bars, or 2-in. (51-mm) galvanized hexagonal wire mesh supported with metal bars or rods spanning the width of the tunnel."

It is interesting to compare this with the statements in NFPA 262, as follows:

"1-1.3* Although this test uses equipment similar to that used in NFPA 255, Standard Method of Test of Surface Burning Characteristics of Building Materials, and ASTM E 84, Standard Test Method for Surface Burning Characteristics of Building Materials, sufficient changes have been made to the chamber so that a test conducted in the apparatus used for NFPA 255 or ASTM E 84 cannot be considered identical or produce comparable results.

A-1-1.3 The changes made in equipment for this test were deemed necessary in order to obtain proper precision from the test when the equipment is used for small quantities of wire and cable, which produce much smaller quantities of heat release and smoke obscuration."

* NFPA 259: "... NFPA 259 has traditionally been carried out on individual materials, and so the potential heat of a finished product like a cable would be calculated as the um of the contributions of each component, each contribution being the potential heat of the component multiplied by the mass fraction of that component in the cable. To produce such a measurement it would be necessary to disassemble the cable into its different components – insulation, jacket, shielding, rip cord and the like – and measure the potential heat of each component. *An obvious question is whether such a cumbersome procedure is necessary* ..." {Emphasis added, but statement comes verbatim from report}.

* Observations on NFPA 259: "One of the labs (Laboratory 2) had both more experience and more advanced equipment ..."

* Procedure for NFPA 259: "... The procedure followed was NFPA 259, Standard Test Method for Potential Heat of Building Materials, 1998 Edition, with modifications to the following sections: ... *This modification should be viewed provisionally since it so far has only been tested on 4-pair unshielded twisted pair (UTP) plenum cable*." {Emphasis added, but statement comes verbatim from report}

(iv) The oxygen bomb calorimeter test used to assess "limited combustible" classifications is severely flawed. NFPA 259 uses the oxygen bomb calorimeter as part of its testing to assess potential heat. The term "limited combustible" was developed for "building construction materials", with the intent of applying it to materials of construction of the plenum and not to cables. NFPA 90A defines "limited combustible" as follows:

"Limited-Combustible Material. A building construction material not complying with the definition of noncombustible material that in the form in which it is used, has a potential heat value not exceeding 3500 Btu/lb (8141 kJ/kg) where tested in accordance with NFPA 259, Standard Test Method for Potential Heat of Building Materials, and complies with (a) or (b):

(a) Materials having a structural base of noncombustible material, with a surfacing not exceeding a thickness of 1/8 in. (3.2 mm), that has a flame spread index not greater than 50; (b) Materials, in the form and thickness used, other than as described in (a), having neither a flame spread index greater than 25 nor evidence of continued progressive combustion, and of such composition that surfaces that would be exposed by cutting through the material on any plane would have neither a flame spread index greater than 25 nor evidence of continued progressive combustion. Materials subject to increase in combustibility or flame spread index beyond the limits herein established through the effects of age, moisture, or other atmospheric condition shall be considered combustible."

The oxygen bomb calorimeter is a method for determining the theoretical (or complete or absolute) calorific energy (or heat of combustion), as opposed to the effective (or practical) values. The reason such instruments are used is to ensure that the correct value is chosen. As such they represent the following chemical equations for combustible fuels containing only carbon, hydrogen and oxygen:

$$C + O_2 = CO_2$$

$$4\,H + O_2 = 2\,H_2O$$

For hydrocarbon fuels: $- C\,H_2 - + O_2 = CO_2 + H_2O$

However, when building materials are more complex, because they contain other elements, there is a certain inconsistency in the equation and in the energy calculated.

1. Cl: Thus, for example, when PVC is burnt in an oxygen bomb, depending on the fraction of hydrogen atoms present, there will be different proportions of the following two equations:

$$(C_2\,H_3\,Cl)_n + 2.5\,n\,O_2 = 2\,n\,CO_2 + n\,H_2O + n\,HCl$$

$$(C_2\,H_3\,Cl)_n + 2.75\,n\,O_2 = 2\,n\,CO_2 + 1.5\,n\,H_2O + 0.5\,n\,Cl_2$$

where the two equations differ by 380 kJ/kg.

2. S: Combustion of materials containing sulphur also depends on the final product. Typically the combustion bomb generates sulphuric acid as the final sulphur containing product, while

furnace combustion generates sulphur dioxide (with the sulphur less fully oxidized). Therefore, the convention in bomb calorimetry is to determine values of calorific value of fuels (including coal), by referring to the quantitative conversion to sulphur dioxide, and ignoring the conversion to sulphuric acid (or sulphur trioxide) that occurs, by using a conversion factor based on the sulphur content. Interestingly, gypsum (which is calcium sulphate dihydrate), is a building material containing sulphur. The typical fuel containing sulphur is coal. The difference between conversion to sulphur dioxide and sulphuric acid is 9410 kJ/kg.

3. N: Combustion of materials containing nitrogen also has a convention: the heat of convention is normally calculated assuming that all the nitrogen is converted into molecular nitrogen. However, that is not what happens in oxygen bomb calorimetry, where nitrogen oxides and nitric acid are actually formed. Thus, a correction is applied to account for the following equation:

$HNO_3 = 0.5\ H_2O + 0.5\ N_2 + 1.25\ O_2$, with a net heat of reaction of 1017 kJ/kg.

4. F: Combustion of materials containing fluorine is generally represented as ending in the formation of carbon tetrafluoride (CF_4) and of hydrogen fluoride (HF), in varying proportions. The equation is as follows:

$$C_a H_b O_c F_e + (a+b/4-c/2-e/4)\ O_2 + (n+1/2)*e*(1-x) - b/2)\ H_2O = (a-ex/4)\ CO_2 + ex/4\ CF_4 + e(1-x)\ (HF) + e(1-x)\ n\ H_2O$$

where x is the fraction of fluorine atoms converted to CF_4 as opposed to converted to HF. The energy of the conversion of CF_4 to HF is approximately 192 kJ/kg. Moreover, fluorine materials will attack the walls of the bomb calorimeter.

5. Si: Compounds containing silicon are impossible to convert completely to their final oxidation product, which is silica (SiO_2), by conventional means because as burning proceeds, the material becomes covered by a layer of silica which prevents access of oxygen and leads to the formation of a residue. The only way to obtain a reliable result of heat of combustion of materials containing silicon (such as silicones) is by a method which combines the material with an organic fluorine compound (the value of which has been accurately assessed in advance) in rotating bomb containing also water and aqueous HF. This converts all the Si into fluorosilicic acid, and the results can then be calculated back.

6. P: Compounds containing phosphorus are exceedingly difficult to assess by oxygen bomb combustion calorimetry. There are four major problems: (1) various phosphorus acids with different energies of dilution are formed in various concentrations throughout the oxygen bomb, (2) the combustion products contain different types of phosphorus oxyacids, each one of which has a different heat of formation, (3) the burning compound gets covered by phosphorus oxides and acids, which inhibit further combustion and (4) the bomb calorimeter walls are attacked and metal phosphates are formed, so that the recommended wall materials should be corundum or gold, since Pyrex glass, quartz, stainless steel titanium, porcelain and platinum all suffered heavy weight losses. For example, depending on whether a rotating bomb or a static bomb is used, the fraction of pyrophosphoric acid formed varied from 10 to 18% and that of triphosphoric acid from 1 to 3%.

7. Auxiliary combustion material: When an auxiliary material is used for assessing the heat of combustion, a 1% error in the assessment of the heat of combustion of the auxiliary material (such as benzoic acid), which is typically used in the order of 20% energy loading, corresponds to a 5% error in the total energy/heat measured. Thus, at a value of 1500 kJ/kg that would be an error of 75 kJ/kg, and this would be a systematic error for that series of experiments.

8. Moisture content: the moisture content of the building material is critical, because the combustion reaction considered in the oxygen bomb is that to convert to gaseous water. Thus, if a material contains water, the water will have reaction to vaporize the water content. Thus, results must be expressed as a function of the original moisture content for them to be valid. This matters, of course, for materials that absorb moisture when exposed to the atmosphere.

Bibliography on oxygen bomb calorimetry:

* Mansson, Margret, "Determination of Calorific Values of Building Materials - A Guide", SP Nordtest Report Project 871-90, Swedish National Testing and Research Institute, Boras, Sweden, 1991.

* Head, Arthur J, and Good, William D., "Combustion of Liquid/Solid Compounds with Non-Metallic Hetero Atoms", Chapter 9 in "Combustion Calorimetry", "Volume 1, Experimental Chemical thermodynamics", Eds. Stig Sunner & Margret M. Mansson), Pergamon Press, Oxford, UK (for Int. Union Pure & Applied Chemistry, IUPAC), 1979.

* Mansson, Margret and Hubbard, Ward N., "Strategies in the Calculation of Standard-State Energies of Combustion from the Experimentally Determined Quantities", Chapter 5 in "Combustion Calorimetry", "Volume 1, Experimental Chemical thermodynamics", Eds. Stig Sunner & Margret M. Mansson), Pergamon Press, Oxford, UK (for Int. Union Pure & Applied Chemistry, IUPAC), 1979.

* Hu, Andrew T., Sinke, G.C., Mansson, Margret and Ringner, Birgitta, "Test Substances for Bomb Combustion Calorimetry, p-Chlorobenzoic Acid". J. Chem. Thermodynamics, 4, 283-99 (1972).

* Mansson, Margret, "Thermochemistry - Some Recent Lines of Development", Pure & Applied Chemistry, 55(3), 417-26 (1983).

* Mansson, Margret, "A 4.5 cm^3 Bomb Combustion Calorimeter and an Ampoule Technique for 5 to 10 mg Samples with Vapour Pressures Below Approximately 3 kPa (20 Torr)", J. Chem. Thermodynamics, 5, 7232 (1973).

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

PANEL ACTION: Reject.

PANEL STATEMENT: Refer to panel action and statement on Comment 16-98.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21

VOTE ON PANEL ACTION:

AFFIRMATIVE: 20

ABSTENTION: 1

EXPLANATION OF ABSTENTION:

CAUDILL: The Society of the Plastics Industries could not reach a consensus position on this issue.

(Log #1595)

16- 214 - (Table 770-50): Reject

Note: "See Technical Correlating Committee action on Comment 16-98."

SUBMITTER: Wayne G. Carson, Carson Assoc. Inc.

COMMENT ON PROPOSAL NO: 16-162

RECOMMENDATION: Delete reference to OFNP-50 and OFCP-50 cables in Table 770-50.

SUBSTANTIATION: The new cable classification "Limited Combustible Cable" if deleted as recommended by comments to sections 725.71(b) [16-89]; 760-71(e) [16-149]; 770-51(b) [16-169]; 800-51(h) [16-232]; and 820-51(b) [16-302] will not be included in the Code. This type cable designation is not needed and is premature - see related comments for complete substantiation.

PANEL ACTION: Reject.

PANEL STATEMENT: Refer to panel action and statement on Comment 16-98.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21

VOTE ON PANEL ACTION:

AFFIRMATIVE: 20

ABSTENTION: 1

EXPLANATION OF ABSTENTION:

CAUDILL: The Society of the Plastics Industries could not reach a consensus position on this issue.

(Log #1290)

16- 215 - (770-51): Accept

SUBMITTER: Allen C. Weidman, The Society of the Plastics Industry, Inc.

COMMENT ON PROPOSAL NO: 16-165

RECOMMENDATION: We support the action of the panel.

SUBSTANTIATION: None.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21

VOTE ON PANEL ACTION:

AFFIRMATIVE: 20

ABSTENTION: 1

EXPLANATION OF ABSTENTION:

CAUDILL: The Society of the Plastics Industries could not reach a consensus position on this issue.

(Log #464)

16- 216 - (770-51(b)): Accept

Note: "See Technical Correlating Committee action on Comment 16-98."

SUBMITTER: Technical Correlating Committee on Signaling Systems for the Protection of Life and Property

COMMENT ON PROPOSAL NO: 16-169

RECOMMENDATION: The Technical Correlating Committee on the National Fire Alarm Code recommends that Code Panel 16 continue to accept this proposal.

SUBSTANTIATION: The Technical Correlating Committee on the National Fire Alarm Code supports the introduction of limited combustible cable and recognizes that it represents a significant improvement in fire safety.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21

VOTE ON PANEL ACTION:

AFFIRMATIVE: 20

ABSTENTION: 1

EXPLANATION OF ABSTENTION:

CAUDILL: The Society of the Plastics Industries could not reach a consensus position on this issue.

(Log #1080)

16- 217 - (770-51(b) (New)): Reject

Note: "See Technical Correlating Committee action on Comment 16-98."

SUBMITTER: Marcelo M. Hirschler, GBH International/Rep. Plenum Cable Association and Fire Retardent Chemicals Assoc.

COMMENT ON PROPOSAL NO: 16-169

RECOMMENDATION: This proposal should be rejected, the new section 770-51(b) should not be created and the OFNP-50 and OFCP-50 classifications should not be created.

SUBSTANTIATION: The OFNP-50 and OFCP-50 classifications are unnecessary classifications because they are not justified either by requirements for reduction in fire hazard in plenums (fire hazard is the potential for harm associated with fire) or a general reduction in fire risk (fire risk is the combination of fire hazard and the probability of fires resulting in undesirable outcomes). Furthermore, they are based on a research project which is incomplete (according to the Interim Report issued) and they are based on flawed testing technology, as represented by the oxygen bomb calorimeter.

The Plenum Cable Association endorses use of fire hazard assessment and fire risk assessment in order to further develop technically supportable standards, codes and regulations, that ensure reasonable and justifiable classification and control of plastic and other combustible products. The creation of the (CXP-50) marking is not justified based on fire hazard or on fire risk and is simply an effort for one type of material to gain market share at the expense of others. If a search for better fire performance is continued indefinitely, without taking into account the overall fire safety required by the application, clearly the use of plastics and other combustible materials should be discontinued, as a non combustible material can always be found which outperforms any plastic material. Thus, if the National Electrical Code were to support unjustified improvements in fire performance, eventually any use of plastic or other combustible materials would be in jeopardy.

Thus, there are 4 reasons to oppose the CXP-50 classifications: (i) no justification based on fire risk, (ii) no justification based on fire hazard, (iii) the study for the development of the classification by the proponents is incomplete, and (iv) the technique of oxygen bomb calorimetry, and the concept of limited combustible, are technically flawed. These concerns are exemplified as follows:

(i) An analysis of fire performance of cables addresses fire hazard.

Fire hazard analysis: Traditional CMP-rated cables will not cause significant flame spread or smoke obscuration unless the fire source is very large. For example, a CMP cable with a PVC jacket and FEP insulation was shown to have no significant flame spread (out of a possible flame spread of 20 feet) and a peak optical density of much less than 0.2 when exposed to a fire of approximately 1 MW, from a wood crib, in a full scale facility, that simulated a room and plenum [Reference: L.M. Caudill, J.R. Hoover, J.T. Walnock and J.T. Chapin, "Fire Performance of Communications Cables in Concealed Spaces", pages 277-285, NFPRF Fire Risk and Hazard Assessment Symposium, June 26-28, 1996, San Francisco, CA]. The same cable also showed approximately 2 feet flame spread in the NFPA 262 plenum cable test, with a peak optical density not exceeding 0.3, according to the same reference. Clearly, if a cable does not spread flame significantly when a 1 MW fire source is applied, it does not represent any severe fire hazard. In a different scenario, a similar type of cable was studied by the European research project FIPEC, and found to release 42 kW and less than 6 MJ, to spread flame vertically for only 1.1 m, and to give low smoke release when tested in a severe vertical cable tray test (30 kW input at high air flow rate) [Reference: Fire Performance of Electric Cables Report, Interscience Communications, UK, 1999]. This indicates that the fire hazard associated with traditional CMP cables (and this with traditional CL2P and CL3P cables) is very low.

(ii) Analysis of NFPA statistics serves to illustrate fire risk. NFPA statistics address the following types of fires:

* "Non residential concealed space structure fires involving ignition of fixed wiring in ceiling/roof assemblies" {Roof plenums are examples of these spaces}
* "Non residential concealed space structure fires involving ignition of fixed wiring in ceiling/floor assemblies" {Floor plenums are examples of these spaces}

In each case, the statistics can distinguish whether wire and cable insulation was or was not the item first ignited, giving four sets of statistics relevant to plenum cables. These statistics are relevant to the fire risk from plenum cables, as plenum cables are the typical type of wire and cable insulation present in roof plenums or in floor plenums.

Fire risk analysis: The statistics indicate that, between 1980 and 1996, there have been an average of only 584 fires per year, and of those only 171 have started with ignition of a wire and cable product, and the trend has been downwards (see the attached Tables with fire statistics and the attached charts, indicating a similar type of downward trend for both concealed roof spaces and concealed floor spaces). In fact, over the entire period between 1980 and 1996 the total number of fires in concealed roof spaces involving ignition of fixed wiring has been 0.29% of the total number of non residential structure fires (of which less than 30% started in wire and cable) and the total number of fires in concealed floor spaces involving ignition of fixed wiring has been 0.10% of the total number of non residential structure fires (of which ca. 32% started in wire and cable). With regard to fatalities or injuries: out of 3,734 fatalities in non residential structure fires, only 7 occurred in concealed roof or floor spaces involving ignition of fixed wiring (less than 0.19%), and out of 60,950 injuries in non residential structure fires, only 85 occurred in concealed roof or floor spaces involving ignition of fixed wiring (less than 0.14%). At least 4 of the 7 fatalities have been shown not to have resulted from plenum cable fires with the other 3 unknown. Thus, the fire record in a period when the amount of installed plenum cables increased from virtually none to some 20 billion feet, indicates that the fire risk is minimal.

(iii) The classifications of CXP-50 are not yet ready for application, since the NFPA Fire Protection Research Foundation Project developing the classification has not yet issued its final report. The Interim Report (International Limited Combustible Plenum Cable Fire Test Project, Interim Report, by F.B. Clarke and R.G. Gewain, June 2000) is the source of our [Plenum Cable Association] concerns. The first objective of this project was to: "Develop harmonized Steiner Tunnel listing protocols for permanent plenum cables related to NFPA 262/UL 910 and NFPA 255." The Interim Report describes part of Phase I of the project, wherein no harmonized listing protocol has been developed. The Interim Report addresses NFPA 255 and NFPA 259 and states, among other things:

* NFPA 255, flame travel distance: "... The NFPA 255 flame travel distances appear to be highly repeatable {i.e. within one lab} in each laboratory, as evidenced by the small variance of the measurements, *but not particularly reproducible* {i.e. between labs}, as can be seen by comparing this variance with the interlaboratory results. ..." {Emphasis added, but statement comes verbatim from report}
* NFPA 255, smoke index, or SDI: "... With respect to the smoke measurements, multiple determinations of the SDI by a given laboratory on a given cable agree with one another quite closely *but the SDI's reported by the two labs for the same cables do not appear to be close at all*. The results reported by Laboratory 2 are, with one exception, systematically higher than those of Laboratory 1. ..." {Emphasis added, but statement comes verbatim from report}
* NFPA 255 precision: " ... The flame spread and smoke measurements in NFPA 255 show ... *relatively poor reproducibility*, i.e. the result for a cable in a given laboratory can be repeated with precision but the difference in results between laboratories is on average considerably larger than the repeatability error. ..." {Emphasis added, but statement comes verbatim from report}

* Procedure for NFPA 255: "It is possible to test wire and cable following the current NFPA 255 test procedure, using the mounting specified for plastics in Appendix B7 of the standard." Appendix B-7 of NFPA 255 states:

"B-7 Plastics. B-7.1 The term plastics includes foams, reinforced panels, laminates, grids, and transparent or translucent sheets.

B-7.2 Where any plastic remains in position in the tunnel during a fire test, no additional support is necessary. Thermoplastic materials and other plastics that do not remain in place should be supported by 1/4-in. (6.3-mm) round metal rods or 3/16 in. (4.8 mm) thick 2 in. (51 mm) wide steel bars, or 2-in. (51-mm) galvanized hexagonal wire mesh supported with metal bars or rods spanning the width of the tunnel."

It is interesting to compare this with the statements in NFPA 262, as follows:

"1-1.3* Although this test uses equipment similar to that used in NFPA 255, Standard Method of Test of Surface Burning Characteristics of Building Materials, and ASTM E 84, Standard Test Method for Surface Burning Characteristics of Building Materials, sufficient changes have been made to the chamber so that a test conducted in the apparatus used for NFPA 255 or ASTM E 84 cannot be considered identical or produce comparable results.

A-1-1.3 The changes made in equipment for this test were deemed necessary in order to obtain proper precision from the test when the equipment is used for small quantities of wire and cable, which produce much smaller quantities of heat release and smoke obscuration."

* NFPA 259: "... NFPA 259 has traditionally been carried out on individual materials, and so the potential heat of a finished product like a cable would be calculated as the um of the contributions of each component, each contribution being the potential heat of the component multiplied by the mass fraction of that component in the cable. To produce such a measurement it would be necessary to disassemble the cable into its different components – insulation, jacket, shielding, rip cord and the like – and measure the potential heat of each component. *An obvious question is whether such a cumbersome procedure is necessary* ..." {Emphasis added, but statement comes verbatim from report}.

* Observations on NFPA 259: "One of the labs (Laboratory 2) had both more experience and more advanced equipment ..."

* Procedure for NFPA 259: "... The procedure followed was NFPA 259, Standard Test Method for Potential Heat of Building Materials, 1998 Edition, with modifications to the following sections: ... *This modification should be viewed provisionally since it so far has only been tested on 4-pair unshielded twisted pair (UTP) plenum cable*." {Emphasis added, but statement comes verbatim from report}

(iv) The oxygen bomb calorimeter test used to assess "limited combustible" classifications is severely flawed. NFPA 259 uses the oxygen bomb calorimeter as part of its testing to assess potential heat. The term "limited combustible" was developed for "building construction materials", with the intent of applying it to materials of construction of the plenum and not to cables. NFPA 90A defines "limited combustible" as follows:

"Limited-Combustible Material. A building construction material not complying with the definition of noncombustible material that in the form in which it is used, has a potential heat value not exceeding 3500 Btu/lb (8141 kJ/kg) where tested in accordance with NFPA 259, Standard Test Method for Potential Heat of Building Materials, and complies with (a) or (b):

(a) Materials having a structural base of noncombustible material, with a surfacing not exceeding a thickness of 1/8 in. (3.2 mm), that has a flame spread index not greater than 50; (b) Materials, in the form and thickness used, other than as described in (a), having neither a flame spread index greater than 25 nor evidence of continued progressive combustion, and of such composition that surfaces that would be exposed by cutting through the material on any plane would have neither a flame spread index greater than 25 nor evidence of continued progressive combustion. Materials subject to increase in combustibility or flame spread index beyond the limits herein established through the effects of age, moisture, or other atmospheric condition shall be considered combustible."

The oxygen bomb calorimeter is a method for determining the theoretical (or complete or absolute) calorific energy (or heat of combustion), as opposed to the effective (or practical) values. The reason such instruments are used is to ensure that the correct value is chosen. As such they represent the following chemical equations for combustible fuels containing only carbon, hydrogen and oxygen:

$$C + O_2 = CO_2$$

$$4\,H + O_2 = 2\,H_2O$$

For hydrocarbon fuels: $- C\,H_2 - + O_2 = CO_2 + H_2O$

However, when building materials are more complex, because they contain other elements, there is a certain inconsistency in the equation and in the energy calculated.

1. Cl: Thus, for example, when PVC is burnt in an oxygen bomb, depending on the fraction of hydrogen atoms present, there will be different proportions of the following two equations:

$$(C_2\,H_3\,Cl)_n + 2.5\,n\,O_2 = 2\,n\,CO_2 + n\,H_2O + n\,HCl$$

$$(C_2\,H_3\,Cl)_n + 2.75\,n\,O_2 = 2\,n\,CO_2 + 1.5\,n\,H_2O + 0.5\,n\,Cl_2$$

where the two equations differ by 380 kJ/kg.

2. S: Combustion of materials containing sulphur also depends on the final product. Typically the combustion bomb generates sulphuric acid as the final sulphur containing product, while furnace combustion generates sulphur dioxide (with the sulphur less fully oxidized). Therefore, the convention in bomb calorimetry is to determine values of calorific value of fuels (including coal), by referring to the quantitative conversion to sulphur dioxide, and ignoring the conversion to sulphuric acid (or sulphur trioxide) that occurs, by using a conversion factor based on the sulphur content. Interestingly, gypsum (which is calcium sulphate dihydrate), is a building material containing sulphur. The typical fuel containing sulphur is coal. The difference between conversion to sulphur dioxide and sulphuric acid is 9410 kJ/kg.

3. N: Combustion of materials containing nitrogen also has a convention: the heat of convention is normally calculated assuming that all the nitrogen is converted into molecular nitrogen. However, that is not what happens in oxygen bomb calorimetry, where nitrogen oxides and nitric acid are actually formed. Thus, a correction is applied to account for the following equation:

$HNO_3 = 0.5\,H_2O + 0.5\,N_2 + 1.25\,O_2$, with a net heat of reaction of 1017 kJ/kg.

4. F: Combustion of materials containing fluorine is generally represented as ending in the formation of carbon tetrafluoride (CF_4) and of hydrogen fluoride (HF), in varying proportions. The equation is as follows:

$$C_a\,H_b\,O_c\,F_e + (a+b/4-c/2-e/4)\,O_2 + (n+1/2)*e*(1-x) - b/2)\,H_2O = (a-ex/4)\,CO_2 + ex/4\,CF_4 + e(1-x)\,(HF) + e(1-x)\,n\,H_2O$$

where x is the fraction of fluorine atoms converted to CF_4 as opposed to converted to HF. The energy of the conversion of CF_4 to HF is approximately 192 kJ/kg. Moreover, fluorine materials will attack the walls of the bomb calorimeter.

5. Si: Compounds containing silicon are impossible to convert completely to their final oxidation product, which is silica (SiO_2), by conventional means because as burning proceeds, the material becomes covered by a layer of silica which prevents access of oxygen and leads to the formation of a residue. The only way to obtain a reliable result of heat of combustion of materials containing silicon (such as silicones) is by a method which combines the material with an organic fluorine compound (the value of which has been accurately assessed in advance) in rotating bomb containing also water and aqueous HF. This converts all the Si into fluorosilicic acid, and the results can then be calculated back.

6. P: Compounds containing phosphorus are exceedingly difficult to assess by oxygen bomb combustion calorimetry. There are four major problems: (1) various phosphorus acids with different energies of dilution are formed in various concentrations throughout the oxygen bomb, (2) the combustion products contain different types of phosphorus oxyacids, each one of which has a different heat of formation, (3) the burning compound gets covered by phosphorus oxides and acids, which inhibit further combustion and (4) the bomb calorimeter walls are attacked and metal phosphates are formed, so that the recommended wall materials should be corundum or gold, since Pyrex glass, quartz, stainless steel titanium, porcelain and platinum all suffered heavy weight losses. For example, depending on whether a rotating bomb or a static bomb is used, the fraction of pyrophosphoric acid

formed varied from 10 to 18% and that of triphosphoric acid from 1 to 3%.

7. Auxiliary combustion material: When an auxiliary material is used for assessing the heat of combustion, a 1% error in the assessment of the heat of combustion of the auxiliary material (such as benzoic acid), which is typically used in the order of 20% energy loading, corresponds to a 5% error in the total energy/heat measured. Thus, at a value of 1500 kJ/kg that would be an error of 75 kJ/kg, and this would be a systematic error for that series of experiments.

8. Moisture content: the moisture content of the building material is critical, because the combustion reaction considered in the oxygen bomb is that to convert to gaseous water. Thus, if a material contains water, the water will have reaction to vaporize the water content. Thus, results must be expressed as a function of the original moisture content for them to be valid. This matters, of course, for materials that absorb moisture when exposed to the atmosphere.

Bibliography on oxygen bomb calorimetry:

* Mansson, Margret, "Determination of Calorific Values of Building Materials - A Guide", SP Nordtest Report Project 871-90, Swedish National Testing and Research Institute, Boras, Sweden, 1991.

* Head, Arthur J, and Good, William D., "Combustion of Liquid/Solid Compounds with Non-Metallic Hetero Atoms", Chapter 9 in "Combustion Calorimetry", "Volume 1, Experimental Chemical thermodynamics", Eds. Stig Sunner & Margret M. Mansson), Pergamon Press, Oxford, UK (for Int. Union Pure & Applied Chemistry, IUPAC), 1979.

* Mansson, Margret and Hubbard, Ward N., "Strategies in the Calculation of Standard-State Energies of Combustion from the Experimentally Determined Quantities", Chapter 5 in "Combustion Calorimetry", "Volume 1, Experimental Chemical thermodynamics", Eds. Stig Sunner & Margret M. Mansson), Pergamon Press, Oxford, UK (for Int. Union Pure & Applied Chemistry, IUPAC), 1979.

* Hu, Andrew T., Sinke, G.C., Mansson, Margret and Ringner, Birgitta, "Test Substances for Bomb Combustion Calorimetry, p-Chlorobenzoic Acid". J. Chem. Thermodynamics, 4, 283-99 (1972).

* Mansson, Margret, "Thermochemistry - Some Recent Lines of Development", Pure & Applied Chemistry, 55(3), 417-26 (1983).

* Mansson, Margret, "A 4.5 cm^3 Bomb Combustion Calorimeter and an Ampoule Technique for 5 to 10 mg Samples with Vapour Pressures Below Approximately 3 kPa (20 Torr)", J. Chem. Thermodynamics, 5, 7232 (1973).

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

PANEL ACTION: Reject.
PANEL STATEMENT: Refer to panel action and statement on Comment 16-98.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 18
NEGATIVE: 2
ABSTENTION: 1
EXPLANATION OF NEGATIVE:
JOHNSON: See my explanation of negative vote on Comment 16-88.
WADEHRA: See my explanation of negative vote on Comment 16-88.
COMMENT ON AFFIRMATIVE:
KAHN: See my comment on affirmative vote on Comment 16-88.
KAUFMAN: See my comment on affirmative vote on Comment 16-88.
EXPLANATION OF ABSTENTION:
CAUDILL: The Society of the Plastics Industries could not reach a consensus position on this issue.

(Log #1291)

16- 218 - (770-51(b)): Accept
Note: "See Technical Correlating Committee action on Comment 16-98."
SUBMITTER: Allen C. Weidman, The Society of the Plastics Industry, Inc.
COMMENT ON PROPOSAL NO: 16-169
RECOMMENDATION: We support the action of the panel.
SUBSTANTIATION: None.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
ABSTENTION: 1
EXPLANATION OF ABSTENTION:
CAUDILL: The Society of the Plastics Industries could not reach a consensus position on this issue.

(Log #1333)

16- 219 - (770-51(b)): Accept
Note: "See Technical Correlating Committee action on Comment 16-98."
SUBMITTER: Jeffrey S. Deckman, SyNet Inc.
COMMENT ON PROPOSAL NO: 16-169
RECOMMENDATION: SyNet recommends that Code Panel 16 continue to accept this proposal.
SUBSTANTIATION: SyNet supports the acceptance and use of limited combustible cable. The NFPRF research project demonstrated that cable can be tested and listed for full compliance to the NFPA 255 and 259 test methods. Limited combustible cable is consistent with the full requirements of NFPA 90A and its originally intended fire safety performance. We believe this cable design would provide a significant improvement in fire safety and protect lives and property.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
ABSTENTION: 1
EXPLANATION OF ABSTENTION:
CAUDILL: The Society of the Plastics Industries could not reach a consensus position on this issue.

(Log #1484)

16- 220 - (770-51(b)): Accept
Note: "See Technical Correlating Committee action on Comment 16-98."
SUBMITTER: George Thorning, Yale University
COMMENT ON PROPOSAL NO: 16-169
RECOMMENDATION: Yale recommends that Code Making Panel 16 continue to accept this proposal.
SUBSTANTIATION: We believe this cable design would provide a significant improvement in fire safety and protect lives and property. Yale supports the NFPA's acceptance and recognition of limited combustible cable in the 2002 NEC. The NFPRF research project demonstrates that cable can be tested and listed for full compliance to the NFPA 255 and 259 test methods. Limited combustible cable is consistent with the full requirements of NFPA 90A and its originally intended fire safety performance.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
ABSTENTION: 1
EXPLANATION OF ABSTENTION:
CAUDILL: The Society of the Plastics Industries could not reach a consensus position on this issue.

(Log #1495)

16- 221 - (770-51(b)): Accept
Note: "See Technical Correlating Committee action on Comment 16-98."
SUBMITTER: John Moseley, Suddath Van Lines, Inc.
COMMENT ON PROPOSAL NO: 16-169
RECOMMENDATION: Suddath Van Lines, Inc. recommends that Code Making Panel 16 continue to accept this proposal.
SUBSTANTIATION: Suddath Van Lines, Inc. advocates the endorsement and application of limited combustible cable. This cable design supplies a major upgrade in fire safety offerings. Cable can be tested and listed for full compliance to the NFPA 255 and 259 protocols; the NFPRF has already established this information. Limited combustible cable observes and applies the current guidelines of NFPA 90A, without the exception, and its fire safety performance tenet.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
ABSTENTION: 1

EXPLANATION OF ABSTENTION:
CAUDILL: The Society of the Plastics Industries could not reach a consensus position on this issue.

(Log #1500)

16- 222 - (770-51(b)): Accept
Note: "See Technical Correlating Committee action on Comment 16-98."
SUBMITTER: Michael Lohr, Staples Communications
COMMENT ON PROPOSAL NO: 16-169
RECOMMENDATION: Staples Communications recommends that Code Making Panel 16 continue to accept this proposal.
SUBSTANTIATION: Staples Communications endorses the acceptance and application of limited combustible cable. This cable design presents a considerable improvement in fire safety. The NFPRF has shown that cable can be tested and listed for full compliance to NFPA 255 and 259 protocols. Limited combustible cable is consistent with the NFPA 90A's full, original requirements and its intended fire safety performance.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
ABSTENTION: 1
EXPLANATION OF ABSTENTION:
CAUDILL: The Society of the Plastics Industries could not reach a consensus position on this issue.

(Log #1505)

16- 223 - (770-51(b)): Accept
Note: "See Technical Correlating Committee action on Comment 16-98."
SUBMITTER: Scott Paulov, Cabling Business Institute
COMMENT ON PROPOSAL NO: 16-169
RECOMMENDATION: Cabling Business Institute recommends that Code Making Panel 16 continue to accept this proposal.
SUBSTANTIATION: Cabling Business Institute encourages the acceptance and utilization of limited combustible cable. This cable design offers a substantial advancement in fire safety. The NFPRF has verified that cable can be tested and listed for complete compliance with the NFPA 255 and 259 protocols. Limited combustible cable is totally consistent with the provisions of NFPA 90A, without the exception, and its desired fire safety performance.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
ABSTENTION: 1
EXPLANATION OF ABSTENTION:
CAUDILL: The Society of the Plastics Industries could not reach a consensus position on this issue.

(Log #1588)

16- 224 - (770-51(b)): Reject
Note: "See Technical Correlating Committee action on Comment 16-98."
SUBMITTER: Wayne G. Carson, Carson Assoc. Inc.
COMMENT ON PROPOSAL NO: 16-169
RECOMMENDATION: Delete proposed section 770-51(b) and associated notes.
SUBSTANTIATION: The introduction of a new class of cable ("Limited Combustible Cable") is premature at this time for the following reasons:

A. The note to the definition section 725.71(B), FPN No. 1 references NFPA 90A, Standard for the Installation of Air-Conditioning and Ventilating Systems for the definition of limited combustible. That definition is as follows:

"Limited-Combustible Material. A building construction material not complying with the definition of noncombustible material that in the form in which it is used, has a potential heat value not exceeding 3500 Btu/lb (8141J/kg) where tested in accordance with NFPA 259, Standard Test Method for Potential Heat of Building Materials, and complies with (a) or (b):

a. Materials having a structural base of noncombustible material, with a surfacing not exceeding a thickness of 1/8 in. (3.2 mm), that has a flame spread index not greater than 50;

b. Materials, in the form and thickness used, other than as described in (a), having neither a flame spread index greater than 25 nor evidence of continued progressive combustion, and of such composition that surfaces that would be exposed by cutting through the material on any plane would have neither a flame spread index greater than 25 nor evidence of continued progressive combustion. Materials subject to increase in combustibility or flame spread index beyond the limits herein established through the effects of age, moisture, or other atmospheric condition shall be combustible."

This definition was established and is applied to <u>building construction materials</u> and not to specific wiring methods or technologies for use in buildings. NFPA 255 and NFPA 259 were never intended for the evaluation of multi-component systems such as electrical and optical cable. More current test methods (other than NFPA 255 and 259), such as NFPA 262, the cone calorimeter, etc. provide reproducible smoke obscuration, flame spread, or heat release (not heat value) information and are more appropriate for measuring the fire hazards of cable. Not all parts of this "Limited Combustible" definition have been applied to the broad scope of cables. Until this definition can be shown as appropriate for cables (attainable and reproducible) it should not be deemed credible and supported by the National Electrical Code at this time. Referencing this inappropriate definition in the National Electrical Code is misleading and bad code.

B. The note references NFPA 255 as the test standard for smoke developed index. This test is not an appropriate test for cables for the following reasons:

a. NFPA 255 has not been harmonized, as has NFPA 262. NFPA 262 has a proven record, unlike NFPA 255.

b. NFPA 255 is not reproducible, whereas NFPA 262 has been shown to be reproducible. This lack of reproducibility has been demonstrated numerous times in round-robin testing of building materials among multiple labs.

The most recent example of this reproducibility problem has been demonstrated in the Interim Report of the Fire Protection Research Foundation (FPRF) "Limited Combustible Cable" (ex. "Permanent Plenum Cable") project, dated June 2000. This report states "The flame spread and smoke measurements in NFPA 255 show good repeatability but relatively poor reproducibility, i.e., the result for a cable in a given laboratory can be repeated with precision but the difference in results between laboratories is on average considerably larger than the repeatability error." (Page 9, section 4.1.2). In this case, with only two laboratories participating, errors in reproducibility were in the range of 100 percent. Given that numerous fire-testing tunnels exist, the range of error can be expected to be even larger.

This test is inappropriate for cables as the cables are installed against the top of the tunnel. This orientation is not similar to normal cable installations, and cable placement on top of the wire mesh is random in the tunnel.

C. Cable installed above ceilings does not become involved in the fire until near or at flashover. At that point in the fire development, the ceiling tile is falling to expose the cable. Cables in walls or below floors are generally exposed to the fire conditions even later in the fire development. These cables do not spread flame more than 5 ft when tested in accordance with NFPA 262. The proposed restrictions on cable appear excessive based on the fire record.

D. There is not a need established (fire record or hazard analysis) for a new cable category. There are two research projects that are intended to provide information on the fire hazard of cables. The ASHRAE project has not yet begun. This ASHRAE Project is being conducted by the National Research Council of Canada and is a broad based fire hazard assessment program developed to evaluate the hazard presented by the accumulation of plenum cables. This question has not yet been answered and developing cable categories to address a hazard that has not yet been defined is premature. The project when completed will assist in developing appropriate language for NFPA 90A and/or the National Electrical Code.

The FPRF project has only issued an interim report dated June 2000. This project has only accomplished a cursory review of one cable type in NFPA 255 and NFPA 259 and has just begun the experimental work on broader aspects of the "limited combustible" definition.

The proposals for the National Electrical Code that have been accepted by Code Making Panel 16 for the removal of all abandoned cable broadly addresses this problem now. The adoption of these proposals for removing all abandoned cable will significantly reduce the fuel load created by excessive cable accumulation.

E. The International Mechanical Code (IMC), the Uniform Mechanical Code (UMC), and the NFPA 90A (the membership and the NFPA Standards Council) have each recently rejected

similar provisions to the ones being proposed for the National Electrical Code. These proposals for "limited combustible cables" have been rejected for several reasons including:
a. They will present confusion in the field;
b. They are not good code based on sound engineering principles;
c. They are not based on good fire hazard assessment information; and
d. Questions regarding the appropriateness and accuracy of the test protocols NFPA 255 and NFPA 259.
PANEL ACTION: Reject.
PANEL STATEMENT: Refer to panel action and statement on Comment 16-98.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 18
NEGATIVE: 2
ABSTENTION: 1
EXPLANATION OF NEGATIVE:
JOHNSON: See my explanation of negative vote on Comment 16-88.
WADEHRA: See my explanation of negative vote on Comment 16-88.
COMMENT ON AFFIRMATIVE:
KAHN: See my comment on affirmative vote on Comment 16-88.
KAUFMAN: See my comment on affirmative vote on Comment 16-88.
EXPLANATION OF ABSTENTION:
CAUDILL: The Society of the Plastics Industries could not reach a consensus position on this issue.

(Log #1617)

16- 225 - (770-51(b)): Accept
Note: "See Technical Correlating Committee action on Comment 16-98."
SUBMITTER: Phil Brown, Communications Products Inc. (CP)
COMMENT ON PROPOSAL NO: 16-169
RECOMMENDATION: CPI recommends that Code Panel 16 continue to accept this proposal.
SUBSTANTIATION: CPI supports the NFPA's acceptance and recognition of limited combustible cable in the 2002 NEC. This cable design would provide a significant improvement in fire safety and protect lives and property. The NFPRF research project demonstrated that cable can be tested and listed for full compliance to the NFPA 255 and 259 test methods. Limited combustible cable is consistent with the full requirements of NFPA 90A and its originally intended fire safety performance.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
ABSTENTION: 1
EXPLANATION OF ABSTENTION:
CAUDILL: The Society of the Plastics Industries could not reach a consensus position on this issue.

(Log #1752)

16- 226 - (770-51(b)): Accept
Note: "See Technical Correlating Committee action on Comment 16-98."
SUBMITTER: Francis W. Peri, Communications Design Corporation
COMMENT ON PROPOSAL NO: 16-169
RECOMMENDATION: Association of Cabling Professionals (ACP) recommends that Code Panel 16 continue to accept this proposal.
SUBSTANTIATION: ACP supports the acceptance and use of limited combustible cable. This cable design provides a significant improvement in fire safety. The NFPRF has demonstrated that cable can be tested and listed for full compliance to the NFPA 255 and 259 protocols. Limited combustible cable is consistent with the full requirements of NFPA 90A and its intended fire safety performance.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
ABSTENTION: 1
EXPLANATION OF ABSTENTION:
CAUDILL: The Society of the Plastics Industries could not reach a consensus position on this issue.

(Log #1847)

16- 227 - (770-51(b)): Accept
Note: "See Technical Correlating Committee action on Comment 16-98."
SUBMITTER: Robert W. Jensen, dbi-Telecommunications Infrastructure Design
COMMENT ON PROPOSAL NO: 16-169
RECOMMENDATION: BICSI recommends that Code Panel 16 continue to accept this proposal.
SUBSTANTIATION: BICSI supports the introduction of limited combustible cable and recognizes that it represents a significant improvement in fire safety.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
ABSTENTION: 1
EXPLANATION OF ABSTENTION:
CAUDILL: The Society of the Plastics Industries could not reach a consensus position on this issue.

(Log #1933)

16- 228 - (770-51(b)): Accept
Note: "See Technical Correlating Committee action on Comment 16-98."
SUBMITTER: Jeffrey S. Deckman, SyNet Inc.
COMMENT ON PROPOSAL NO: 16-169
RECOMMENDATION: SyNet recommends that Code Panel 16 continue to accept this proposal.
SUBSTANTIATION: SyNet supports the acceptance and use of limited combustible cable. The NFPRF research project demonstrated that cable can be tested and listed for full compliance to the NFPA 255 and 259 test methods. Limited Combustible cable is consistent with the full requirements of NFPA 90A and its originally intended fire safety performance. We believe this cable design would provide a significant imporvement in fire safety and protect lives and property.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
ABSTENTION: 1
EXPLANATION OF ABSTENTION:
CAUDILL: The Society of the Plastics Industries could not reach a consensus position on this issue.

(Log #1088)

16- 229 - (770-52(d) (New)): Accept
SUBMITTER: Marcelo M. Hirschler, GBH International/Rep. Plenum Cable Association and Fire Retardent Chemicals Assoc.
COMMENT ON PROPOSAL NO: 16-73
RECOMMENDATION: Continue rejecting the exception for permitting cable to be listed as limited combustible to remain in plenums, in particular OFNP-50 and OFCP-50.
SUBSTANTIATION: Materials that are limited combustible can burn (i.e. they are not noncombustible) and increase the fire load. Therefore, there is a potential for increased fire hazard or fire risk when any cable, irrespective of whether it is or is not limited combustible, remains as fuel load unnecessarily once it has been taken out of use. Furthermore, all abandoned cables can also affect the safety of plenums because of their weight. There is, thus, no justification for permitting a "limited combustible" cable to remain in a plenum once it is abandoned and not intended for future use.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
ABSTENTION: 1
EXPLANATION OF ABSTENTION:
CAUDILL: The Society of the Plastics Industries could not reach a consensus position on this issue.

(Log #1096)

16- 230 - (770-52(d)): Accept in Principle
SUBMITTER: Marcelo M. Hirschler, GBH International/Rep. Plenum Cable Association and Fire Retardent Chemicals Assoc.
COMMENT ON PROPOSAL NO: 16-176
RECOMMENDATION: Continue accepting this proposal in principle, by retaining the phrase: "Abandoned cables, not intended for future use shall not be permitted to remain."
SUBSTANTIATION: There is a potential for increased fire hazard or fire risk when any cable, irrespective of whether it is or is not limited combustible, remains as fuel load unnecessarily once it has been taken out of use. Materials that are limited combustible can also burn (i.e., they are not noncombustible) and also increase the fire load. Furthermore, all abandoned cables can also affect the safety of plenums because of their weight. There is, thus, no justification for permitting any cable to remain in a plenum once it is abandoned and not intended for future use.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Refer to panel action and statement on Comment 16-195.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21

(Log #1292)

16- 231 - (770-52(d) (New)): Accept in Principle
SUBMITTER: Allen C. Weidman, The Society of the Plastics Industry, Inc.
COMMENT ON PROPOSAL NO: 16-173
RECOMMENDATION: We support the action of the panel.
SUBSTANTIATION: None.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Refer to the panel action and statement on Comment 16-195.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
ABSTENTION: 1
EXPLANATION OF ABSTENTION:
CAUDILL: The Society of the Plastics Industries could not reach a consensus position on this issue.

(Log #1293)

16- 232 - (770-52(d)): Accept in Principle
SUBMITTER: Allen C. Weidman, The Society of the Plastics Industry, Inc.
COMMENT ON PROPOSAL NO: 16-174
RECOMMENDATION: We support the action of the panel.
SUBSTANTIATION: None.
Note: Supporting Material is available for review at NFPA Headquarters.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Refer to the panel action and statement on Comment 16-195.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
ABSTENTION: 1
EXPLANATION OF ABSTENTION:
CAUDILL: The Society of the Plastics Industries could not reach a consensus position on this issue.

(Log #1294)

16- 233 - (770-52(d) (New)): Accept in Principle
SUBMITTER: Allen C. Weidman, The Society of the Plastics Industry, Inc.
COMMENT ON PROPOSAL NO: 16-175
RECOMMENDATION: We support the action of the panel.
SUBSTANTIATION: None.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Refer to the panel action and statement on Comment 16-195.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
ABSTENTION: 1
EXPLANATION OF ABSTENTION:
CAUDILL: The Society of the Plastics Industries could not reach a consensus position on this issue.

(Log #1295)

16- 234 - (770-52(d)): Accept in Principle
SUBMITTER: Allen C. Weidman, The Society of the Plastics Industry, Inc.
COMMENT ON PROPOSAL NO: 16-176
RECOMMENDATION: We support the action of the panel.
SUBSTANTIATION: None.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Refer to panel action and statement on Comment 16-195.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
ABSTENTION: 1
EXPLANATION OF ABSTENTION:
CAUDILL: The Society of the Plastics Industries could not reach a consensus position on this issue.

(Log #1089)

16- 235 - (770-52(d), Exception): Accept
SUBMITTER: Marcelo M. Hirschler, GBH International/Rep. Plenum Cable Association and Fire Retardent Chemicals Assoc.
COMMENT ON PROPOSAL NO: 16-174
RECOMMENDATION: Continue rejecting the exception for permitting cable to be listed as limited combustible to remain in plenums, in particular CL2PP and CL3PP.
SUBSTANTIATION: Materials that are limited combustible can burn (i.e. they are not noncombustible) and increase the fire load. Therefore, there is a potential for increased fire hazard or fire risk when any cable, irrespective of whether it is or is not limited combustible, remains as fuel load unnecessarily once it has been taken out of use. Furthermore, all abandoned cables can also affect the safety of plenums because of their weight. There is, thus, no justification for permitting a "limited combustible" cable to remain in a plenum once it is abandoned and not intended for future use.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
ABSTENTION: 1
EXPLANATION OF ABSTENTION:
CAUDILL: The Society of the Plastics Industries could not reach a consensus position on this issue.

(Log #1072)

16- 236 - (770-53): Reject
Note: "See Technical Correlating Committee action on Comment 16-98."
SUBMITTER: Marcelo M. Hirschler, GBH International/Rep. Plenum Cable Association and Fire Retardent Chemicals Assoc.
COMMENT ON PROPOSAL NO: 16-177
RECOMMENDATION: This proposal should be rejected, the references to OFNP-50 and OFCP-50 should be deleted from the Table 770-53 and not incorporated into Figure 770-53 and the OFNP-50 and OFCP-50 classifications should not be created.
SUBSTANTIATION: The OFNP-50 and OFCP-50 classifications are unnecessary classification because they are not justified either by requirements for reduction in fire hazard in plenums (fire hazard is the potential for harm associated with fire) or a general reduction in fire risk (fire risk is the combination of fire hazard and the probability of fires resulting in undesirable outcomes). Furthermore, they are based on a research project which is incomplete (according to the Interim Report issued) and they are based on flawed testing technology, as represented by the oxygen bomb calorimeter.

The Plenum Cable Association endorses use of fire hazard assessment and fire risk assessment in order to further develop technically supportable standards, codes and regulations, that ensure reasonable and justifiable classification and control of plastic and other combustible products. The creation of the (CXP-50) marking is not justified based on fire hazard or on fire risk and is simply an effort for one type of material to gain market share at the expense of others. If a search for better fire performance is continued indefinitely, without taking into account the overall fire safety required by the application, clearly the use of plastics and other combustible materials should be discontinued, as a non combustible material can always be found which outperforms any plastic material. Thus, if the National Electrical Code were to support unjustified improvements in fire

performance, eventually any use of plastic or other combustible materials would be in jeopardy.

Thus, there are 4 reasons to oppose the CXP-50 classifications: (i) no justification based on fire risk, (ii) no justification based on fire hazard, (iii) the study for the development of the classification by the proponents is incomplete, and (iv) the technique of oxygen bomb calorimetry, and the concept of limited combustible, are technically flawed. These concerns are exemplified as follows:

(i) An analysis of fire performance of cables addresses fire hazard.

Fire hazard analysis: Traditional CMP-rated cables will not cause significant flame spread or smoke obscuration unless the fire source is very large. For example, a CMP cable with a PVC jacket and FEP insulation was shown to have no significant flame spread (out of a possible flame spread of 20 feet) and a peak optical density of much less than 0.2 when exposed to a fire of approximately 1 MW, from a wood crib, in a full scale facility, that simulated a room and plenum [Reference: L.M. Caudill, J.R. Hoover, J.T. Walnock and J.T. Chapin, "Fire Performance of Communications Cables in Concealed Spaces", pages 277-285, NFPRF Fire Risk and Hazard Assessment Symposium, June 26-28, 1996, San Francisco, CA]. The same cable also showed approximately 2 feet flame spread in the NFPA 262 plenum cable test, with a peak optical density not exceeding 0.3, according to the same reference. Clearly, if a cable does not spread flame significantly when a 1 MW fire source is applied, it does not represent any severe fire hazard. In a different scenario, a similar type of cable was studied by the European research project FIPEC, and found to release 42 kW and less than 6 MJ, to spread flame vertically for only 1.1 m, and to give low smoke release when tested in a severe vertical cable tray test (30 kW input at high air flow rate) [Reference: Fire Performance of Electric Cables Report, Interscience Communications, UK, 1999]. This indicates that the fire hazard associated with traditional CMP cables (and this with traditional CL2P and CL3P cables) is very low.

(ii) Analysis of NFPA statistics serves to illustrate fire risk. NFPA statistics address the following types of fires:

* "Non residential concealed space structure fires involving ignition of fixed wiring in ceiling/roof assemblies" {Roof plenums are examples of these spaces}
* "Non residentia1 concealed space structure fires involving ignition of fixed wiring in ceiling/floor assemblies" {Floor plenums are examples of these spaces}

In each case, the statistics can distinguish whether wire and cable insulation was or was not the item first ignited, giving four sets of statistics relevant to plenum cables. These statistics are relevant to the fire risk from plenum cables, as plenum cables are the typical type of wire and cable insulation present in roof plenums or in floor plenums.

Fire risk analysis: The statistics indicate that, between 1980 and 1996, there have been an average of only 584 fires per year, and of those only 171 have started with ignition of a wire and cable product, and the trend has been downwards (see the attached Tables with fire statistics and the attached charts, indicating a similar type of downward trend for both concealed roof spaces and concealed floor spaces). In fact, over the entire period between 1980 and 1996 the total number of fires in concealed roof spaces involving ignition of fixed wiring has been 0.29% of the total number of non residential structure fires (of which less than 30% started in wire and cable) and the total number of fires in concealed floor spaces involving ignition of fixed wiring has been 0.10% of the total number of non residential structure fires (of which ca. 32% started in wire and cable). With regard to fatalities or injuries: out of 3,734 fatalities in non residential structure fires, only 7 occurred in concealed roof or floor spaces involving ignition of fixed wiring (less than 0.19%), and out of 60,950 injuries in non residential structure fires, only 85 occurred in concealed roof or floor spaces involving ignition of fixed wiring (less than 0.14%). At least 4 of the 7 fatalities have been shown not to have resulted from plenum cable fires with the other 3 unknown. Thus, the fire record in a period when the amount of installed plenum cables increased from virtually none to some 20 billion feet, indicates that the fire risk is minimal.

(iii) The classifications of CXP-50 are not yet ready for application, since the NFPA Fire Protection Research Foundation Project developing the classification has not yet issued its final report. The Interim Report (International Limited Combustible Plenum Cable Fire Test Project, Interim Report, by F.B. Clarke and R.G. Gewain, June 2000) is the source of our [Plenum Cable Association] concerns. The first objective of this project was to: "Develop harmonized Steiner Tunnel listing protocols for permanent plenum cables related to NFPA 262/UL 910 and NFPA 255." The Interim Report describes part of Phase I of the project, wherein no harmonized listing protocol has been developed. The Interim Report addresses NFPA 255 and NFPA 259 and states, among other things:

* NFPA 255, flame travel distance: "... The NFPA 255 flame travel distances appear to be highly repeatable {i.e. within one lab} in each laboratory, as evidenced by the small variance of the measurements, *but not particularly reproducible* {i.e. between labs}, as can be seen by comparing this variance with the interlaboratory results. ..." {Emphasis added, but statement comes verbatim from report}
* NFPA 255, smoke index, or SDI: "... With respect to the smoke measurements, multiple determinations of the SDI by a given laboratory on a given cable agree with one another quite closely *but the SDI's reported by the two labs for the same cables do not appear to be close at all*. The results reported by Laboratory 2 are, with one exception, systematically higher than those of Laboratory 1. ..." {Emphasis added, but statement comes verbatim from report}
* NFPA 255 precision: " ... The flame spread and smoke measurements in NFPA 255 show ... *relatively poor reproducibility*, i.e. the result for a cable in a given laboratory can be repeated with precision but the difference in results between laboratories is on average considerably larger than the repeatability error. ..." {Emphasis added, but statement comes verbatim from report}
* Procedure for NFPA 255: "It is possible to test wire and cable following the current NFPA 255 test procedure, using the mounting specified for plastics in Appendix B7 of the standard." Appendix B-7 of NFPA 255 states:

"B-7 Plastics. B-7.1 The term plastics includes foams, reinforced panels, laminates, grids, and transparent or translucent sheets.

B-7.2 Where any plastic remains in position in the tunnel during a fire test, no additional support is necessary. Thermoplastic materials and other plastics that do not remain in place should be supported by 1/4-in. (6.3-mm) round metal rods or 3/16 in. (4.8 mm) thick 2 in. (51 mm) wide steel bars, or 2-in. (51-mm) galvanized hexagonal wire mesh supported with metal bars or rods spanning the width of the tunnel."

It is interesting to compare this with the statements in NFPA 262, as follows:

"1-1.3* Although this test uses equipment similar to that used in NFPA 255, Standard Method of Test of Surface Burning Characteristics of Building Materials, and ASTM E 84, Standard Test Method for Surface Burning Characteristics of Building Materials, sufficient changes have been made to the chamber so that a test conducted in the apparatus used for NFPA 255 or ASTM E 84 cannot be considered identical or produce comparable results.

A-1-1.3 The changes made in equipment for this test were deemed necessary in order to obtain proper precision from the test when the equipment is used for small quantities of wire and cable, which produce much smaller quantities of heat release and smoke obscuration."

* NFPA 259: "... NFPA 259 has traditionally been carried out on individual materials, and so the potential heat of a finished product like a cable would be calculated as the um of the contributions of each component, each contribution being the potential heat of the component multiplied by the mass fraction of that component in the cable. To produce such a measurement it would be necessary to disassemble the cable into its different components – insulation, jacket, shielding, rip cord and the like – and measure the potential heat of each component. *An obvious question is whether such a cumbersome procedure is necessary* ..." {Emphasis added, but statement comes verbatim from report}.
* Observations on NFPA 259: "One of the labs (Laboratory 2) had both more experience and more advanced equipment ..."
* Procedure for NFPA 259: "... The procedure followed was NFPA 259, Standard Test Method for Potential Heat of Building Materials, 1998 Edition, with modifications to the following sections: ... *This modification should be viewed provisionally since it so far has only been tested on 4-pair unshielded twisted pair (UTP) plenum cable*." {Emphasis added, but statement comes verbatim from report}

(iv) The oxygen bomb calorimeter test used to assess "limited combustible" classifications is severely flawed. NFPA 259 uses the oxygen bomb calorimeter as part of its testing to assess potential heat. The term "limited combustible" was developed for "building construction materials", with the intent of applying it to materials of construction of the plenum and not to cables. NFPA 90A defines "limited combustible" as follows:

"Limited-Combustible Material. A building construction material not complying with the definition of noncombustible

material that in the form in which it is used, has a potential heat value not exceeding 3500 Btu/lb (8141 kJ/kg) where tested in accordance with NFPA 259, Standard Test Method for Potential Heat of Building Materials, and complies with (a) or (b):

(a) Materials having a structural base of noncombustible material, with a surfacing not exceeding a thickness of 1/8 in. (3.2 mm), that has a flame spread index not greater than 50; (b) Materials, in the form and thickness used, other than as described in (a), having neither a flame spread index greater than 25 nor evidence of continued progressive combustion, and of such composition that surfaces that would be exposed by cutting through the material on any plane would have neither a flame spread index greater than 25 nor evidence of continued progressive combustion. Materials subject to increase in combustibility or flame spread index beyond the limits herein established through the effects of age, moisture, or other atmospheric condition shall be considered combustible."

The oxygen bomb calorimeter is a method for determining the theoretical (or complete or absolute) calorific energy (or heat of combustion), as opposed to the effective (or practical) values. The reason such instruments are used is to ensure that the correct value is chosen. As such they represent the following chemical equations for combustible fuels containing only carbon, hydrogen and oxygen:

$$C + O_2 = CO_2$$

$$4\,H + O_2 = 2\,H_2O$$

For hydrocarbon fuels: $- C\,H_2 - + O_2 = CO_2 + H_2O$

However, when building materials are more complex, because they contain other elements, there is a certain inconsistency in the equation and in the energy calculated.

1. Cl: Thus, for example, when PVC is burnt in an oxygen bomb, depending on the fraction of hydrogen atoms present, there will be different proportions of the following two equations:

$$(C_2\,H_3\,Cl)_n + 2.5\,n\,O_2 = 2\,n\,CO_2 + n\,H_2O + n\,HCl$$

$$(C_2\,H_3\,Cl)_n + 2.75\,n\,O_2 = 2\,n\,CO_2 + 1.5\,n\,H_2O + 0.5\,n\,Cl_2$$

where the two equations differ by 380 kJ/kg.

2. S: Combustion of materials containing sulphur also depends on the final product. Typically the combustion bomb generates sulphuric acid as the final sulphur containing product, while furnace combustion generates sulphur dioxide (with the sulphur less fully oxidized). Therefore, the convention in bomb calorimetry is to determine values of calorific value of fuels (including coal), by referring to the quantitative conversion to sulphur dioxide, and ignoring the conversion to sulphuric acid (or sulphur trioxide) that occurs, by using a conversion factor based on the sulphur content. Interestingly, gypsum (which is calcium sulphate dihydrate), is a building material containing sulphur. The typical fuel containing sulphur is coal. The difference between conversion to sulphur dioxide and sulphuric acid is 9410 kJ/kg.

3. N: Combustion of materials containing nitrogen also has a convention: the heat of convention is normally calculated assuming that all the nitrogen is converted into molecular nitrogen. However, that is not what happens in oxygen bomb calorimetry, where nitrogen oxides and nitric acid are actually formed. Thus, a correction is applied to account for the following equation:

$HNO_3 = 0.5\,H_2O + 0.5\,N_2 + 1.25\,O_2$, with a net heat of reaction of 1017 kJ/kg.

4. F: Combustion of materials containing fluorine is generally represented as ending in the formation of carbon tetrafluoride (CF_4) and of hydrogen fluoride (HF), in varying proportions. The equation is as follows:

$$C_a\,H_b\,O_c\,F_e + (a+b/4-c/2-e/4)\,O_2 + (n+1/2)*e*(1-x) - b/2)\,H_2O = (a-ex/4)\,CO_2 + + ex/4\,CF_4 + e(1-x)\,(HF) + e(1-x)\,n\,H_2O$$

where x is the fraction of fluorine atoms converted to CF_4 as opposed to converted to HF. The energy of the conversion of CF_4 to HF is approximately 192 kJ/kg. Moreover, fluorine materials will attack the walls of the bomb calorimeter.

5. Si: Compounds containing silicon are impossible to convert completely to their final oxidation product, which is silica (SiO_2), by conventional means because as burning proceeds, the material becomes covered by a layer of silica which prevents access of oxygen and leads to the formation of a residue. The only way to obtain a reliable result of heat of combustion of materials containing silicon (such as silicones) is by a method which combines the material with an organic fluorine compound (the value of which has been accurately assessed in advance) in rotating bomb containing also water and aqueous HF. This converts all the Si into fluorosilicic acid, and the results can then be calculated back.

6. P: Compounds containing phosphorus are exceedingly difficult to assess by oxygen bomb combustion calorimetry. There are four major problems: (1) various phosphorus acids with different energies of dilution are formed in various concentrations throughout the oxygen bomb, (2) the combustion products contain different types of phosphorus oxyacids, each one of which has a different heat of formation, (3) the burning compound gets covered by phosphorus oxides and acids, which inhibit further combustion and (4) the bomb calorimeter walls are attacked and metal phosphates are formed, so that the recommended wall materials should be corundum or gold, since Pyrex glass, quartz, stainless steel titanium, porcelain and platinum all suffered heavy weight losses. For example, depending on whether a rotating bomb or a static bomb is used, the fraction of pyrophosphoric acid formed varied from 10 to 18% and that of triphosphoric acid from 1 to 3%.

7. Auxiliary combustion material: When an auxiliary material is used for assessing the heat of combustion, a 1% error in the assessment of the heat of combustion of the auxiliary material (such as benzoic acid), which is typically used in the order of 20% energy loading, corresponds to a 5% error in the total energy/heat measured. Thus, at a value of 1500 kJ/kg that would be an error of 75 kJ/kg, and this would be a systematic error for that series of experiments.

8. Moisture content: the moisture content of the building material is critical, because the combustion reaction considered in the oxygen bomb is that to convert to gaseous water. Thus, if a material contains water, the water will have reaction to vaporize the water content. Thus, results must be expressed as a function of the original moisture content for them to be valid. This matters, of course, for materials that absorb moisture when exposed to the atmosphere.

Bibliography on oxygen bomb calorimetry:

* Mansson, Margret, "Determination of Calorific Values of Building Materials - A Guide", SP Nordtest Report Project 871-90, Swedish National Testing and Research Institute, Boras, Sweden, 1991.

* Head, Arthur J, and Good, William D., "Combustion of Liquid/Solid Compounds with Non-Metallic Hetero Atoms", Chapter 9 in "Combustion Calorimetry", "Volume 1, Experimental Chemical thermodynamics", Eds. Stig Sunner & Margret M. Mansson), Pergamon Press, Oxford, UK (for Int. Union Pure & Applied Chemistry, IUPAC), 1979.

* Mansson, Margret and Hubbard, Ward N., "Strategies in the Calculation of Standard-State Energies of Combustion from the Experimentally Determined Quantities", Chapter 5 in "Combustion Calorimetry", "Volume 1, Experimental Chemical thermodynamics", Eds. Stig Sunner & Margret M. Mansson), Pergamon Press, Oxford, UK (for Int. Union Pure & Applied Chemistry, IUPAC), 1979.

* Hu, Andrew T., Sinke, G.C., Mansson, Margret and Ringner, Birgitta, "Test Substances for Bomb Combustion Calorimetry, p-Chlorobenzoic Acid". J. Chem. Thermodynamics, 4, 283-99 (1972).

* Mansson, Margret, "Thermochemistry - Some Recent Lines of Development", Pure & Applied Chemistry, 55(3), 417-26 (1983).

* Mansson, Margret, "A 4.5 cm^3 Bomb Combustion Calorimeter and an Ampoule Technique for 5 to 10 mg Samples with Vapour Pressures Below Approximately 3 kPa (20 Torr)", J. Chem. Thermodynamics, 5, 7232 (1973).

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

PANEL ACTION: Reject.

PANEL STATEMENT: Refer to panel action and statement on Comment 16-98.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21

VOTE ON PANEL ACTION:

AFFIRMATIVE: 20

ABSTENTION: 1

EXPLANATION OF ABSTENTION:

CAUDILL: The Society of the Plastics Industries could not reach a consensus position on this issue.

(Log #751)

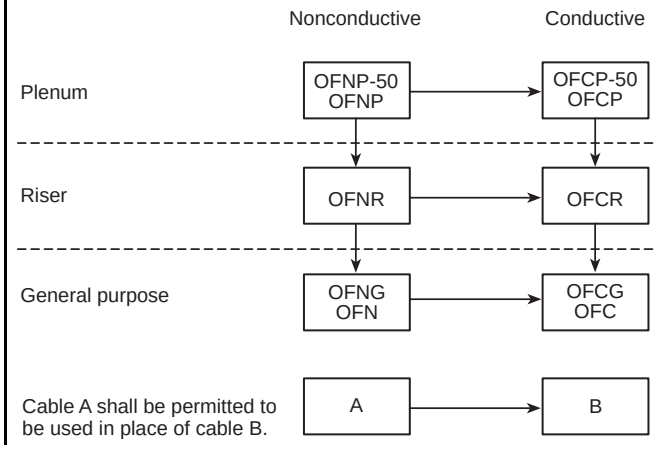
16- 237 - (Table 770-53): Reject
SUBMITTER: Irving Mande, Edwards System Technology (EST)
COMMENT ON PROPOSAL NO: 16-178
RECOMMENDATION: Reconsider the panel action and accept this proposal.
SUBSTANTIATION: The panel statement does not seem to consider that OFC type could also be specified for safety reasons. The panel should explain why they do not consider metallic strength members and metallic armor or sheath to be usable for safety reasons.
PANEL ACTION: Reject.
PANEL STATEMENT: Article 770 permits nonconductive optical fiber cable, under some conditions, to be run in the same raceway with power cable. Conductive optical fiber cable is never permitted to run in the same raceway with power cable because of the possibility of energizing the metallic strength member. The cable substitution table and chart consider fire performance and shock hazard. Mechanical protection is not considered in Article 770. The substitution table does not consider engineering considerations.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21

(Log #1596)

16- 238 - (Table 770-53): Reject
Note: "See Technical Correlating Committee action on Comment 16-98."
SUBMITTER: Wayne G. Carson, Carson Assoc. Inc.
COMMENT ON PROPOSAL NO: 16-177
RECOMMENDATION: Delete reference to OFNP-50 and OFCP-50 cables in Table 770-53 and Figure 770-53.
SUBSTANTIATION: The new cable classification "Limited Combustible Cable" if deleted as recommended by comments to sections 725.71(b) [16-89]; 760-71(e) [16-149]; 770-51(b) [16-169]; 800-51(h) [16-232]; and 820-51(b) [16-302] will not be included in the Code. This type cable designation is not needed and is premature - see related comments for complete substantiation.
PANEL ACTION: Reject.
PANEL STATEMENT: Refer to panel action and statement on Comment 16-98.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
ABSTENTION: 1
EXPLANATION OF ABSTENTION:
CAUDILL: The Society of the Plastics Industries could not reach a consensus position on this issue.

(Log #274)

16- 239 - (Figure 770-53): Accept
Note: "See Technical Correlating Committee action on Comment 16-98."
SUBMITTER: Stanley Kaufman, Lucent Technologies
COMMENT ON PROPOSAL NO: 16-177
RECOMMENDATION: Revise Figure 770-53 as shown:



SUBSTANTIATION: This comment revises Figure 770-53 to be consistent with Table 770-53.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
ABSTENTION: 1
EXPLANATION OF ABSTENTION:
CAUDILL: The Society of the Plastics Industries could not reach a consensus position on this issue.

(Log #750)

16- 240 - (Figure 770-53): Reject
SUBMITTER: Irving Mande, Edwards System Technology (EST)
COMMENT ON PROPOSAL NO: 16-179
RECOMMENDATION: Accept this proposal.
SUBSTANTIATION: This comment should also be accepted if my comment for Proposal 16-178 is accepted.
PANEL ACTION: Reject.
PANEL STATEMENT: Refer to the panel action and statement on Comment 16-237.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21

(Log #1296)

16- 241 - (770-53(a)): Accept in Principle
SUBMITTER: Allen C. Weidman, The Society of the Plastics Industry, Inc.
COMMENT ON PROPOSAL NO: 16-182
RECOMMENDATION: We support the action of the panel.
SUBSTANTIATION: None.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Refer to the panel action and statement on Comment 16-195.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
ABSTENTION: 1
EXPLANATION OF ABSTENTION:
CAUDILL: The Society of the Plastics Industries could not reach a consensus position on this issue.

(Log #306)

16- 242 - (770-53(b)): Accept
SUBMITTER: Stanley Kaufman, Lucent Technologies
COMMENT ON PROPOSAL NO: 16-180
RECOMMENDATION: In the second sentence, revise the order of the cable types to read:
Only Types OFNP, OFCP, OFNR and OFCR shall be permitted to be installed in these raceways.
SUBSTANTIATION: The reordering is consistent with the rest of the article where the cables on top of the fire resistance hierarchy are listed before the cables lower in the hierarchy.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21

(Log #1297)

16- 243 - (770-54(e) (New)): Accept in Principle
SUBMITTER: Allen C. Weidman, The Society of the Plastics Industry, Inc.
COMMENT ON PROPOSAL NO: 16-185
RECOMMENDATION: We support the action of the panel.
SUBSTANTIATION: None.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Refer to the panel action and statement on Comment 16-195.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
ABSTENTION: 1

EXPLANATION OF ABSTENTION:
CAUDILL: The Society of the Plastics Industries could not reach a consensus position on this issue.

(Log #1298)

16- 244 - (770-54(e) (New)): Accept in Principle
SUBMITTER: Allen C. Weidman, The Society of the Plastics Industry, Inc.
COMMENT ON PROPOSAL NO: 16-186
RECOMMENDATION: We support the action of the panel.
SUBSTANTIATION: None.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Refer to the panel action and statement on Comment 16-195.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
ABSTENTION: 1
EXPLANATION OF ABSTENTION:
CAUDILL: The Society of the Plastics Industries could not reach a consensus position on this issue.

(Log #301)

16- 245 - (800-2 Abandoned Cable (New)): Accept in Principle
SUBMITTER: Gerald Lee Dorna, Belden Wire & Cable Co.
COMMENT ON PROPOSAL NO: 16-189
RECOMMENDATION: The definition of "Abandoned Cable" should be the same here as what we accepted in Proposal 16-273. It should be:
"Cable that is neither terminated at ~~both ends, at a connector or other~~ equipment, not identified for future use with a tag."
This is the same wording we accepted for Proposal 16-273.
SUBSTANTIATION: The reason we took out the reference to connectors in Proposal 16-273 is because CATV cable usually has connectors attached. It was our concern that CATV cables would have connectors attached and then would not fall under the definition the panel had accepted in principal. If we make the definition the same as I have suggested above then it will make it irrelevant on whether the cable has connectors or not. I can foresee someone using the fact that the cable has a connector on it, therefore it does not fall under "abandoned cable" and does not need to be removed.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Refer to panel action and statement on Comment 16-247.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21

ARTICLE 800 —COMMUNICATIONS CIRCUITS

(Log #459)

16- 246 - (800-2, Abandoned Cable): Accept in Principle in Part
SUBMITTER: Technical Correlating Committee on Signaling Systems for the Protection of Life and Property
COMMENT ON PROPOSAL NO: 16-189
RECOMMENDATION: Revise the proposed definition of abandoned cable to read as follows:
"Cable that is neither terminated at equipment, nor identified for future use with a dated tag."
SUBSTANTIATION: The definition proposed for 820-2 by the Panel Action of Proposal 16-273 is clear and concise and should be used consistently in all Articles. This proposed definition has been modified in the above recommendation to add the word "dated" before the word "tag." The tag should be dated so the authority having jurisdiction can determine the date on which the cable was designated for future use. This will establish a means to allow the decision of abandonment to be re-evaluated periodically if the authority having jurisdiction so desires.
PANEL ACTION: Accept in Principle in Part.
PANEL STATEMENT: See panel action and statement on Comment 16-247. That comment included a definition. The part adding the word "dated" is rejected.
In buildings that are prewired for communications, cables may remain unused for extended periods until tenants change and require a reconfiguration of communications cabling. To add a date to the tag would add confusion, and might even result in removal of cable that is part of the intended building prewiring. The Manual of Style precludes the use of requirements within definitions.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21

(Log #1848)

16- 247 - (800-2): Accept in Principle
SUBMITTER: Robert W. Jensen, dbi-Telecommunications Infrastructure Design
COMMENT ON PROPOSAL NO: 16-189
RECOMMENDATION: New wording:
Abandoned Cable. Installed cable that is neither terminated at both ends at a connector or other equipment, nor identified for future use with a tag.
SUBSTANTIATION: BICSI added the word installed to show that the cable needs to be installed and not in the installers truck. We retained "terminated at both ends" because communications cable is typically terminated at both ends when it is in use (i.e., when not abandoned).
PANEL ACTION: Accept in Principle.
Revise the recommendation to read as follows:
"Abandoned Communications Cable. Installed communications cable that is not terminated at both ends at a connector or other equipment and not identified for future use with a tag."
PANEL STATEMENT: The revised text satisfies the submitter's intent and more clearly expresses the definition and complies with the Manual of Style.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21

(Log #1299)

16- 248 - (800-2-Abandoned Cable (New)): Accept in Principle
SUBMITTER: Allen C. Weidman, The Society of the Plastics Industry, Inc.
COMMENT ON PROPOSAL NO: 16-189
RECOMMENDATION: We support the action of the panel.
SUBSTANTIATION: None.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Refer to panel action and statement on Comment 16-247.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21

(Log #1575)

16- 249 - (800-2-Abandoned Cable): Accept in Principle
SUBMITTER: Wayne G. Carson, Carson Assoc. Inc.
COMMENT ON PROPOSAL NO: 16-189
RECOMMENDATION: Revise text to read as follows:
Abandoned Cable: Cable that is <u>not</u> ~~neither~~ terminated at both ends, ~~at a connector or other~~ <u>not connected to</u> equipment, <u>or not</u> ~~nor~~ identified for future use with a tag.
SUBSTANTIATION: The term "terminated at a connector" may result in cables being left in place as many cables come with connectors or the installer could add crimp connectors and leave the cables in place. The present language can be easily misunderstood: does the cable have to be terminated and tagged, or is it a choice?
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Refer to panel action and statement on Comment 16-247.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21

(Log #1753)

16- 250 - (800-2-Abandoned Cable): Accept in Principle
SUBMITTER: Francis W. Peri, Communications Design Corporation
COMMENT ON PROPOSAL NO: 16-189
RECOMMENDATION: New wording:
Abandoned cable. Installed cable that is neither terminated at both ends at a connector or other equipment, nor identified for future use with a tag.
SUBSTANTIATION: The word "installed" shows that the cable needs to be installed and not in the installer's truck. The words "terminated at both ends" are accurate and descriptive since

communications cable is typically terminated at both ends when it is in use (i.e., when not abandoned).
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Refer to panel action and statement on Comment 16-247.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21

(Log #1300)

16- 251 - (800-3, FPN): Accept
SUBMITTER: Allen C. Weidman, The Society of the Plastics Industry, Inc.
COMMENT ON PROPOSAL NO: 16-191
RECOMMENDATION: We support the action of the panel.
SUBSTANTIATION: None.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
ABSTENTION: 1
EXPLANATION OF ABSTENTION:
CAUDILL: The Society of the Plastics Industries could not reach a consensus position on this issue.

(Log #203)

16- 252 - (800-5): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 16-192
RECOMMENDATION: See Technical Correlating Committee action on Proposal 16-38. It was the action of the Technical Correlating Committee that further consideraton be given to the comments expressed in the voting. The Technical Correlating Committee directs that the Action on this Proposal be revised to comply with the NEC Style Manual 3.2.1 relative to use of the unenforceable terms "practicable" and "impracticable". This action will be considered by the Panel as a Public Comment. It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 3 for Comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
PANEL STATEMENT: Refer to the recommendation and substantiation on Comment 16-270a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21

(Log #705)

16- 253 - (800-5): Reject
SUBMITTER: Glenn W. Zieseniss, Crown Point, IN
COMMENT ON PROPOSAL NO: 16-192
RECOMMENDATION: Change the "Accept in Principle" to "Reject".
SUBSTANTIATION: I agree with Mr. Egesdal's and Mr. Speer's negative vote and comment on Proposal 16-192. This proposal is giving a "blanket okay for any type of ceiling tile to support the possible added weight of 3 cables of less than 1/2 in. in diameter on each ceiling tile. The proposal does not affirm that the ceiling tile industry was contacted of adding weight to lay on their product. This product is not part of the building structure, and is not designed to be suitable for supporting cables. I have seen ceiling tiles which look as if made of fiber glass insulation which has a finished surface on the exposed side of the ceiling. It is my belief that this ceiling tile would not accept additional weight upon it. I have contacted three ceiling tile companies or organizations on this proposal. They all suggested that their ceiling tiles are not to support additional weight. I have provided copies of my e-mail contacts.
NOTE: Supporting Material is available at NFPA Headquarters.
PANEL ACTION: Reject.
PANEL STATEMENT: The recommendation of Comment 16-270a provides a reasonable, safe, and practical solution to placing a limited number of unsupported signaling and communications cables in existing construction. The restrictions contained in Comment 16-270a limit both the number and size of wires and cables permitted on each ceiling panel, thereby controlling weight and accumulation so that cables can be easily moved aside to permit access. The submitter's concern about weight is addressed by decreasing the size of the cable to 1/4 inch and limiting the number of cables to three per each 10 ft x 10 ft area.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
SPEER: See my explanation of negative vote on Comment 16-27a.

(Log #861)

16- 254 - (800-5): Accept in Principle in Part
SUBMITTER: Larry F. Miller, National Electrical Manufacturers Association (NEMA)
COMMENT ON PROPOSAL NO: 16-192
RECOMMENDATION: The Panel should continue to Accept the proposal in Principle but revise the Panel action text to read as follows:
800- Access to Electrical Equipment Behind panels Designed to Allow Access.
Access to electrical equipment shall not be denied by an accumulation of wires and cables that prevents removal of panels. Cables shall be installed in such a manner that the cable will not be damaged by normal building use or maintenance. Access to electrical equipment behind ceilings designed to allow access shall comply with (a) or (b).
a. New building construction (e.g., renovation, remodeling, new spaces). Installation of cables shall comply with Section 300.11.
b.1. Installation of cables in suspended lay-in type ceiling spaces shall comply with 300.11.
2. Installation of cables in other than suspended lay-in type ceiling spaces shall comply with 300.11 where the space is accessible.
3. Where the ceiling is not the lay-in type, and the space is not accessible, three cables less than 13 mm (0.5 in.) shall be permitted to be installed unsupported by the building structure between access points or access panels.
~~Buildings with existing cabling systems.~~
~~Where practicable, installation of cables shall comply with Section 300.11. Where impracticable to comply with Section 300.11, cables less than 13 mm (0.5 in) in diameter shall be permitted to be installed unsupported by the building structure in accordance with 1 or 2.~~
~~1. In areas having ceilings with access points or access panels, it shall be permissible to fish a maximum of three cables between access points in the ceiling.~~
~~2. In areas having suspended lay-in ceilings, it shall be permissible to install a maximum three supported cables on top of any one ceiling tile. The cables shall be run parallel to the ceiling grid."~~
SUBSTANTIATION: We agree with Mr. Egedsal's and Mr. Speer's negative comments that suspended ceilings are not intended to support electrical wires or cables.
Section 300-11(a)(1) (wiring located within the cavity of a fire-rated floor-ceiling or roof-ceiling) allows an exception for wiring that has been tested as part of the fire-rated assembly. This proposal could compromise the fire-rating of the ceiling by overriding that requirement. The words "or maintenance" have been added because so much of the damage occurs in ceiling spaces as various trades perform maintenance.
The submitter states that he has submitted companion proposals for Articles 725 760, 770, 820 and 830. If each of these articles will allow three cables per ceiling tile, this could result in a total of 18 cables per ceiling tile, which appears to be approaching the "excessive accumulation" the submitter agrees could be a hazard. Limiting the size and quantity of cable permitted to be fished in non-lay-in ceiling spaces will help control the weight of cable (combined with that permitted in the other articles referenced above) on these ceilings.
PANEL ACTION: Accept in Principle in Part.
PANEL STATEMENT: The panel rejects the recommended addition of the word "maintenance." The term "normal building use" includes "maintenance." The balance of the recommendation is accepted in principle. Refer to the recommendation and substantiation on Comment 16-270a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
NEGATIVE: 1

EXPLANATION OF NEGATIVE:
SPEER: See my explanation of negative vote on Comment 16-27a.

(Log #968)

16- 255 - (800-5): Accept in Part
SUBMITTER: Palmer Hickman, Royersford, PA
COMMENT ON PROPOSAL NO: 16-192
RECOMMENDATION: Reject Proposal 16-192 as amended by Code-Making Panel 16. Accept Proposal as submitted by Mr. Brunssen.
SUBSTANTIATION: I implore Code-Making Panel 16 to reconsider their action on this proposal. The proposed 800.5(B)(2) would now permit three cables to be installed on the tiles of a suspended ceiling, without providing any technical substantiation for this allowance.

I understand that this proposed allowance of ceiling support only applies to buildings with existing cabling systems where it is "impracticable" to comply with 300-11. Impracticability does not provide technical substantiation to allow a ceiling assembly that has not been evaluated to support the potential additional load of three cables on each and every ceiling tile.

I am aware that Chapter 8 is independent of other chapters except where specifically referenced therein. Panel 16 has referenced 300-11, and Code-Making Panel 3 is on record reaffirming their prohibition of ceiling assemblies being used beyond the manufacturers design parameters in the Panel Statement to Comments 3-53 and 3-57 of the 1998 ROC, and Proposal 3-68 of the 2001 ROP. In the latter reference, Code-Making Panel 3 states: "The panel reaffirms its position that an independent means of support shall be provided for all wiring, not just branch circuit wiring...".

The substantiation provided by Mr. Brunssen for his proposal does not support the proposed change as amended by Code-Making Panel 16. He claims that "a limited amount of wiring or cabling laid directly on a suspended ceiling is permitted..." without stating where this permission is given. The entire substantiation of the submitter seems contrary to the action of the panel. I am not sure he would recognize the end result as the proposal he made. Mr. Brunssen begins his substantiation by stating that "Section 800-5 may be misinterpreted to mean that wires and cables may not be placed directly on suspended ceilings." He notes that the 1999 NEC Handbook "Figures 800-1 and 800-2 lead the reader to conclude that no wires or cables are permitted to rest directly on the suspended ceiling." The submitter also stated Code-Making Panel 16 responded to a proposal to Article 725 (1992 TCD Comment 16-18) that the proposed requirement "...would still allow some cabling of a limited quantity above the ceiling tile, but not to an excessive amount." Note the words "above the ceiling tile", not on the ceiling tile. I feel these examples are not misinterpretations, but rather correct interpretations, and a case to reject this proposal as amended by CMP16.

In conclusion, I respectfully disagree with the Panel Action on this Proposal. I find no technical substantiation to warrant such a dramatic change. Mr. Brunssen presented a well-researched proposal addressing access, not support. The substantiation of the submitter does not support this change, nor does the Panel Statement.
PANEL ACTION: Accept in Part.
PANEL STATEMENT: The panel accepts the portion of the comment to retain Section 800.5, and rejects the portion of the comment to reject Proposal 16-192. Refer to the recommendation and substantiation on Comment 16-270a. Also refer to the panel action and statement on Comment 16-253.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
SPEER: See my explanation of negative vote on Comment 16-27a.

(Log #1147)

16- 256 - (800-5): Accept in Principle
SUBMITTER: James E. Brunssen, Telcordia Technologies, Inc.
COMMENT ON PROPOSAL NO: 16-192
RECOMMENDATION: Revise as follows:

800-5. Access to Electrical Equipment Behind Panels Designed to Allow Access. Access to electrical equipment shall not be denied by an accumulation of wires and cables that prevents removal of panels. Cables shall be installed in such a manner that the cable will not be damaged by normal building use. Access to electrical equipment behind ceilings designed to allow access shall comply with (a) or (b).

a. New building construction (e.g., renovation, remodeling, new spaces). Installation of cables shall comply with Section 300.11.

b. Buildings with existing cabling systems. Where practicable, installation of cables shall comply with Section 300-11. Where impracticable to comply with Section 300-11, cables less than 13 mm (0.5 in.) in diameter shall be permitted to be installed unsupported by the building structure in accordance with 1 or 2.

1. In areas having ceilings with access points or access panels, it shall be permissible to fish a maximum of three cables between access points in the ceiling.

2. In areas having suspended lay-in ceilings, it shall be permissible to install a maximum of three unsupported cables on top of ~~any one~~ each ceiling tile, i.e., up to three wires and cables are permitted to lay on a ceiling tile. The cables shall be run parallel to the ceiling grid.

SUBSTANTIATION: Proposed Section 800-5(b)(2), as presently written in Proposal 16-192, panel action, is confusing and could be interpreted as permitting a total of only three unsupported wires and cables above a suspended ceiling. The intent of the panel was that up to a maximum of three unsupported wires and cables may be routed across each and every ceiling tile. The revision proposed in this comment clarifies and accomplishes the intent of the panel. This is a companion comment and is intended to correlate with comments on Proposals 16-38, 16-112, 16-159, 16-276, and 16-332.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Refer to the recommendation and substantiation on Comment 16-270a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
SPEER: See my explanation of negative vote on Comment 16-27a.

(Log #1152)

16- 257 - (800-5): Accept in Principle
SUBMITTER: James E. Brunssen, Telcordia Technologies, Inc.
COMMENT ON PROPOSAL NO: 16-192
RECOMMENDATION: Continue to accept in principle.
SUBSTANTIATION: Panel 16 should continue to accept in principle as it provides a reasonable and safe solution to placing a limited number of signaling and communications wires and cables in existing construction. The restrictions contained in the proposed change limit both the number and size of wires and cables permitted on each suspended ceiling panel. In this manner additional weight, as well as an accumulation of wires and cables that would otherwise restrict access above suspended ceiling panels, is controlled and limited. The limited number of cables permitted can easily be moved aside to permit access. Some concern has also been expressed that cables placed directly on the ceiling panels would degrade the fire rating of the ceiling. The suspended ceiling, part of a membrane that is intended to retard fire from spreading into the ceiling cavity, would be unaffected in its ability to retard the spread of fire by a limited number of wires and cables resting on top of the panels. This is a companion comment and is intended to correlate with comments on Proposals 16-38, 16-112, 16-159, 16-276, and 16-332.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Refer to the substantiation on Comment 16-270a. This action meets the intent of the submitter.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
SPEER: See my explanation of negative vote on Comment 16-27a.

(Log #1166)

16- 258 - (800-5): Accept in Principle
SUBMITTER: James E. Brunssen, Telcordia Technologies, Inc.
COMMENT ON PROPOSAL NO: 16-192
RECOMMENDATION: Revise as follows:

800-5. Access to Electrical Equipment Behind Panels Designed to Allow Access. Access to electrical equipment shall not be denied by an accumulation of wires and cables that prevents removal of panels. Cables shall be installed in such a manner that the cable will not be damaged by normal building use. Access to electrical equipment behind ceilings designed to allow access shall comply with (a) or (b).

a. New building construction (e.g., renovation, remodeling, new spaces). Installation of cables shall comply with Section 300.11.

b. Buildings with existing cabling systems. ~~Where practicable, installation of cables shall comply with Section 300-11. Where impracticable with Section 300-11, c~~Cables less than 13 mm (0.5 in.) in diameter shall be permitted to be installed unsupported by the building structure in accordance with 1 or 2.

1. In areas having ceilings with access points or access panels, it shall be permissible to fish a maximum of three cables between access points in the ceiling.

2. In areas having suspended lay-in ceilings, it shall be permissible to install a maximum of three unsupported cables on top of any one ceiling tile. The cables shall be run parallel to the ceiling grid.

Where the maximum number of cables permitted in 1 or 2 will be exceeded, installation of cables shall comply with Section 300.11.

SUBSTANTIATION: The Technical Correlating Committee has directed that Proposal 16-192 be revised to comply with the NEC Style Manual 3.2.1 relative to the use of unenforceable terms. The proposed revision contained in this comment removes the unenforceable terms "practicable" and "impracticable"; the remaining text is in agreement with the NEC Style Manual 3.1.2 using the phrase "shall be permitted" to indicate allowed optional or alternate methods. The added text (final sentence) provides direction on how to proceed if the limits of 800-5(b)(1) or (2) will be exceeded. This is a companion comment and is intended to correlate with comments on Proposals16-38, 16-112, 16-159, 16-276, and 16-332.

PANEL ACTION: Accept in Principle.

PANEL STATEMENT: Refer to the recommendation and substantiation on Comment 16-270a.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21

VOTE ON PANEL ACTION:

AFFIRMATIVE: 20

NEGATIVE: 1

EXPLANATION OF NEGATIVE:

SPEER: See my explanation of negative vote on Comment 16-27a.

(Log #1462)

16- 259 - (800-5): Accept in Principle

SUBMITTER: Thomas J. Garvey, Milwaukee, WI

COMMENT ON PROPOSAL NO: 16-192

RECOMMENDATION: Revise 800-5 to read as follows:

"800-5. Access to Electrical Equipment Behind Panels Designed to Allow Access. Access to electrical equipment shall not be denied by an accumulation of wires and cables that prevents removal of panels. Cables shall be installed in such a manner that the cable will not be damaged by normal building use. Access to electrical equipment behind ceilings designed to allow access shall comply with 300-11.

SUBSTANTIATION: The proposed text for existing buildings is not enforceable. For example, a 20 foot by 64 foot room with lay-in type tiles. Not including any lay-in luminaires, there would be 100 4-foot by 2-foot tiles. How many cables would be permitted in this room supported by the tiles? 30? 48? Now the owner replaces the ceiling with 2-foot by 2-foot tiles. How many cables are now permitted?

Ceiling systems are not an acceptable substitute for proper cable support.

PANEL ACTION: Accept in Principle.

PANEL STATEMENT: Refer to the recommendation and substantiation of Comment 16-270a which limits the number of unsupported cables that can be installed in non-fire rated ceilings. Installations in fire-rated ceilings must comply with Section 300.11.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21

VOTE ON PANEL ACTION:

AFFIRMATIVE: 20

NEGATIVE: 1

EXPLANATION OF NEGATIVE:

SPEER: See my explanation of negative vote on Comment 16-27a.

(Log #CC1605)

16- 270a - (800-5, 7, 8): Accept

Note: The Technical Correlating Committee directs that the references to Articles 640 and 650 be deleted because the panel did not accept similar requirements in those articles. The Technical Correlating Committee also directs that the FPN which contains a mandatory requirement be deleted to comply with the NEC Style Manual.

SUBMITTER: CMP 16

COMMENT ON PROPOSAL NO: 16-192

RECOMMENDATION: Renumber current Section 800-7 as 800-8.

Retain the existing 1999 code text for Section 800-5 (unmodified).

Add new Section 800.7 to read as follows:

800.7 Installation of Circuits.

Communications circuits shall be installed in compliance with A or B.

A. New Ceiling Construction. The installation of cables in new ceiling construction shall comply with Section 300-11.

B. Existing Ceilings.

1. Fire-Rated Ceilings. The installation of cables in the cavity of an existing fire-rated ceiling assembly shall comply with Section 300-11.

2. Non-Fire-Rated Ceilings. For installations in the cavity of an existing non-fire-rated ceiling assembly, cables less than 6 mm (0.25 in) in diameter shall be permitted to be installed unsupported from the building structure in accordance with the following:

a. Fixed or Hard Ceilings. In areas having fixed or hard ceilings with access points or access panels, a combined total of three cables from Articles 640, 650, 725, 760, 770, 800, 820 and 830, shall be permitted to be placed between access points or access panels in the ceiling. Additional cables shall be installed in accordance with 300.11.

b. Suspended Lay-In Ceilings. In areas having suspended lay-in ceilings, in any 3 m by 3m (10 ft. x 10 ft) ceiling area, a combined total of three cables from Articles 640, 650, 725, 760, 770, 800, 820 and 830, shall be permitted to be installed directly on the ceiling grid. Additional cables shall be installed in accordance with 300.11.

FPN. Cables of all types are included in the total limit of three cables, not three cables from each article.

SUBSTANTIATION: Proposal 16-192 was accepted in principle to permit the installation of unsupported cables under limited conditions. Proposal 16-192 text, however, was too broad and unclear. The text of this comment clarifies the original intent. The new text includes requirements to comply with Section 300.11. Permitted installation conditions will not compromise the integrity of fire-rated ceilings. For non-fire-rated ceilings, the permitted relief from Section 300.11 is limited to very specific conditions. Section 800.5 is not being modified because the accessibility requirements should remain.

The sections have been renumbered so that they appear in a logical order.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21

VOTE ON PANEL ACTION:

AFFIRMATIVE: 20

NEGATIVE: 1

EXPLANATION OF NEGATIVE:

SPEER: See my explanation of negative vote on Comment 16-27a.

(Log #1754)

16- 260 - (800-5): Accept in Principle

SUBMITTER: Francis W. Peri, Communications Design Corporation

COMMENT ON PROPOSAL NO: 16-192

RECOMMENDATION: Association of Cabling Professionals (ACP) recommends that Code Panel 16 continue to accept this proposal.

SUBSTANTIATION: ACP supports the introduction of complying with Section 300-11. It represents a major improvement in providing safe cabling pathways.

PANEL ACTION: Accept in Principle.

PANEL STATEMENT: Refer to the substantiation on Comment 16-270a. This action meets the intent of the submitter.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21

VOTE ON PANEL ACTION:

AFFIRMATIVE: 20

NEGATIVE: 1

EXPLANATION OF NEGATIVE:

SPEER: See my explanation of negative vote on Comment 16-27a.

(Log #1849)

16- 261 - (800-5): Accept in Principle

SUBMITTER: Robert W. Jensen, dbi-Telecommunications Infrastructure Design

COMMENT ON PROPOSAL NO: 16-192

RECOMMENDATION: BICSI recommends that Code Panel 16 continue to accept this proposal.

SUBSTANTIATION: BICSI supports the introduction of complying with Section 300-11 and recognizes that it represents a significant improvement in providing safe cabling pathways.

PANEL ACTION: Accept in Principle.

PANEL STATEMENT: Refer to the substantiation on Comment 16-270a. This action meets the intent of the submitter.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
SPEER: See my explanation of negative vote on Comment 16-27a.

(Log #1910)

16- 262 - (800-5): Reject
SUBMITTER: Michael I. Callanan, International Brotherhood of Electrical Workers
COMMENT ON PROPOSAL NO: 16-192
RECOMMENDATION: Reject this proposal.
SUBSTANTIATION: This proposal will allow for a continuous buildup of cable, lying on ceilings without individual support, creating a dangerous situation. All cable, of any type system must be supported independently of the ceiling system.
Ceiling systems are not designed to support additional weight from cables or raceways of any type. Cable support is a Safety issue. Persons who maintain systems will constantly fight with cable which may impede access to most ceiling tiles. An accessible ceiling must remain "Accessible." The intent of many safety driven sections in the NEC is to support/secure all cables and raceways to the structural ceiling. This prevents the buildup of cable from contributing to a ceiling failure. This also assures that in the event of a ceiling failure cables and raceways from all types of systems remain supported by the building structure.
If this proposal is accepted, in a fire situation, the failure of the ceiling system would result in a tremendously dangerous situation for fire fighters and rescue personnel.
Individual support of cable will not create a tremendous expense for the user. There are many readily available support systems including cable tray to allow for the safe installation of system cables.
This comment represents the official position of the International Brotherhood of Electrical Workers Codes & Standards Committee.
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter's concern regarding accessibility is addressed by retaining the original Section 800.5. The recommendation of Comment 16-270a provides a reasonable, safe, and practical solution to placing a limited number of unsupported signaling and communications cables in existing construction. The restrictions contained in Comment 16-270a limit both the number and size of wires and cables permitted on each ceiling panel, thereby controlling weight and accumulation so that cables can be easily moved aside to permit access. The submitter's concern about weight is addressed by decreasing the size of the cable to 1/4 inch and limiting the number of cables to three per each 10 ft x 10 ft area.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
SPEER: See my explanation of negative vote on Comment 16-27a.

(Log #2239)

16- 263 - (800-5): Accept in Principle
SUBMITTER: Thomas J. Garvey, Milwaukee, WI
COMMENT ON PROPOSAL NO: 16-192
RECOMMENDATION: Revise 800-5 to read as follows:
800-5. Access to Electrical Equipment Behind Panels Designed to Allow Access. Access to electrical equipment shall not be denied by an accumulation of wires and cables that prevents removal of panels. Cables shall be installed in such a manner that the cable will not be damaged by normal building use. Access to electrical equipment behind ceilings designed to allow access shall comply Section with 300-11.
SUBSTANTIATION: The proposed text for existing buildings is not enforceable. For example, a 20 foot by 64 foot room with lay-in type tiles. Not including any lay-in luminaries, there would be 100 4 foot by 2 foot tiles. How many cables would be permitted in this room supported by the tiles? 30? 48? Now the owner replaces the ceiling with 2 foot by 2 foot tiles. How many cables are now permitted?
Ceiling systems are not an acceptable substitute for proper cable support.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Refer to panel action and statement on Comment 16-259.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
SPEER: See my explanation of negative vote on Comment 16-27a.

(Log #2292)

16- 264 - (800-5): Reject
SUBMITTER: Christopher R. Pharo, Marlton, NJ
COMMENT ON PROPOSAL NO: 16-192
RECOMMENDATION: I ask that this proposal be rejected.
SUBSTANTIATION: This proposal seems to conflict with the requirements in 800-6 that requires support every 5 feet.
A suspended ceiling system is not recognized in other areas of the Code to support cables, conduit, or boxes. Special attention has been given to this in past code cycles. We finally have a consensus of what is good for the industry, now we are being asked to take a step backwards.
PANEL ACTION: Reject.
PANEL STATEMENT: Refer to the recommendation and substantiation of Comment 16-270a which addresses the concerns of accessibility, weight and support.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
SPEER: See my explanation of negative vote on Comment 16-27a.

(Log #743)

16- 265 - (800-5(b)): Accept in Principle in Part
SUBMITTER: Richard P. Owen, City of St. Paul, Electrical Inspection
COMMENT ON PROPOSAL NO: 16-192
RECOMMENDATION: Replace (b) of the proposal with the following text:
(b) Buildings not Covered Under (a) Above. In areas having ceilings with access points or panels and having 900 mm (3 ft) or less vertical clearance above the ceiling, it shall be permissible to fish a maximum of 3 cables, each less than 13 mm (0.5 in.) in diameter, between access points in the ceiling.
SUBSTANTIATION: The Technical Correlating Committee directed Panel 3 Chair Raymond Weber to form a Task Group to review these proposals and to submit the results as comments to Panel 16. Task Group 3-16, consisting of Chair Weber, members Steven Speer; Lee Hewitt; Richard Owen and Ron Maassen held a conference call on October 3, 2000 and developed the above language as a comment. The Task Group was concerned with allowing unsupported cabling above suspended ceilings, since companion proposals for Articles 725, 760, 770, 800, 820 and 830 would also allow this limited cabling without support. The possible accumulation of cable allowed by all these articles would be excessive and would both limit access to a ceiling and conflict with Section 300.11. Rewording of (b) also eliminated the unenforceable terms "practicable" and "impracticable" as directed by the Technical Correlating Committee.
PANEL ACTION: Accept in Principle in Part.
PANEL STATEMENT: The panel rejects the specific limitations in the comment but accepts the principle of permitting a limited number of cables. The recommendation of Comment 16-270a provides a reasonable, safe, and practical solution to placing a limited number of unsupported communications wires and cables in existing construction.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
SPEER: See my explanation of negative vote on Comment 16-27a.

(Log #1257)

16- 266 - (800-5(b)(2)): Reject
SUBMITTER: J. Paul Spinn, USG Research & Technology Center
COMMENT ON PROPOSAL NO: 16-192
RECOMMENDATION: Delete the following text:
In areas having suspended lay in ceiling, it shall be permissible to install a maximum of three unsupported cables on top of any one ceiling tile. The cables shall be run parallel to the ceiling grid.

SUBSTANTIATION: By allowing a maximum of three unsupported cables on top of any one (or more) ceiling tiles, the fire-rating of the assembly and the Class A surface burning characteristic requirement, which includes flame spread and smoke development, could be jeopardized. By decreasing the fire-rating of the plenum assembly and the surface burning characteristic of the ceiling tile, the life safety of the occupants can be negatively affected. By rejecting this proposal, these problems can be eliminated.

To substantiate the comment made for the proposal, four key points are provided:

[1] For a fire rated floor/ceiling or roof/ceiling assembly, placement of unsupported cables on top of any one ceiling tile or a row of ceiling tiles could invalidate the fire-rating for a particular assembly. The rationale for this argument are:
(a) The weight of the cables could cause premature tile fallout leading to an early failure of the assembly, which is tested in accordance with NFPA 251 or ASTM E 119.
(b) The increased heat of combustion associated with the cable jackets, which commonly use plastics, will add to the total fire load of an assembly. As the total fire load increases for an assembly, the fire endurance of the assembly will decrease, which could jeopardize an assembly's fire-rating.

[2] For a Class A ceiling, placement of unsupported cables on the ceiling can effect flame spread and smoke development performance and jeopardize the required Class A rating for the ceiling tiles. The rationale for this argument are:
(a) The flame spread will increase due to the increased total heat load, which is caused by the plastic on the cable jacket.
(b) The smoke development will increase due to the cable jackets, which are usually plastic such as PVC or CPVC.

[3] The placement of unsupported cables on top of any one or more ceiling tiles presents potential life safety issues for occupants due to the decreased fire-rating of the floor/ceiling or roof/ceiling or an increase in the ceiling surface burning characteristics.

[4] Placement of unsupported cables on top of any one ceiling tile or a row of ceiling tiles would increase ceiling tile sag due to increased weight of the cables on the ceiling tiles, and would impair the accessibility of the ceiling plenum.

PANEL ACTION: Reject.
PANEL STATEMENT: The recommendation of Comment 16-270a provides a reasonable, safe, and practical solution to placing a limited number of unsupported signaling and communications cables in existing construction. The restrictions contained in Comment 16-270a limit both the number and size of cables permitted on each ceiling panel, thereby controlling weight and accumulation so that cables can be easily moved aside to permit access. The submitter's concern about weight is addressed by decreasing the size of the cable to 1/4 inch and limiting the number of cables to three per each 10 ft x 10 ft area. The revised text precludes the installation of cables in all fire-rated ceiling assemblies.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
SPEER: See my explanation of negative vote on Comment 16-27a.

(Log #2086)

16- 267 - (800-5(b)(2) (New)): Accept in Principle in Part
SUBMITTER: Marcelo M. Hirschler, GBH International
COMMENT ON PROPOSAL NO: 16-192
RECOMMENDATION: Revise text as follows:

800-5. Access to Electrical Equipment Behind Panels Designed to Allow Access

Access to equipment shall not be denied by an accumulation of wires and cables that prevents removal of panels. Cables shall be installed in such a manner that the cable will not be damaged by normal building use. Access to electrical equipment behind ceilings designed to allow access shall comply with (a) or (b).

a. New building construction (e.g. renovation, remodeling, new spaces). Installation of cables shall comply with Section 300.11.

b. Buildings with existing cable systems. Where practicable, installation of cables shall comply with Section 300.11. Where impracticable to comply with Section 300.11, in those areas having ceilings with access points or access panels, it shall be permissible to fish a maximum of three cables less than 13 mm (0.5 in) in diameter, between access points in the ceiling. ~~cables less than 13 mm (0.5 in) in diameter shall be permitted to be installed unsupported by the building structure in accordance with 1 or 2.~~

~~1. In areas having ceilings with access points or access panels, it shall be permissible to fish a maximum of three cables between access points in the ceiling.~~

~~2. In areas having suspended lay-in ceilings, it shall be permissible to install a maximum of three unsupported cables on top of any one ceiling tile. The cables shall be run parallel to the ceiling grid.~~

SUBSTANTIATION: The permission granted by the panel to install cables on suspended ceiling tiles should be rescinded. Neither cables nor any other item should be installed on top of a suspended ceiling tile. The support systems of suspended ceilings are not designed to resist any significant amount of weight without being deflected or broken.

This issue has been raised on Proposal 16-192 (log 1665) in negative comments by two panel members, Mr Egesdal and Mr Speer, who both correctly point out that suspended ceiling tiles are not intended to support the weight of electrical cables. Mr. Sandy Egesdal repeats his negative comment on this proposal.

The point made by the Technical Correlating Committee on proposal 16-38 that such use would constitute an exposed use of cables is an additional consideration to rejecting this part of the proposal.

PANEL ACTION: Accept in Principle in Part.
PANEL STATEMENT: The panel accepts the principle of permitting a limited number of cables to be installed in a fixed or hard ceiling. The panel rejects the balance of the submitter's recommendation including the limiting of the installation of cables in a suspended lay-in ceiling . The recommendation of Comment 16-270a provides a reasonable, safe, and practical solution to placing a limited number of unsupported signaling and communications cables in existing construction.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
SPEER: See my explanation of negative vote on Comment 16-27a.

(Log #862)

16- 268 - (800-6): Accept
SUBMITTER: Larry F. Miller, National Electrical Manufacturers Association (NEMA)
COMMENT ON PROPOSAL NO: 16-192a
RECOMMENDATION: The Panel should Accept the proposal in Principal and revise the panel recommendation as follows:
"Mechanical Execution of Work. Communications circuits and equipment shall be installed in a neat and workmanlike manner. Cables installed exposed on the outer surface of ceiling and sidewalls shall be supported by the structural components of the building strucutre...".
SUBSTANTIATION: To clarify this cable is in the room, not in the ceiling void space.
PANEL ACTION: Accept.
PANEL STATEMENT: The panel notes that the only effect of this action is to add the word "outer." The remaining text is not affected.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
SPEER: See my explanation of negative vote on Comment 16-27a.

(Log #1158)

16- 269 - (800-6): Reject
SUBMITTER: James E. Brunssen, Telcordia Technologies, Inc.
COMMENT ON PROPOSAL NO: 16-192a
RECOMMENDATION: Delete 800-6 and incorporate the information in 800-5 as follows:

800-5. ~~Access to Electrical Equipment Behind Panels Designed to Allow Access~~ Mechanical Execution of Work. Communications circuits and equipment shall be installed in a neat and workmanlike manner. Access to electrical equipment shall not be denied by an accumulation of ~~wires and~~ cables that prevents removal of panels. Cables shall be installed in such a manner that the cable will not be damaged by normal building use. ~~Access to electrical equipment behind ceilings designed to allow access.~~ Cables installed exposed shall comply with (a) or (b).

a. New building construction (e.g., renovation, remodeling, new spaces). Installation of cables shall comply with Section 300.11 Cables shall be supported by structural components of the

building. Such cables shall be attached to structural components at intervals not exceeding 1.52 m (5 ft) and within 305 mm (12 in.) from every cabinet, box or fitting by straps, staples, hangers or similar fittings designed and installed so as not to damage the cable. The installation shall also conform with Section 300-4(d).

(b) Buildings with existing cable systems. Where practicable, installation of cables shall comply with ~~Section 300-11~~ 800-5(a). Where impracticable to comply with ~~Section 300-11~~ 800-5(a), cables less than 13 mm (0.5 in.) in diameter shall be permitted to be installed unsupported by the building structure in accordance with 1 or 2.

1. In areas having ceilings with access points or access panels, it shall be permissible to fish a maximum of three cables between access points in the ceiling.

2. In areas having suspended lay-in ceilings, it shall be permissible to install a maximum of three unsupported cables on top of any one ceiling tile. The cables shall be run parallel to the ceiling grid.

Continue to delete the fine print note as proposed in Proposal 16-192a.

SUBSTANTIATION: This is a companion comment and is intended to correlate with similar comments on Proposals 16-39, 16-115, 16-159a, 16-276a, and 16-333a. Sections 800-5 and 800-6 actually address the same issue, the mechanical execution of work. Accessibility behind panels designed to allow access is really an "execution of work" issue. Additionally, the Technical Correlating Committee has identified a potential conflict between the panel action on Proposals 16-38 and 16-39, that would also result here in 800. This comment editorially combines 800-5 and 800-6 into a single Section 800-5 requiring attachment to the building structure of exposed cables and conductors and, where impracticable to do so, permits a limited number of cables of specified maximum size to be placed on suspended ceiling tiles. It accommodates the intent of both proposals that cables should be supported by the building structure, but in extenuating circumstances in existing construction, a limited number and weight of cables may be placed on a suspended ceiling. Further, in the first paragraph of 800-5, the phrase "wires and" is deleted as communications circuits are typically provided via cable and cable is defined in 800-2.

PANEL ACTION: Reject.

PANEL STATEMENT: The sections should not be combined. Refer to the recommendation and substantiation for Comment 16-270a where these recommendations are addressed.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21

VOTE ON PANEL ACTION:

AFFIRMATIVE: 20

NEGATIVE: 1

EXPLANATION OF NEGATIVE:

SPEER: See my explanation of negative vote on Comment 16-27a.

(Log #1418)

16- 270 - (800-6): Accept in Part

SUBMITTER: Kari Barrett, American Chemistry Council

COMMENT ON PROPOSAL NO: 16-192a

RECOMMENDATION: Delete the following text:

~~Such cables shall be attached to structural components at intervals not exceeding 1.52 m (5 ft) and within 305 mm (12 In.) from every cabinet, box or fitting by straps, staples, hangers or similar fittings designed and installed so as not to damage the cable. The installation shall also conform with Section 300-4(d).~~

SUBSTANTIATION: The addition of this text would make the mandatory requirements of this section overly specific. The present wording is sufficient guidance to both the installer and the authority having jurisdiction.

PANEL ACTION: Accept in Part.

Revise the third sentence of the panel action text of Proposal 16-192a to read as follows:

"Such cables shall be attached to structural components by straps, staples, hangers or similar fittings designed and installed so as not to damage the cable."

PANEL STATEMENT: The panel accepts the removal of specific distances for the attachment of the cable. The panel does not agree that the existing code wording is sufficient guidance to both the installer and the authority having jurisdiction.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21

VOTE ON PANEL ACTION:

AFFIRMATIVE: 20

NEGATIVE: 1

EXPLANATION OF NEGATIVE:

SPEER: See my explanation of negative vote on Comment 16-27a.

(Log #615)

16- 271 - (800-10(c)): Accept in Principle

SUBMITTER: Steven C. Johnson, Time Warner Cable

COMMENT ON PROPOSAL NO: 16-202

RECOMMENDATION: Reject the proposal to prohibit use of service masts for drop attachments.

SUBSTANTIATION: There is no reason to force a homeowner to install a separate mast to accommodate communications (telephone, CATV) service drops wherever the service mast can be listed to do so. An arbitrary prohibition of attaching to electrical masts is not reasonable. Where the mast can be shown to support additional attachments without creating a safety hazard, these attachments should be allowed. Reasonable qualifications would include the ability to support the weight (with ice loading) and not damage the mast or structure, ability to maintain proper clearance, etc.

PANEL ACTION: Accept in Principle.

PANEL STATEMENT: Refer to the panel action and statement on Comment 16-272.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21

VOTE ON PANEL ACTION:

AFFIRMATIVE: 16

NEGATIVE: 5

EXPLANATION OF NEGATIVE:

DORNA: I am in agreement with Mr. Kahn that the primary jurisdiction of these items are in Code-Making Panel 4. Code-Making Panel 4 has rejected the idea, and I believe Code-Making Panel 16 should do the same. Therefore, I am changing my vote to negative.

KAHN: The comments should be rejected and the original Panel Action to Reject Proposal 16-202 should be sustained.

Code-Making Panel 4 has rejected the Proposal and that panel has primary jurisdiction. In their Panel Statement, they state: "... that they do not believe that the listing of the product will adequately address the personnel issues that are created by the co-mingling of the different systems on a common mast. Issues such as loading can be addressed by the proposed listing, however personnel safety cannot be assured regardless of the listing criteria." I agree with their assessment.

A task group of Code-Making Panel 4 and Code-Making Panel 16 members as suggested in the Panel Statement should be formed to study the problem further if the
Technical Correlating Committee deems it advisable.

MANGAN: I am voting against Panel 16's action on Comments 16-271; 16-272; 16-273 on Section 800.10, Comments 16-336; 16-337; 16-338 on Section 820.10, Comments 16-391; 16-392; 16-393 on Section 830.10. The addition of these 3 cables to an electric service mast would compromise the safety of workers and the added liability of these cables in close proximity to live conductors. This type of installation would be a violation of Sections 230.28 and 300.11. The electric utility companies would not allow any other drops to this service mast. Also, service masts are not limited to single family homes, they are also used on service stations and low commercial buildings. The requirements for electric service masts are designated by the electric utility company serving the area.

SPEER: Code-Making Panel 4 has jurisdiction over this issue and any proposed change should be addressed to that panel.

In Comment 16-272, the submitter states that it is "unreasonable to arbitrarily prohibit attaching to the electric service mast", thereby causing the homeowner to bear the cost of a separate comunications mast.

The reasoning for not allowing other systems to attach drops to the electric service mast is not "arbitrary", but a well founded safety concern for those who must have access to the mast area. They may be required to work with energized circuits associated with that mast.

The required safe working clearances may also be impeded by the installation of other systems on the electric service mast, as well as, the safe avenues of escape from the area may become unnecessarily restricted, for those required to work on energized circuits associated with these masts.

Further, the submitter suggests that the homeowner might suffer less expense by utilizing a single mast "listed" for the application, as opposed to using separate system masts. My experience suggests that the expense for a "listed" piece of equipment will far exceed the cost of a piece of galvanized rigid conduit or intermediate rigid conduit, as is now being used.

TODD: See my explanation of negative on Comment 16-155.

(Log #1144)

16- 272 - (800-10(c) (New)):

Note: The Technical Correlating Committee directs that this comment be reported as "Reject" to correlate with the action on Proposal 4-73 and Comment 4-51.

SUBMITTER: James E. Brunssen, Telcordia Technologies, Inc.
COMMENT ON PROPOSAL NO: 16-202
RECOMMENDATION: Accept the proposal.
SUBSTANTIATION: This is a companion comment to my comment on Proposal 4-73 wherein it was proposed to revise Section 230-28 to permit communications wires and cables to be attached to a service mast that is listed for the purpose. Code-Making Panel 4 has been asked to reconsider their rejection of Proposal 4-73, based on the panel statement that Code-Making Panel 4 does not "believe" listing will adequately address the personnel safety issues. Code-Making Panel 4's position is contrary to both the industry and NEC accepted method to ensure the safety of wiring, cable, and equipment when used for its intended application, that of listing by a Nationally Recognized Testing Laboratory (NRTL). Listing will ensure that the service mast can adequately support multiple attachments while providing for the safety of power, communications and CATV technitions who must access the service mast. Code-Making Panel 16 stated that detailed design and installation requirements are not defined. This is the purpose of listing - to establish that a product will be safe when used as intended. It is unreasonable to arbitrarily prohibit attaching to the electric service mast and cause the homeowner to bear the cost of a separate mast for communications. When the mast is listed and installed properly for its intended use it will be capable of safely supporting, and safely permitting access to, multiple attachments. CMP 16 should accept Proposal 16-202 based on the merits of the submitter's original substantiation, contingent upon the action of Code-Making Panel 4.

Note also companion comments to Proposals 16-281 and 16-344.

PANEL ACTION: Accept.
PANEL STATEMENT: CMP 16 understands that CMP 4 has primary jurisdiction over requirements associated with the power service mast. A companion comment has been submitted to CMP 4 to allow relief for the attachment of communications cables to the power service mast. Should CMP 4 continue to reject the proposal, CMP 16 requests that the Technical Correlating Committee assign a task group consisting of members of both panels to review the issues.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16
NEGATIVE: 5
EXPLANATION OF NEGATIVE:
DORNA: See my explanation of negative vote on Comment 16-271.
KAHN: See my explanation of negative vote on Comment 16-271.
MANGAN: See my explanation of negative vote on Comment 16-271.
SPEER: See my explanation of negative vote on Comment 16-271.
TODD: See my explanation of negative vote on Comment 16-155.

(Log #1645)

16- 273 - (800-10(c)):

Note: The Technical Correlating Committee directs that this comment be reported as "Reject" to correlate with the action on Proposal 4-73 and Comment 4-51.

SUBMITTER: Andy Scott, National Cable Television Association
COMMENT ON PROPOSAL NO: 16-202
RECOMMENDATION: Accept Proposal 16-202.
SUBSTANTIATION: NCTA, on behalf of the cable television industry, strongly urges Panel 16 to accept these proposals. An arbitrary prohibition of attaching to electrical masts is not reasonable. Where it can be established that the mast can support additional attachments without creating a safety hazard, these attachments should be allowed. Reasonable substantiation would include the ability to support the weight (with ice loading) and not damage the mast or structure, ability to maintain proper clearance, etc. It is unreasonable to force a homeowner to install a separate mast to accommodate communications (telephone, CATV) service drops when the service mast can be listed to do so.
PANEL ACTION: Accept.
PANEL STATEMENT: Refer to the panel action and statement on Comment 16-272.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16
NEGATIVE: 5
EXPLANATION OF NEGATIVE:
DORNA: See my explanation of negative vote on Comment 16-271.
KAHN: See my explantion of negative vote on Comment 16-271.
MANGAN: See my explanation of negative vote on Comment 16-271.
SPEER: See my explanation of negative vote on Comment 16-271.
TODD: See my explanation of negative vote on Comment 16-155.

(Log #1118)

16- 274 - (800-40(a)(4)): Reject
SUBMITTER: Steven C. Johnson, Time Warner Cable
COMMENT ON PROPOSAL NO: 16-212
RECOMMENDATION: Reject Proposal 16-212.
SUBSTANTIATION: 1. The distance between entrances for different services is practically limited to 100 feet for most installations which corresponds to 0.3 ohms for 14 AWG solid copper conductor and 0.05 ohms for 6 AWG solid copper conductor. Neither resistance is significant. The new 800-40(a)(4) proposed would mandate placing an additional electrode wherever the distance between the grounding terminal for communications cables and the electrical service ground is greater than 20 feet. The additional electrode would not significantly decrease resistance to ground nor increase safety.

2. The practical difference between the existing code and the proposed change is that the grounding conductor size is increased to 6 AWG every time the 20-foot distance rule is violated. This difference results in 0.25 ohm difference in the extreme case of 100 feet grounding conductor run. The difference is usually significantly less than 0.25 ohms since the distance is usually less than 100 feet.

3. The proposal provided no technical justification for the quantified 20 foot limitation and no demonstrated improvement in safety. No problems are cited and no incidents of damage or harm are presented that are the result of present installation and bonding practices.

4. The 20 foot rule is not always practical to maintain. The new proposal would result in a backlash from homeowners whenever an additional electrode is to be placed and 6 AWG wire to be used to bond it to the existing electrode system.

PANEL ACTION: Reject.
PANEL STATEMENT: The panel's intent is to limit the potential difference between power and communications circuits during lightning events.

That potential difference is generally a function of conductor inductance (L), which increases in direct proportion to conductor length, and the rate of rise of the current (di/dt). This proposal addresses that issue, encourages short primary protector grounding conductor, provides guidance as to a reasonable maximum length, and provides an alternative where it is not practicable to meet the maximum length (20 ft) restriction. The proposed length restriction is limited to one- and two-family residences as it is such installations that are more likely to have diverse power and communications entrances and experience lightning-related problems (urban/suburban environment with a fewer elevated structures and extensive buried metallic objects).
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 19
NEGATIVE: 2
EXPLANATION OF NEGATIVE:
JOHNSON: This proposal has no technical merit and no demonstrated improvement in safety. To my knowledge, no incidents of harm or damage that were the result of existing installation and bonding practices have been documented to support such a change in existing practice.

The practice within the cable industry is to maintain grounding conductors as short as practicable. In many installations, the distance between entrances for different services can be limited to less than 20 feet. Where this cannot be reasonably accomplished, typical worst-case grounding conductor installations are under approximately 100 feet. This distance corresponds to 0.3 ohms for 14 AWG solid copper conductor and 0.05 ohms for 6 AWG solid copper conductor. Neither resistance is significant. Notwithstanding the additional increase in installation cost to the customer, the 20 ft rule cannot be practically maintained, and would result in a negative reaction from homeowners whenever an additional electrode is to be placed and 6 AWG wire to be used to bond it to the existing electrode system.

Justification for introduction of the new rule was based solely on the danger caused by lightning impulses present in the telecommunications drops. Previous comments to the proposal clearly indicated that a direct contact with high voltage power lines

is addressed adequately by the existing NEC rules and together with NESC rules provides for a safe installation.

The telecommunications installation cannot be considered separately from the rules imposed by the rules of NESC. The NESC requires a minimum of four (4) grounding/bonding points in each mile of plant. The impedance of these grounding points is much lower than the impedance of the grounding points at the cable entrance to the building (considering communications drops and grounding conductors). This is true for any type of current surges and their rise times, ranging from 60Hz current (resulting from contacts with power lines) to lightning induced surges of a 4 microsecond rise time.

Previous editions of the NEC allowed that the system contained within a block may be considered as not exposed to lightning or accidental contacts with high voltage power lines and hence did not have to be grounded at the building entrance. The new proposal approved by the panel to require point of entrance or attachment grounding in all instances was justified not by safety requirements but by the need to reduce confusion as to when grounding is or is not required. Hence, the grounding system for the communications drop at the building entrance contributes only minimally (due to its higher impedance that the grounding of the plant) in dissipation of the current surges to the ground. In the worst case, it is only one of the five grounding points for a plant within a block.

Because of the role of the entire grounding network, the increased building grounding requirement improves the ground impedance for high frequency events (similar to surges with a 4 microsecond rise time) by 20 percent at worst and by 40 percent at best. This fact, considered jointly with the points above, indicates that the total improvement provided by the new proposal is not material. No documentation has been submitted to show that the communications installations following the existing rules of the NESC and the NEC are unsafe.

TODD: The submitter of the proposal did not provide technical justification for the 20 foot limitation, originally requested for five feet, or if it solves the concerns of the proposals and comments expressed during the 1999 Code cycle. This is an additional cost to the homeowner/commercial establishment without evidence being provided that safety will be improved.

(Log #1647)

16- 275 - (800-40(a)(4)): Reject
SUBMITTER: Andy Scott, National Cable Television Association
COMMENT ON PROPOSAL NO: 16-212
RECOMMENDATION: Reject Proposal 16-212.
SUBSTANTIATION: The Cable Television industry urges the NFPA to reject this proposal. These proposals have no technical merit and no demonstrated improvement in safety. To our knowledge, no incidents of harm or damage that were the result of existing installation and bonding practices have been documented to support such a change in existing practice.

The practice within the cable industry is to maintain grounding conductors as short as practicable. In the majority of installations, the distance between entrances for different services is limited to approximately 100 ft. This distance corresponds to 0.3 ohms for 14 AWG solid copper conductor and 0.05 ohms for 6 AWG solid copper conductor. Neither resistance is significant. Notwithstanding the additional increase in installation cost to the customer, the 20 ft rule cannot be practically maintained, and would result in a negative reaction from homeowners whenever an additional electrode is to be placed and 6 AWG wire to be used to bond it to the existing electrode system.
PANEL ACTION: Reject.
PANEL STATEMENT: Refer to the panel action and statement on Comment 16-274.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 19
NEGATIVE: 2
EXPLANATION OF NEGATIVE:
JOHNSON: See my explanation of negative vote on Comment 16-274.
TODD: See my Explanation of Negative on Comment 16-274.

(Log #2249)

16- 276 - (800-48): Reject
SUBMITTER: Guy R. Franks, SBC
COMMENT ON PROPOSAL NO: 16-220
RECOMMENDATION: Reject the proposal.
SUBSTANTIATION: Raceways for communications wires and cables have not been required to be grounded by the NEC and this has not resulted in any adverse operational or safety related issues. The rationale for this proposal does not present any technical justification to now require grounding of these raceways. Further, Section 250-86 refers the reader to Section 250-112(i), Section 250-112(i) refers the reader to Article 250, Section B for the grounding requirements associated with the system of interest. Through all of this, there is no requirement to ground the raceways of communications systems. In fact, it appears the Article 250 references result in these raceways being exempt from grounding. Since this proposal does not result in a clear and enforceable requirement Code-Making Panel 16 should reject this proposal.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel reaffirms the requirement for metal communications raceways to be grounded in accordance with Section 250-86. All metal raceways should be grounded because the potential exists that raceway can be energized. This proposal is clear and enforceable.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
BRUNSSEN: The original proposal (16-220) provided no technical justification other than to "...bring metal raceways and enclosures for telecommunications cabling into conformance with other sections of the Code." Neither a safety issue, nor adverse experience with ungrounded telecommunications metallic enclosures and raceways has been cited. Installations of telecommunications equipment and circuits have maintained an exemplary safety record over many decades and there has been no demonstrated reason to revise telecom installation requirements. Further, I would ask the panel to reconsider the substantiation provided with the submitter's Comment 16-276. Section 250-86 refers the reader to Section 250-112(i) which in turn refers the reader to Article 250, Section B. Article 250, Section B addresses service conductors and does not even mention communications circuits. The result is a requirement that is unclear and unenforceable. Panel 16 should, therefore, accept Comment 16-276, which will reject the original Proposal (16-220).

(Log #752)

16- 277 - (800-50, 800-51, 800-52 and 800-53): Accept in Principle in Part
SUBMITTER: Irving Mande, Edwards System Technology (EST)
COMMENT ON PROPOSAL NO: 16-223
RECOMMENDATION: Accept the original proposal after making the following revisions that are in response to questions raised in the panel statement. Instead of deleting 800-51(g), revise it to read:

(g) Multipurpose (MP) Cables. Listing of multipurpose (MP) cables shall not be permitted after July 1, 2003. Existing inventories of new and used MP cables shall be permitted to be used until the supply is exhausted.

FPN: For the permitted use of communications (CM) type cables as a multipurpose cable that can be used as a substitute for MP and other power-limited cables on power-limited circuits, see 725-61(g); 760-61(d); 800-53(f); 820-53(d); and 830-58(e).
SUBSTANTIATION: The revisions proposed in this comment address the panel's primary concern (provisions for reuse of listed MP cables) as stated in the panel statement. The panel's other concern (recoaxial MP cables) would only eliminate the substitute for coaxial FPL cables, the primary cables would still be available. There is no requirement that there must be a substitute for every cable.

The substantiation for requesting the elimination of MP cables is provided in my original proposal.
PANEL ACTION: Accept in Principle in Part.
In section 800-51(g) insert, "Until July 1, 2003, …", at the beginning of the sentence.
PANEL STATEMENT: This editorial change accomplishes the submitter's intention of eliminating the listing of multipurpose cables while at the same time it has no effect on the use and reuse of existing multipurpose cables because no changes are being made in the applications sections for multipurpose cable.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21

(Log #1071)

16- 278 - (Table 800-50): Reject

Note: "See Technical Correlating Committee action on Comment 16-98."

SUBMITTER: Marcelo M. Hirschler, GBH International/Rep. Plenum Cable Association and Fire Retardent Chemicals Assoc.

COMMENT ON PROPOSAL NO: 16-224

RECOMMENDATION: This proposal should be rejected, the references to CMP-50 and MPP-50 should be deleted from the Table 800-50 and the CMP-50 and MPP-50 classifications should not be created.

SUBSTANTIATION: The CMP-50 and MPP-50 classifications are unnecessary classification because they are not justified either by requirements for reduction in fire hazard in plenums (fire hazard is the potential for harm associated with fire) or a general reduction in fire risk (fire risk is the combination of fire hazard and the probability of fires resulting in undesirable outcomes). Furthermore, they are based on a research project which is incomplete (according to the Interim Report issued) and they are based on flawed testing technology, as represented by the oxygen bomb calorimeter.

The Plenum Cable Association endorses use of fire hazard assessment and fire risk assessment in order to further develop technically supportable standards, codes and regulations, that ensure reasonable and justifiable classification and control of plastic and other combustible products. The creation of the (CXP-50) marking is not justified based on fire hazard or on fire risk and is simply an effort for one type of material to gain market share at the expense of others. If a search for better fire performance is continued indefinitely, without taking into account the overall fire safety required by the application, clearly the use of plastics and other combustible materials should be discontinued, as a non combustible material can always be found which outperforms any plastic material. Thus, if the National Electrical Code were to support unjustified improvements in fire performance, eventually any use of plastic or other combustible materials would be in jeopardy.

Thus, there are 4 reasons to oppose the CXP-50 classifications: (i) no justification based on fire risk, (ii) no justification based on fire hazard, (iii) the study for the development of the classification by the proponents is incomplete, and (iv) the technique of oxygen bomb calorimetry, and the concept of limited combustible, are technically flawed. These concerns are exemplified as follows:

(i) An analysis of fire performance of cables addresses fire hazard.

Fire hazard analysis: Traditional CMP-rated cables will not cause significant flame spread or smoke obscuration unless the fire source is very large. For example, a CMP cable with a PVC jacket and FEP insulation was shown to have no significant flame spread (out of a possible flame spread of 20 feet) and a peak optical density of much less than 0.2 when exposed to a fire of approximately 1 MW, from a wood crib, in a full scale facility, that simulated a room and plenum [Reference: L.M. Caudill, J.R. Hoover, J.T. Walnock and J.T. Chapin, "Fire Performance of Communications Cables in Concealed Spaces", pages 277-285, NFPRF Fire Risk and Hazard Assessment Symposium, June 26-28, 1996, San Francisco, CA]. The same cable also showed approximately 2 feet flame spread in the NFPA 262 plenum cable test, with a peak optical density not exceeding 0.3, according to the same reference. Clearly, if a cable does not spread flame significantly when a 1 MW fire source is applied, it does not represent any severe fire hazard. In a different scenario, a similar type of cable was studied by the European research project FIPEC, and found to release 42 kW and less than 6 MJ, to spread flame vertically for only 1.1 m, and to give low smoke release when tested in a severe vertical cable tray test (30 kW input at high air flow rate) [Reference: Fire Performance of Electric Cables Report, Interscience Communications, UK, 1999]. This indicates that the fire hazard associated with traditional CMP cables (and this with traditional CL2P and CL3P cables) is very low.

(ii) Analysis of NFPA statistics serves to illustrate fire risk. NFPA statistics address the following types of fires:

* "Non residential concealed space structure fires involving ignition of fixed wiring in ceiling/roof assemblies" {Roof plenums are examples of these spaces}
* "Non residential concealed space structure fires involving ignition of fixed wiring in ceiling/floor assemblies" {Floor plenums are examples of these spaces}

In each case, the statistics can distinguish whether wire and cable insulation was or was not the item first ignited, giving four sets of statistics relevant to plenum cables. These statistics are relevant to the fire risk from plenum cables, as plenum cables are the typical type of wire and cable insulation present in roof plenums or in floor plenums.

Fire risk analysis: The statistics indicate that, between 1980 and 1996, there have been an average of only 584 fires per year, and of those only 171 have started with ignition of a wire and cable product, and the trend has been downwards (see the attached Tables with fire statistics and the attached charts, indicating a similar type of downward trend for both concealed roof spaces and concealed floor spaces). In fact, over the entire period between 1980 and 1996 the total number of fires in concealed roof spaces involving ignition of fixed wiring has been 0.29% of the total number of non residential structure fires (of which less than 30% started in wire and cable) and the total number of fires in concealed floor spaces involving ignition of fixed wiring has been 0.10% of the total number of non residential structure fires (of which ca. 32% started in wire and cable). With regard to fatalities or injuries: out of 3,734 fatalities in non residential structure fires, only 7 occurred in concealed roof or floor spaces involving ignition of fixed wiring (less than 0.19%), and out of 60,950 injuries in non residential structure fires, only 85 occurred in concealed roof or floor spaces involving ignition of fixed wiring (less than 0.14%). At least 4 of the 7 fatalities have been shown not to have resulted from plenum cable fires with the other 3 unknown. Thus, the fire record in a period when the amount of installed plenum cables increased from virtually none to some 20 billion feet, indicates that the fire risk is minimal.

(iii) The classifications of CXP-50 are not yet ready for application, since the NFPA Fire Protection Research Foundation Project developing the classification has not yet issued its final report. The Interim Report (International Limited Combustible Plenum Cable Fire Test Project, Interim Report, by F.B. Clarke and R.G. Gewain, June 2000) is the source of our [Plenum Cable Association] concerns. The first objective of this project was to: "Develop harmonized Steiner Tunnel listing protocols for permanent plenum cables related to NFPA 262/UL 910 and NFPA 255." The Interim Report describes part of Phase I of the project, wherein no harmonized listing protocol has been developed. The Interim Report addresses NFPA 255 and NFPA 259 and states, among other things:

* NFPA 255, flame travel distance: "... The NFPA 255 flame travel distances appear to be highly repeatable {i.e. within one lab} in each laboratory, as evidenced by the small variance of the measurements, *but not particularly reproducible* {i.e. between labs}, as can be seen by comparing this variance with the interlaboratory results. ..." {Emphasis added, but statement comes verbatim from report}
* NFPA 255, smoke index, or SDI: "... With respect to the smoke measurements, multiple determinations of the SDI by a given laboratory on a given cable agree with one another quite closely *but the SDI's reported by the two labs for the same cables do not appear to be close at all*. The results reported by Laboratory 2 are, with one exception, systematically higher than those of Laboratory 1. ..." {Emphasis added, but statement comes verbatim from report}
* NFPA 255 precision: " ... The flame spread and smoke measurements in NFPA 255 show ... *relatively poor reproducibility*, i.e. the result for a cable in a given laboratory can be repeated with precision but the difference in results between laboratories is on average considerably larger than the repeatability error. ..." {Emphasis added, but statement comes verbatim from report}
* Procedure for NFPA 255: "It is possible to test wire and cable following the current NFPA 255 test procedure, using the mounting specified for plastics in Appendix B7 of the standard." Appendix B-7 of NFPA 255 states:

"B-7 Plastics. B-7.1 The term plastics includes foams, reinforced panels, laminates, grids, and transparent or translucent sheets.

B-7.2 Where any plastic remains in position in the tunnel during a fire test, no additional support is necessary. Thermoplastic materials and other plastics that do not remain in place should be supported by 1/4-in. (6.3-mm) round metal rods or 3/16 in. (4.8 mm) thick 2 in. (51 mm) wide steel bars, or 2-in. (51-mm) galvanized hexagonal wire mesh supported with metal bars or rods spanning the width of the tunnel."

It is interesting to compare this with the statements in NFPA 262, as follows:

"1-1.3* Although this test uses equipment similar to that used in NFPA 255, Standard Method of Test of Surface Burning Characteristics of Building Materials, and ASTM E 84, Standard Test Method for Surface Burning Characteristics of Building Materials, sufficient changes have been made to the chamber so that a test conducted in the apparatus used for NFPA 255 or ASTM

E 84 cannot be considered identical or produce comparable results.

A-1-1.3 The changes made in equipment for this test were deemed necessary in order to obtain proper precision from the test when the equipment is used for small quantities of wire and cable, which produce much smaller quantities of heat release and smoke obscuration."

* NFPA 259: "... NFPA 259 has traditionally been carried out on individual materials, and so the potential heat of a finished product like a cable would be calculated as the um of the contributions of each component, each contribution being the potential heat of the component multiplied by the mass fraction of that component in the cable. To produce such a measurement it would be necessary to disassemble the cable into its different components – insulation, jacket, shielding, rip cord and the like – and measure the potential heat of each component. *An obvious question is whether such a cumbersome procedure is necessary* ..." {Emphasis added, but statement comes verbatim from report}.

* Observations on NFPA 259: "One of the labs (Laboratory 2) had both more experience and more advanced equipment ..."

* Procedure for NFPA 259: "... The procedure followed was NFPA 259, Standard Test Method for Potential Heat of Building Materials, 1998 Edition, with modifications to the following sections: ... *This modification should be viewed provisionally since it so far has only been tested on 4-pair unshielded twisted pair (UTP) plenum cable*." {Emphasis added, but statement comes verbatim from report}

(iv) The oxygen bomb calorimeter test used to assess "limited combustible" classifications is severely flawed. NFPA 259 uses the oxygen bomb calorimeter as part of its testing to assess potential heat. The term "limited combustible" was developed for "building construction materials", with the intent of applying it to materials of construction of the plenum and not to cables. NFPA 90A defines "limited combustible" as follows:

"Limited-Combustible Material. A building construction material not complying with the definition of noncombustible material that in the form in which it is used, has a potential heat value not exceeding 3500 Btu/lb (8141 kJ/kg) where tested in accordance with NFPA 259, Standard Test Method for Potential Heat of Building Materials, and complies with (a) or (b):

(a) Materials having a structural base of noncombustible material, with a surfacing not exceeding a thickness of 1/8 in. (3.2 mm), that has a flame spread index not greater than 50; (b) Materials, in the form and thickness used, other than as described in (a), having neither a flame spread index greater than 25 nor evidence of continued progressive combustion, and of such composition that surfaces that would be exposed by cutting through the material on any plane would have neither a flame spread index greater than 25 nor evidence of continued progressive combustion. Materials subject to increase in combustibility or flame spread index beyond the limits herein established through the effects of age, moisture, or other atmospheric condition shall be considered combustible."

The oxygen bomb calorimeter is a method for determining the theoretical (or complete or absolute) calorific energy (or heat of combustion), as opposed to the effective (or practical) values. The reason such instruments are used is to ensure that the correct value is chosen. As such they represent the following chemical equations for combustible fuels containing only carbon, hydrogen and oxygen:

$$C + O_2 = CO_2$$

$$4\,H + O_2 = 2\,H_2O$$

For hydrocarbon fuels: $- C\,H_2 - + O_2 = CO_2 + H_2O$

However, when building materials are more complex, because they contain other elements, there is a certain inconsistency in the equation and in the energy calculated.

1. Cl: Thus, for example, when PVC is burnt in an oxygen bomb, depending on the fraction of hydrogen atoms present, there will be different proportions of the following two equations:

$$(C_2\,H_3\,Cl)_n + 2.5\,n\,O_2 = 2\,n\,CO_2 + n\,H_2O + n\,HCl$$

$$(C_2\,H_3\,Cl)_n + 2.75\,n\,O_2 = 2\,n\,CO_2 + 1.5\,n\,H_2O + 0.5\,n\,Cl_2$$

where the two equations differ by 380 kJ/kg.

2. S: Combustion of materials containing sulphur also depends on the final product. Typically the combustion bomb generates sulphuric acid as the final sulphur containing product, while furnace combustion generates sulphur dioxide (with the sulphur less fully oxidized). Therefore, the convention in bomb calorimetry is to determine values of calorific value of fuels (including coal), by referring to the quantitative conversion to sulphur dioxide, and ignoring the conversion to sulphuric acid (or sulphur trioxide) that occurs, by using a conversion factor based on the sulphur content. Interestingly, gypsum (which is calcium sulphate dihydrate), is a building material containing sulphur. The typical fuel containing sulphur is coal. The difference between conversion to sulphur dioxide and sulphuric acid is 9410 kJ/kg.

3. N: Combustion of materials containing nitrogen also has a convention: the heat of convention is normally calculated assuming that all the nitrogen is converted into molecular nitrogen. However, that is not what happens in oxygen bomb calorimetry, where nitrogen oxides and nitric acid are actually formed. Thus, a correction is applied to account for the following equation:

$HNO_3 = 0.5\,H_2O + 0.5\,N_2 + 1.25\,O_2$, with a net heat of reaction of 1017 kJ/kg.

4. F: Combustion of materials containing fluorine is generally represented as ending in the formation of carbon tetrafluoride (CF_4) and of hydrogen fluoride (HF), in varying proportions. The equation is as follows:

$$C_a\,H_b\,O_c\,F_e + (a+b/4-c/2-e/4)\,O_2 + (n+1/2)*e*(1-x) - b/2)\,H_2O = (a-ex/4)\,CO_2 + ex/4\,CF_4 + e(1-x)\,(HF) + e(1-x)\,n\,H_2O$$

where x is the fraction of fluorine atoms converted to CF_4 as opposed to converted to HF. The energy of the conversion of CF_4 to HF is approximately 192 kJ/kg. Moreover, fluorine materials will attack the walls of the bomb calorimeter.

5. Si: Compounds containing silicon are impossible to convert completely to their final oxidation product, which is silica (SiO_2), by conventional means because as burning proceeds, the material becomes covered by a layer of silica which prevents access of oxygen and leads to the formation of a residue. The only way to obtain a reliable result of heat of combustion of materials containing silicon (such as silicones) is by a method which combines the material with an organic fluorine compound (the value of which has been accurately assessed in advance) in rotating bomb containing also water and aqueous HF. This converts all the Si into fluorosilicic acid, and the results can then be calculated back.

6. P: Compounds containing phosphorus are exceedingly difficult to assess by oxygen bomb combustion calorimetry. There are four major problems: (1) various phosphorus acids with different energies of dilution are formed in various concentrations throughout the oxygen bomb, (2) the combustion products contain different types of phosphorus oxyacids, each one of which has a different heat of formation, (3) the burning compound gets covered by phosphorus oxides and acids, which inhibit further combustion and (4) the bomb calorimeter walls are attacked and metal phosphates are formed, so that the recommended wall materials should be corundum or gold, since Pyrex glass, quartz, stainless steel titanium, porcelain and platinum all suffered heavy weight losses. For example, depending on whether a rotating bomb or a static bomb is used, the fraction of pyrophosphoric acid formed varied from 10 to 18% and that of triphosphoric acid from 1 to 3%.

7. Auxiliary combustion material: When an auxiliary material is used for assessing the heat of combustion, a 1% error in the assessment of the heat of combustion of the auxiliary material (such as benzoic acid), which is typically used in the order of 20% energy loading, corresponds to a 5% error in the total energy/heat measured. Thus, at a value of 1500 kJ/kg that would be an error of 75 kJ/kg, and this would be a systematic error for that series of experiments.

8. Moisture content: the moisture content of the building material is critical, because the combustion reaction considered in the oxygen bomb is that to convert to gaseous water. Thus, if a material contains water, the water will have reaction to vaporize the water content. Thus, results must be expressed as a function of the original moisture content for them to be valid. This matters, of course, for materials that absorb moisture when exposed to the atmosphere.

Bibliography on oxygen bomb calorimetry:

* Mansson, Margret, "Determination of Calorific Values of Building Materials - A Guide", SP Nordtest Report Project 871-90, Swedish National Testing and Research Institute, Boras, Sweden, 1991.

* Head, Arthur J, and Good, William D., "Combustion of Liquid/Solid Compounds with Non-Metallic Hetero Atoms",

Chapter 9 in "Combustion Calorimetry", "Volume 1, Experimental Chemical thermodynamics", Eds. Stig Sunner & Margret M. Mansson), Pergamon Press, Oxford, UK (for Int. Union Pure & Applied Chemistry, IUPAC), 1979.

* Mansson, Margret and Hubbard, Ward N., "Strategies in the Calculation of Standard-State Energies of Combustion from the Experimentally Determined Quantities", Chapter 5 in "Combustion Calorimetry", "Volume 1, Experimental Chemical thermodynamics", Eds. Stig Sunner & Margret M. Mansson), Pergamon Press, Oxford, UK (for Int. Union Pure & Applied Chemistry, IUPAC), 1979.

* Hu, Andrew T., Sinke, G.C., Mansson, Margret and Ringner, Birgitta, "Test Substances for Bomb Combustion Calorimetry, p-Chlorobenzoic Acid". J. Chem. Thermodynamics, 4, 283-99 (1972).

* Mansson, Margret, "Thermochemistry - Some Recent Lines of Development", Pure & Applied Chemistry, 55(3), 417-26 (1983).

* Mansson, Margret, "A 4.5 cm^3 Bomb Combustion Calorimeter and an Ampoule Technique for 5 to 10 mg Samples with Vapour Pressures Below Approximately 3 kPa (20 Torr)", J. Chem. Thermodynamics, 5, 7232 (1973).

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

PANEL ACTION: Reject.
PANEL STATEMENT: Refer to panel action and statement on Comment 16-98.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 18
NEGATIVE: 2
ABSTENTION: 1
EXPLANATION OF NEGATIVE:
JOHNSON: See my explanation of negative vote on Comment 16-88.
WADEHRA: See my explanation of negative vote on Comment 16-88.
COMMENT ON AFFIRMATIVE:
KAHN: See my comment on affirmative vote on Comment 16-88.
KAUFMAN: See my comment on affirmative vote on Comment 16-88.
EXPLANATION OF ABSTENTION:
CAUDILL: The Society of the Plastics Industries could not reach a consensus position on this issue.

(Log #1597)

16- 279 - (Table 800-50): Reject
Note: "See Technical Correlating Committee action on Comment 16-98."
SUBMITTER: Wayne G. Carson, Carson Assoc. Inc.
COMMENT ON PROPOSAL NO: 16-224
RECOMMENDATION: Delete reference to MPP-50 and CMP-50 cables in Table 800-50.
SUBSTANTIATION: The new cable classification "Limited Combustible Cable" if deleted as recommended by comments to sections 725.71(b) [16-89]; 760-71(e) [16-149]; 770-51(b) [16-169]; 800-51(h) [16-232]; and 820-51(b) [16-302] will not be included in the Code. This type cable designation is not needed and is premature - see related comments for complete substantiation.
PANEL ACTION: Reject.
PANEL STATEMENT: Refer to panel action and statement on Comment 16-98.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
ABSTENTION: 1
EXPLANATION OF ABSTENTION:
CAUDILL: The Society of the Plastics Industries could not reach a consensus position on this issue.

(Log #748)

16- 280 - (800-50 Exception No. 4): Reject
SUBMITTER: Irving Mande, Edwards System Technology (EST)
COMMENT ON PROPOSAL NO: 16-225
RECOMMENDATION: Accept this proposal.
SUBSTANTIATION: This comment should also be accepted if my comment for Proposal 16-223 is accepted.
PANEL ACTION: Reject.
PANEL STATEMENT: Refer to the panel action and statement on Comment 16-168.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21

(Log #1301)

16- 281 - (800-51): Accept
SUBMITTER: Allen C. Weidman, The Society of the Plastics Industry, Inc.
COMMENT ON PROPOSAL NO: 16-227
RECOMMENDATION: We support the action of the panel.
SUBSTANTIATION: None.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
ABSTENTION: 1
EXPLANATION OF ABSTENTION:
CAUDILL: The Society of the Plastics Industries could not reach a consensus position on this issue.

(Log #807)

16- 282 - (800-51(a)): Reject
SUBMITTER: David H. Kendall, Carlon
COMMENT ON PROPOSAL NO: 16-228
RECOMMENDATION: This proposal should be accepted.
SUBSTANTIATION: This proposal was not intended to add any value to the testing for the listing agency. Instead it was to clarify to the inspectors, installers and designers that CMP cable is permitted to be installed in those air handling spaces as defined in 300-22(b) and 300-22(c). The proposed text also clarifies that CMP cable is not permitted to be used in areas as described in 300-22(a).
PANEL ACTION: Reject.
PANEL STATEMENT: The original proposal adds no additional information, either for the listing agency to determine listing requirements or for the electrical inspector to determine applicability. The authority having jurisdiction will only determine that it is listed for plenum application.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21

(Log #1496)

16- 283 - (800-51(b)): Accept
Note: "See Technical Correlating Committee action on Comment 16-98."
SUBMITTER: John Moseley, Suddath Van Lines, Inc.
COMMENT ON PROPOSAL NO: 16-232
RECOMMENDATION: Suddath Van Lines, Inc. recommends that Code Making Panel 16 continue to accept this proposal.
SUBSTANTIATION: Suddath Van Lines, Inc. advocates the endorsement and application of limited combustible cable. This cable design supplies a major upgrade in fire safety offerings. Cable can be tested and listed for full compliance to the NFPA 255 and 259 protocols; the NFPRF has already established this information. Limited combustible cable observes and applies the current guidelines of NFPA 90A, without the exception, and its fire safety performance tenet.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
ABSTENTION: 1
EXPLANATION OF ABSTENTION:
CAUDILL: The Society of the Plastics Industries could not reach a consensus position on this issue.

(Log #1506)

16- 284 - (800-51(b)): Accept
Note: "See Technical Correlating Committee action on Comment 16-98."
SUBMITTER: Scott Paulov, Cabling Business Institute
COMMENT ON PROPOSAL NO: 16-232
RECOMMENDATION: Cabling Business Institute recommends that Code Making Panel 16 continue to accept this proposal.
SUBSTANTIATION: Cabling Business Institute encourages the acceptance and utilization of limited combustible cable. This cable design offers a substantial advancement in fire safety. The NFPRF has verified that cable can be tested and listed for complete compliance with the NFPA 255 and 259 protocols. Limited combustible cable is totally consistent with the provisions of NFPA 90A, without the exception, and its desired fire safety performance.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21

VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
ABSTENTION: 1
EXPLANATION OF ABSTENTION:
CAUDILL: The Society of the Plastics Industries could not reach a consensus position on this issue.

(Log #1302)

16- 285 - (Table 800-51(g)): Accept
Note: "See Technical Correlating Committee action on Comment 16-98."
SUBMITTER: Allen C. Weidman, The Society of the Plastics Industry, Inc.
COMMENT ON PROPOSAL NO: 16-231
RECOMMENDATION: We support the action of the panel.
SUBSTANTIATION: None.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
ABSTENTION: 1
EXPLANATION OF ABSTENTION:
CAUDILL: The Society of the Plastics Industries could not reach a consensus position on this issue.

(Log #465)

16- 286 - (800-51(h)): Accept
Note: "See Technical Correlating Committee action on Comment 16-98."
SUBMITTER: Technical Correlating Committee on Signaling Systems for the Protection of Life and Property
COMMENT ON PROPOSAL NO: 16-232
RECOMMENDATION: The Technical Correlating Committee on the National Fire Alarm Code recommends that Code Panel 16 continue to accept this proposal in principle.
SUBSTANTIATION: The Technical Correlating Committee on the National Fire Alarm Code supports the introduction of limited combustible cable and recognizes that it represents a significant improvement in fire safety.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
ABSTENTION: 1
EXPLANATION OF ABSTENTION:
CAUDILL: The Society of the Plastics Industries could not reach a consensus position on this issue.

(Log #1079)

16- 287 - (800-51(h) (New)): Reject
Note: "See Technical Correlating Committee action on Comment 16-98."
SUBMITTER: Marcelo M. Hirschler, GBH International/Rep. Plenum Cable Association and Fire Retardent Chemicals Assoc.
COMMENT ON PROPOSAL NO: 16-232
RECOMMENDATION: This proposal should be rejected, the new section 800-51(h) should not be created and the CMP-50 and MPP-50 classifications should not be created.
SUBSTANTIATION: The CMP-50 and MPP-50 classifications are unnecessary classification because they are not justified either by requirements for reduction in fire hazard in plenums (fire hazard is the potential for harm associated with fire) or a general reduction in fire risk (fire risk is the combination of fire hazard and the probability of fires resulting in undesirable outcomes). Furthermore, they are based on a research project which is incomplete (according to the Interim Report issued) and they are based on flawed testing technology, as represented by the oxygen bomb calorimeter.

The Plenum Cable Association endorses use of fire hazard assessment and fire risk assessment in order to further develop technically supportable standards, codes and regulations, that ensure reasonable and justifiable classification and control of plastic and other combustible products. The creation of the (CXP-50) marking is not justified based on fire hazard or on fire risk and is simply an effort for one type of material to gain market share at the expense of others. If a search for better fire performance is continued indefinitely, without taking into account the overall fire safety required by the application, clearly the use of plastics and other combustible materials should be discontinued, as a non combustible material can always be found which outperforms any plastic material. Thus, if the National Electrical Code were to support unjustified improvements in fire performance, eventually any use of plastic or other combustible materials would be in jeopardy.

Thus, there are 4 reasons to oppose the CXP-50 classifications: (i) no justification based on fire risk, (ii) no justification based on fire hazard, (iii) the study for the development of the classification by the proponents is incomplete, and (iv) the technique of oxygen bomb calorimetry, and the concept of limited combustible, are technically flawed. These concerns are exemplified as follows:

(i) An analysis of fire performance of cables addresses fire hazard.

Fire hazard analysis: Traditional CMP-rated cables will not cause significant flame spread or smoke obscuration unless the fire source is very large. For example, a CMP cable with a PVC jacket and FEP insulation was shown to have no significant flame spread (out of a possible flame spread of 20 feet) and a peak optical density of much less than 0.2 when exposed to a fire of approximately 1 MW, from a wood crib, in a full scale facility, that simulated a room and plenum [Reference: L.M. Caudill, J.R. Hoover, J.T. Walnock and J.T. Chapin, "Fire Performance of Communications Cables in Concealed Spaces", pages 277-285, NFPRF Fire Risk and Hazard Assessment Symposium, June 26-28, 1996, San Francisco, CA]. The same cable also showed approximately 2 feet flame spread in the NFPA 262 plenum cable test, with a peak optical density not exceeding 0.3, according to the same reference. Clearly, if a cable does not spread flame significantly when a 1 MW fire source is applied, it does not represent any severe fire hazard. In a different scenario, a similar type of cable was studied by the European research project FIPEC, and found to release 42 kW and less than 6 MJ, to spread flame vertically for only 1.1 m, and to give low smoke release when tested in a severe vertical cable tray test (30 kW input at high air flow rate) [Reference: Fire Performance of Electric Cables Report, Interscience Communications, UK, 1999]. This indicates that the fire hazard associated with traditional CMP cables (and this with traditional CL2P and CL3P cables) is very low.

(ii) Analysis of NFPA statistics serves to illustrate fire risk. NFPA statistics address the following types of fires:

* "Non residential concealed space structure fires involving ignition of fixed wiring in ceiling/roof assemblies" {Roof plenums are examples of these spaces}
* "Non residential concealed space structure fires involving ignition of fixed wiring in ceiling/floor assemblies" {Floor plenums are examples of these spaces}

In each case, the statistics can distinguish whether wire and cable insulation was or was not the item first ignited, giving four sets of statistics relevant to plenum cables. These statistics are relevant to the fire risk from plenum cables, as plenum cables are the typical type of wire and cable insulation present in roof plenums or in floor plenums.

Fire risk analysis: The statistics indicate that, between 1980 and 1996, there have been an average of only 584 fires per year, and of those only 171 have started with ignition of a wire and cable product, and the trend has been downwards (see the attached Tables with fire statistics and the attached charts, indicating a similar type of downward trend for both concealed roof spaces and concealed floor spaces). In fact, over the entire period between 1980 and 1996 the total number of fires in concealed roof spaces involving ignition of fixed wiring has been 0.29% of the total number of non residential structure fires (of which less than 30% started in wire and cable) and the total number of fires in concealed floor spaces involving ignition of fixed wiring has been 0.10% of the total number of non residential structure fires (of which ca. 32% started in wire and cable). With regard to fatalities or injuries: out of 3,734 fatalities in non residential structure fires, only 7 occurred in concealed roof or floor spaces involving ignition of fixed wiring (less than 0.19%), and out of 60,950 injuries in non residential structure fires, only 85 occurred in concealed roof or floor spaces involving ignition of fixed wiring (less than 0.14%). At least 4 of the 7 fatalities have been shown not to have resulted from plenum cable fires with the other 3 unknown. Thus, the fire record in a period when the amount of installed plenum cables increased from virtually none to some 20 billion feet, indicates that the fire risk is minimal.

(iii) The classifications of CXP-50 are not yet ready for application, since the NFPA Fire Protection Research Foundation Project developing the classification has not yet issued its final report. The Interim Report (International Limited Combustible Plenum Cable Fire Test Project, Interim Report, by F.B. Clarke and R.G. Gewain, June 2000) is the source of our [Plenum Cable Association] concerns. The first objective of this project was to: "Develop harmonized Steiner Tunnel listing protocols for permanent plenum cables related to NFPA 262/UL 910 and NFPA

255." The Interim Report describes part of Phase I of the project, wherein no harmonized listing protocol has been developed. The Interim Report addresses NFPA 255 and NFPA 259 and states, among other things:

* NFPA 255, flame travel distance: "... The NFPA 255 flame travel distances appear to be highly repeatable {i.e. within one lab} in each laboratory, as evidenced by the small variance of the measurements, *but not particularly reproducible* {i.e. between labs}, as can be seen by comparing this variance with the interlaboratory results. ..." {Emphasis added, but statement comes verbatim from report}

* NFPA 255, smoke index, or SDI: "... With respect to the smoke measurements, multiple determinations of the SDI by a given laboratory on a given cable agree with one another quite closely *but the SDI's reported by the two labs for the same cables do not appear to be close at all*. The results reported by Laboratory 2 are, with one exception, systematically higher than those of Laboratory 1. ..." {Emphasis added, but statement comes verbatim from report}

* NFPA 255 precision: " ... The flame spread and smoke measurements in NFPA 255 show ... *relatively poor reproducibility*, i.e. the result for a cable in a given laboratory can be repeated with precision but the difference in results between laboratories is on average considerably larger than the repeatability error. ..." {Emphasis added, but statement comes verbatim from report}

* Procedure for NFPA 255: "It is possible to test wire and cable following the current NFPA 255 test procedure, using the mounting specified for plastics in Appendix B7 of the standard." Appendix B-7 of NFPA 255 states:

"B-7 Plastics. B-7.1 The term plastics includes foams, reinforced panels, laminates, grids, and transparent or translucent sheets.

B-7.2 Where any plastic remains in position in the tunnel during a fire test, no additional support is necessary. Thermoplastic materials and other plastics that do not remain in place should be supported by 1/4-in. (6.3-mm) round metal rods or 3/16 in. (4.8 mm) thick 2 in. (51 mm) wide steel bars, or 2-in. (51-mm) galvanized hexagonal wire mesh supported with metal bars or rods spanning the width of the tunnel."

It is interesting to compare this with the statements in NFPA 262, as follows:

"1-1.3* Although this test uses equipment similar to that used in NFPA 255, Standard Method of Test of Surface Burning Characteristics of Building Materials, and ASTM E 84, Standard Test Method for Surface Burning Characteristics of Building Materials, sufficient changes have been made to the chamber so that a test conducted in the apparatus used for NFPA 255 or ASTM E 84 cannot be considered identical or produce comparable results.

A-1-1.3 The changes made in equipment for this test were deemed necessary in order to obtain proper precision from the test when the equipment is used for small quantities of wire and cable, which produce much smaller quantities of heat release and smoke obscuration."

* NFPA 259: "... NFPA 259 has traditionally been carried out on individual materials, and so the potential heat of a finished product like a cable would be calculated as the um of the contributions of each component, each contribution being the potential heat of the component multiplied by the mass fraction of that component in the cable. To produce such a measurement it would be necessary to disassemble the cable into its different components – insulation, jacket, shielding, rip cord and the like – and measure the potential heat of each component. *An obvious question is whether such a cumbersome procedure is necessary* ..." {Emphasis added, but statement comes verbatim from report}.

* Observations on NFPA 259: "One of the labs (Laboratory 2) had both more experience and more advanced equipment ..."

* Procedure for NFPA 259: "... The procedure followed was NFPA 259, Standard Test Method for Potential Heat of Building Materials, 1998 Edition, with modifications to the following sections: ... *This modification should be viewed provisionally since it so far has only been tested on 4-pair unshielded twisted pair (UTP) plenum cable*." {Emphasis added, but statement comes verbatim from report}

(iv) The oxygen bomb calorimeter test used to assess "limited combustible" classifications is severely flawed. NFPA 259 uses the oxygen bomb calorimeter as part of its testing to assess potential heat. The term "limited combustible" was developed for "building construction materials", with the intent of applying it to materials of construction of the plenum and not to cables. NFPA 90A defines "limited combustible" as follows:

"Limited-Combustible Material. A building construction material not complying with the definition of noncombustible material that in the form in which it is used, has a potential heat value not exceeding 3500 Btu/lb (8141 kJ/kg) where tested in accordance with NFPA 259, Standard Test Method for Potential Heat of Building Materials, and complies with (a) or (b):

(a) Materials having a structural base of noncombustible material, with a surfacing not exceeding a thickness of 1/8 in. (3.2 mm), that has a flame spread index not greater than 50; (b) Materials, in the form and thickness used, other than as described in (a), having neither a flame spread index greater than 25 nor evidence of continued progressive combustion, and of such composition that surfaces that would be exposed by cutting through the material on any plane would have neither a flame spread index greater than 25 nor evidence of continued progressive combustion. Materials subject to increase in combustibility or flame spread index beyond the limits herein established through the effects of age, moisture, or other atmospheric condition shall be considered combustible."

The oxygen bomb calorimeter is a method for determining the theoretical (or complete or absolute) calorific energy (or heat of combustion), as opposed to the effective (or practical) values. The reason such instruments are used is to ensure that the correct value is chosen. As such they represent the following chemical equations for combustible fuels containing only carbon, hydrogen and oxygen:

$$C + O_2 = CO_2$$

$$4\,H + O_2 = 2\,H_2O$$

For hydrocarbon fuels: $- C\,H_2 - + O_2 = CO_2 + H_2O$

However, when building materials are more complex, because they contain other elements, there is a certain inconsistency in the equation and in the energy calculated.

1. Cl: Thus, for example, when PVC is burnt in an oxygen bomb, depending on the fraction of hydrogen atoms present, there will be different proportions of the following two equations:

$$(C_2\,H_3\,Cl)_n + 2.5\,n\,O_2 = 2\,n\,CO_2 + n\,H_2O + n\,HCl$$

$$(C_2\,H_3\,Cl)_n + 2.75\,n\,O_2 = 2\,n\,CO_2 + 1.5\,n\,H_2O + 0.5\,n\,Cl_2$$

where the two equations differ by 380 kJ/kg.

2. S: Combustion of materials containing sulphur also depends on the final product. Typically the combustion bomb generates sulphuric acid as the final sulphur containing product, while furnace combustion generates sulphur dioxide (with the sulphur less fully oxidized). Therefore, the convention in bomb calorimetry is to determine values of calorific value of fuels (including coal), by referring to the quantitative conversion to sulphur dioxide, and ignoring the conversion to sulphuric acid (or sulphur trioxide) that occurs, by using a conversion factor based on the sulphur content. Interestingly, gypsum (which is calcium sulphate dihydrate), is a building material containing sulphur. The typical fuel containing sulphur is coal. The difference between conversion to sulphur dioxide and sulphuric acid is 9410 kJ/kg.

3. N: Combustion of materials containing nitrogen also has a convention: the heat of convention is normally calculated assuming that all the nitrogen is converted into molecular nitrogen. However, that is not what happens in oxygen bomb calorimetry, where nitrogen oxides and nitric acid are actually formed. Thus, a correction is applied to account for the following equation:

$HNO_3 = 0.5\,H_2O + 0.5\,N_2 + 1.25\,O_2$, with a net heat of reaction of 1017 kJ/kg.

4. F: Combustion of materials containing fluorine is generally represented as ending in the formation of carbon tetrafluoride (CF_4) and of hydrogen fluoride (HF), in varying proportions. The equation is as follows:

$$C_a\,H_b\,O_c\,F_e + (a+b/4-c/2-e/4)\,O_2 + (n+1/2)*e*(1-x) - b/2)\,H_2O = (a-ex/4)\,CO_2 + ex/4\,CF_4 + e(1-x)\,(HF) + e(1-x)\,n\,H_2O$$

where x is the fraction of fluorine atoms converted to CF_4 as opposed to converted to HF. The energy of the conversion of CF_4 to HF is approximately 192 kJ/kg. Moreover, fluorine materials will attack the walls of the bomb calorimeter.

5. Si: Compounds containing silicon are impossible to convert completely to their final oxidation product, which is silica (SiO_2), by conventional means because as burning proceeds, the material becomes covered by a layer of silica which prevents access of oxygen and leads to the formation of a residue. The only way to obtain a reliable result of heat of combustion of materials containing silicon (such as silicones) is by a method which combines the material with an organic fluorine compound (the value of which has been accurately assessed in advance) in rotating bomb containing also water and aqueous HF. This converts all the Si into fluorosilicic acid, and the results can then be calculated back.

6. P: Compounds containing phosphorus are exceedingly difficult to assess by oxygen bomb combustion calorimetry. There are four major problems: (1) various phosphorus acids with different energies of dilution are formed in various concentrations throughout the oxygen bomb, (2) the combustion products contain different types of phosphorus oxyacids, each one of which has a different heat of formation, (3) the burning compound gets covered by phosphorus oxides and acids, which inhibit further combustion and (4) the bomb calorimeter walls are attacked and metal phosphates are formed, so that the recommended wall materials should be corundum or gold, since Pyrex glass, quartz, stainless steel titanium, porcelain and platinum all suffered heavy weight losses. For example, depending on whether a rotating bomb or a static bomb is used, the fraction of pyrophosphoric acid formed varied from 10 to 18% and that of triphosphoric acid from 1 to 3%.

7. Auxiliary combustion material: When an auxiliary material is used for assessing the heat of combustion, a 1% error in the assessment of the heat of combustion of the auxiliary material (such as benzoic acid), which is typically used in the order of 20% energy loading, corresponds to a 5% error in the total energy/heat measured. Thus, at a value of 1500 kJ/kg that would be an error of 75 kJ/kg, and this would be a systematic error for that series of experiments.

8. Moisture content: the moisture content of the building material is critical, because the combustion reaction considered in the oxygen bomb is that to convert to gaseous water. Thus, if a material contains water, the water will have reaction to vaporize the water content. Thus, results must be expressed as a function of the original moisture content for them to be valid. This matters, of course, for materials that absorb moisture when exposed to the atmosphere.

Bibliography on oxygen bomb calorimetry:

* Mansson, Margret, "Determination of Calorific Values of Building Materials - A Guide", SP Nordtest Report Project 871-90, Swedish National Testing and Research Institute, Boras, Sweden, 1991.

* Head, Arthur J, and Good, William D., "Combustion of Liquid/Solid Compounds with Non-Metallic Hetero Atoms", Chapter 9 in "Combustion Calorimetry", "Volume 1, Experimental Chemical thermodynamics", Eds. Stig Sunner & Margret M. Mansson), Pergamon Press, Oxford, UK (for Int. Union Pure & Applied Chemistry, IUPAC), 1979.

* Mansson, Margret and Hubbard, Ward N., "Strategies in the Calculation of Standard-State Energies of Combustion from the Experimentally Determined Quantities", Chapter 5 in "Combustion Calorimetry", "Volume 1, Experimental Chemical thermodynamics", Eds. Stig Sunner & Margret M. Mansson), Pergamon Press, Oxford, UK (for Int. Union Pure & Applied Chemistry, IUPAC), 1979.

* Hu, Andrew T., Sinke, G.C., Mansson, Margret and Ringner, Birgitta, "Test Substances for Bomb Combustion Calorimetry, p-Chlorobenzoic Acid". J. Chem. Thermodynamics, 4, 283-99 (1972).

* Mansson, Margret, "Thermochemistry - Some Recent Lines of Development", Pure & Applied Chemistry, 55(3), 417-26 (1983).

* Mansson, Margret, "A 4.5 cm^3 Bomb Combustion Calorimeter and an Ampoule Technique for 5 to 10 mg Samples with Vapour Pressures Below Approximately 3 kPa (20 Torr)", J. Chem. Thermodynamics, 5, 7232 (1973).

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

PANEL ACTION: Reject.
PANEL STATEMENT: Refer to panel action and statement on Comment 16-98.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 18
NEGATIVE: 2
ABSTENTION: 1
EXPLANATION OF NEGATIVE:
JOHNSON: See my explanation of negative vote on Comment 16-88.
WADEHRA: See my explanation of negative vote on Comment 16-88.
COMMENT ON AFFIRMATIVE:
KAHN: See my comment on affirmative vote on Comment 16-88.
KAUFMAN: See my comment on affirmative vote on Comment 16-88.
EXPLANATION OF ABSTENTION:
CAUDILL: The Society of the Plastics Industries could not reach a consensus position on this issue.

(Log #1303)

16- 288 - (800-51(h)): Accept
Note: "See Technical Correlating Committee action on Comment 16-98."
SUBMITTER: Allen C. Weidman, The Society of the Plastics Industry, Inc.
COMMENT ON PROPOSAL NO: 16-232
RECOMMENDATION: We support the action of the panel.
SUBSTANTIATION: None.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
ABSTENTION: 1
EXPLANATION OF ABSTENTION:
CAUDILL: The Society of the Plastics Industries could not reach a consensus position on this issue.

(Log #1485)

16- 289 - (800-51(h)): Accept
Note: "See Technical Correlating Committee action on Comment 16-98."
SUBMITTER: George Thorning, Yale University
COMMENT ON PROPOSAL NO: 16-232
RECOMMENDATION: Yale recommends that Code Making Panel 16 continue to accept this proposal.
SUBSTANTIATION: We believe this cable design would provide a significant improvement in fire safety and protect lives and property. Yale supports the NFPA's acceptance and recognition of limited combustible cable in the 2002 NEC. The NFPRF research project demonstrates that cable can be tested and listed for full compliance to the NFPA 255 and 259 test methods. Limited combustible cable is consistent with the full requirements of NFPA 90A and its originally intended fire safety performance.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
ABSTENTION: 1
EXPLANATION OF ABSTENTION:
CAUDILL: The Society of the Plastics Industries could not reach a consensus position on this issue.

(Log #1501)

16- 290 - (800-51(h)): Accept
Note: "See Technical Correlating Committee action on Comment 16-98."
SUBMITTER: Michael Lohr, Staples Communications
COMMENT ON PROPOSAL NO: 16-232
RECOMMENDATION: Staples Communications recommends that Code Making Panel 16 continue to accept this proposal.
SUBSTANTIATION: Staples Communications endorses the acceptance and application of limited combustible cable. This cable design presents a considerable improvement in fire safety. The NFPRF has shown that cable can be tested and listed for full compliance to NFPA 255 and 259 protocols. Limited combustible cable is consistent with the NFPA 90A's full, original requirements and its intended fire safety performance.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
ABSTENTION: 1
EXPLANATION OF ABSTENTION:
CAUDILL: The Society of the Plastics Industries could not reach a consensus position on this issue.

(Log #1589)

16- 291 - (800-51(h)): Reject

Note: "See Technical Correlating Committee action on Comment 16-98."

SUBMITTER: Wayne G. Carson, Carson Assoc. Inc.

COMMENT ON PROPOSAL NO: 16-232

RECOMMENDATION: Delete proposed section 880-51(h) and associated notes.

SUBSTANTIATION: The introduction of a new class of cable ("Limited Combustible Cable") is premature at this time for the following reasons:

A. The note to the definition section 725.71(B), FPN No. 1 references NFPA 90A, Standard for the Installation of Air-Conditioning and Ventilating Systems for the definition of limited combustible. That definition is as follows:

"Limited-Combustible Material. A building construction material not complying with the definition of noncombustible material that in the form in which it is used, has a potential heat value not exceeding 3500 Btu/lb (8141J/kg) where tested in accordance with NFPA 259, Standard Test Method for Potential Heat of Building Materials, and complies with (a) or (b):

a. Materials having a structural base of noncombustible material, with a surfacing not exceeding a thickness of 1/8 in. (3.2 mm), that has a flame spread index not greater than 50;

b. Materials, in the form and thickness used, other than as described in (a), having neither a flame spread index greater than 25 nor evidence of continued progressive combustion, and of such composition that surfaces that would be exposed by cutting through the material on any plane would have neither a flame spread index greater than 25 nor evidence of continued progressive combustion. Materials subject to increase in combustibility or flame spread index beyond the limits herein established through the effects of age, moisture, or other atmospheric condition shall be combustible."

This definition was established and is applied to building construction materials and not to specific wiring methods or technologies for use in buildings. NFPA 255 and NFPA 259 were never intended for the evaluation of multi-component systems such as electrical and optical cable. More current test methods (other than NFPA 255 and 259), such as NFPA 262, the cone calorimeter, etc. provide reproducible smoke obscuration, flame spread, or heat release (not heat value) information and are more appropriate for measuring the fire hazards of cable. Not all parts of this "Limited Combustible" definition have been applied to the broad scope of cables. Until this definition can be shown as appropriate for cables (attainable and reproducible) it should not be deemed credible and supported by the National Electrical Code at this time. Referencing this inappropriate definition in the National Electrical Code is misleading and bad code.

B. The note references NFPA 255 as the test standard for smoke developed index. This test is not an appropriate test for cables for the following reasons:

a. NFPA 255 has not been harmonized, as has NFPA 262. NFPA 262 has a proven record, unlike NFPA 255.

b. NFPA 255 is not reproducible, whereas NFPA 262 has been shown to be reproducible. This lack of reproducibility has been demonstrated numerous times in round-robin testing of building materials among multiple labs.

The most recent example of this reproducibility problem has been demonstrated in the Interim Report of the Fire Protection Research Foundation (FPRF) "Limited Combustible Cable" (ex. "Permanent Plenum Cable") project, dated June 2000. This report states "The flame spread and smoke measurements in NFPA 255 show good repeatability but relatively poor reproducibility, i.e., the result for a cable in a given laboratory can be repeated with precision but the difference in results between laboratories is on average considerable larger than the repeatability error." (Page 9, section 4.1.2). In this case, with only two laboratories participating, errors in reproducibility were in the range of 100 percent. Given that numerous fire-testing tunnels exist, the range of error can be expected to be even larger.

This test is inappropriate for cables as the cables are installed against the top of the tunnel. This orientation is not similar to normal cable installations, and cable placement on top of the wire mesh is random in the tunnel.

C. Cable installed above ceilings does not become involved in the fire until near or at flashover. At that point in the fire development, the ceiling tile is falling to expose the cable. Cables in walls or below floors are generally exposed to the fire conditions even later in the fire development. These cables do not spread flame more than 5 ft when tested in accordance with NFPA 262. The proposed restrictions on cable appear excessive based on the fire record.

D. There is not a need established (fire record or hazard analysis) for a new cable category. There are two research projects that are intended to provide information on the fire hazard of cables. The ASHRAE project has not yet begun. This ASHRAE Project is being conducted by the National Research Council of Canada and is a broad based fire hazard assessment program developed to evaluate the hazard presented by the accumulation of plenum cables. This question has not yet been answered and developing cable categories to address a hazard that has not yet been defined is premature. The project when completed will assist in developing appropriate language for NFPA 90A and/or the National Electrical Code.

The FPRF project has only issued an interim report dated June 2000. This project has only accomplished a cursory review of one cable type in NFPA 255 and NFPA 259 and has just begun the experimental work on broader aspects of the "limited combustible" definition.

The proposals for the National Electrical Code that have been accepted by Code Making Panel 16 for the removal of all abandoned cable broadly addresses this problem now. The adoption of these proposals for removing all abandoned cable will significantly reduce the fuel load created by excessive cable accumulation.

E. The International Mechanical Code (IMC), the Uniform Mechanical Code (UMC), and the NFPA 90A (the membership and the NFPA Standards Council) have each recently rejected similar provisions to the ones being proposed for the National Electrical Code. These proposals for "limited combustible cables" have been rejected for several reasons including:

a. They will present confusion in the field;

b. They are not good code based on sound engineering principles;

c. They are not based on good fire hazard assessment information; and

d. Questions regarding the appropriateness and accuracy of the test protocols NFPA 255 and NFPA 259.

PANEL ACTION: Reject.

PANEL STATEMENT: Refer to panel action and statement on Comment 16-98.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21

VOTE ON PANEL ACTION:

AFFIRMATIVE: 18

NEGATIVE: 2

ABSTENTION: 1

EXPLANATION OF NEGATIVE:

JOHNSON: See my explanation of negative vote on Comment 16-88.

WADEHRA: See my explanation of negative vote on Comment 16-88.

COMMENT ON AFFIRMATIVE:

KAHN: See my comment on affirmative vote on Comment 16-88.

KAUFMAN: See my comment on affirmative vote on Comment 16-88.

EXPLANATION OF ABSTENTION:

CAUDILL: The Society of the Plastics Industries could not reach a consensus position on this issue.

(Log #1618)

16- 292 - (800-51(h)): Accept

Note: "See Technical Correlating Committee action on Comment 16-98."

SUBMITTER: Phil Brown, Communications Products Inc. (CP)

COMMENT ON PROPOSAL NO: 16-232

RECOMMENDATION: CPI recommends that Code Panel 16 continue to accept this proposal.

SUBSTANTIATION: CPI supports the NFPA's acceptance and recognition of limited combustible cable in the 2002 NEC. This cable design would provide a significant improvement in fire safety and protect lives and property. The NFPRF research project demonstrated that cable can be tested and listed for full compliance to the NFPA 255 and 259 test methods. Limited combustible cable is consistent with the full requirements of NFPA 90A and its originally intended fire safety performance.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21

VOTE ON PANEL ACTION:

AFFIRMATIVE: 21

(Log #1755)

16- 293 - (800-51(h)): Accept
Note: "See Technical Correlating Committee action on Comment 16-98."
SUBMITTER: Francis W. Peri, Communications Design Corporation
COMMENT ON PROPOSAL NO: 16-232
RECOMMENDATION: Association of Cabling Professionals (ACP) recommends that Code Panel 16 continue to accept this proposal in principle.
SUBSTANTIATION: ACP supports the acceptance and use of limited combustible cable. This cable design provides a significant improvement in fire safety. The NFPRF has demonstrated that cable can be tested and listed for full compliance to the NFPA 255 and 259 protocols. Limited combustible cable is consistent with the full requirements of NFPA 90A and its intended fire safety performance.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
ABSTENTION: 1
EXPLANATION OF ABSTENTION:
CAUDILL: The Society of the Plastics Industries could not reach a consensus position on this issue.

(Log #1850)

16- 294 - (800-51(h)): Accept
Note: "See Technical Correlating Committee action on Comment 16-98."
SUBMITTER: Robert W. Jensen, dbi-Telecommunications Infrastructure Design
COMMENT ON PROPOSAL NO: 16-232
RECOMMENDATION: BICSI recommends that Code Panel 16 continue to accept this proposal in principle.
SUBSTANTIATION: BICSI supports the introduction of limited combustible cable and recognizes that it represents a significant improvement in fire safety.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
ABSTENTION: 1
EXPLANATION OF ABSTENTION:
CAUDILL: The Society of the Plastics Industries could not reach a consensus position on this issue.

(Log #269)

16- 295 - (800-52(b)): Accept in Principle
SUBMITTER: Stanley Kaufman, Lucent Technologies
COMMENT ON PROPOSAL NO: 16-250
RECOMMENDATION: Delete "not intended for future use."
SUBSTANTIATION: It is redundant to state "Abandoned cables not intended for future use...", since abandoned cables are defined as not being intended for future use.
PANEL ACTION: Accept in Principle.
Revise the last sentence (before the FPN) of Section 800-52(b) in the panel action of Proposal 16-250 to read as follows:
The accessible portion of abandoned communications cables shall not be permitted to remain.
PANEL STATEMENT: The intent is not to remove cables where it would be extremely difficult or damaging to the building or the remaining cables.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21

(Log #1097)

16- 296 - (800-52(b)): Accept in Principle
SUBMITTER: Marcelo M. Hirschler, GBH International/Rep. Plenum Cable Association and Fire Retardent Chemicals Assoc.
COMMENT ON PROPOSAL NO: 16-250
RECOMMENDATION: Continue accepting this proposal in principle, by retaining the phrase: "Abandoned cables, not intended for future use shall not be permitted to remain."
SUBSTANTIATION: There is a potential for increased fire hazard or fire risk when any cable, irrespective of whether it is or is not limited combustible, remains as fuel load unnecessarily once it has been taken out of use. Materials that are limited combustible can also burn (i.e., they are not noncombustible) and also increase the fire load. Furthermore, all abandoned cables can also affect the safety of plenums because of their weight. There is, thus, no justification for permitting any cable to remain in a plenum once it is abandoned and not intended for future use.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Refer to panel action and statement on Comment 16-295.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21

(Log #1304)

16- 297 - (800-52(b)): Accept in Principle
Note: "See Technical Correlating Committee action on Comment 16-98."
SUBMITTER: Allen C. Weidman, The Society of the Plastics Industry, Inc.
COMMENT ON PROPOSAL NO: 16-243
RECOMMENDATION: We support the action of the panel.
SUBSTANTIATION: None.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Refer to the panel action and statement on Comment 16-295.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
ABSTENTION: 1
EXPLANATION OF ABSTENTION:
CAUDILL: The Society of the Plastics Industries could not reach a consensus position on this issue.

(Log #1305)

16- 298 - (800-52(b) (New)): Accept in Principle
SUBMITTER: Allen C. Weidman, The Society of the Plastics Industry, Inc.
COMMENT ON PROPOSAL NO: 16-245
RECOMMENDATION: We support the action of the panel.
SUBSTANTIATION: None.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Refer to the panel action and statement on Comment 16-295.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
ABSTENTION: 1
EXPLANATION OF ABSTENTION:
CAUDILL: The Society of the Plastics Industries could not reach a consensus position on this issue.

(Log #1306)

16- 299 - (800-52(b)): Accept in Principle
SUBMITTER: Allen C. Weidman, The Society of the Plastics Industry, Inc.
COMMENT ON PROPOSAL NO: 16-246
RECOMMENDATION: We support the action of the panel.
SUBSTANTIATION: None.
Note: Supporting Material is available for review at NFPA Headquarters.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Refer to the panel action and statement on Comment 16-295.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
ABSTENTION: 1
EXPLANATION OF ABSTENTION:
CAUDILL: The Society of the Plastics Industries could not reach a consensus position on this issue.

(Log #1307)

16- 300 - (800-52(b)): Accept in Principle
SUBMITTER: Allen C. Weidman, The Society of the Plastics Industry, Inc.
COMMENT ON PROPOSAL NO: 16-247
RECOMMENDATION: We support the action of the panel.
SUBSTANTIATION: None.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Refer to the panel action and statement on Comment 16-295.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
ABSTENTION: 1
EXPLANATION OF ABSTENTION:
CAUDILL: The Society of the Plastics Industries could not reach a consensus position on this issue.

(Log #1309)

16- 301 - (800-52(b)): Accept in Principle
SUBMITTER: Allen C. Weidman, The Society of the Plastics Industry, Inc.
COMMENT ON PROPOSAL NO: 16-248
RECOMMENDATION: We support the action of the panel.
SUBSTANTIATION: None.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Refer to the panel action and statement on Comment 16-295.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
ABSTENTION: 1
EXPLANATION OF ABSTENTION:
CAUDILL: The Society of the Plastics Industries could not reach a consensus position on this issue.

(Log #1310)

16- 302 - (800-52(b) (New)): Accept in Principle
SUBMITTER: Allen C. Weidman, The Society of the Plastics Industry, Inc.
COMMENT ON PROPOSAL NO: 16-249
RECOMMENDATION: We support the action of the panel.
SUBSTANTIATION: None.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Refer to the panel action and statement on Comment 16-295.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
ABSTENTION: 1
EXPLANATION OF ABSTENTION:
CAUDILL: The Society of the Plastics Industries could not reach a consensus position on this issue.

(Log #1311)

16- 303 - (800-52(b)): Accept in Principle
SUBMITTER: Allen C. Weidman, The Society of the Plastics Industry, Inc.
COMMENT ON PROPOSAL NO: 16-250
RECOMMENDATION: We support the action of the panel.
SUBSTANTIATION: None.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Refer to panel action and statement on Comment 16-295.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
ABSTENTION: 1
EXPLANATION OF ABSTENTION:
CAUDILL: The Society of the Plastics Industries could not reach a consensus position on this issue.

(Log #1419)

16- 304 - (800-52(b)): Reject
SUBMITTER: Kari Barrett, American Chemistry Council
COMMENT ON PROPOSAL NO: 16-250
RECOMMENDATION: Delete the following text:
~~Abandoned cables not intended for future use shall not be permitted to remain.~~
SUBSTANTIATION: Removal of abandoned cables in these areas is a "housekeeping" issue. Whether or not to remove them should be the owner's decision and not be mandated by the NEC.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel reaffirms that removal of abandoned cables addresses a significant fire safety issue. The term "housekeeping" is not applicable to abandoned cables. Fire safety and cable installation are within the scope of the NEC.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21

(Log #1090)

16- 305 - (800-52(b), Exception): Accept
Note: "See Technical Correlating Committee action on Comment 16-98."
SUBMITTER: Marcelo M. Hirschler, GBH International/Rep. Plenum Cable Association and Fire Retardent Chemicals Assoc.
COMMENT ON PROPOSAL NO: 16-243
RECOMMENDATION: Continue rejecting the exception for permitting cable to be listed as limited combustible to remain in plenums, in particular CMP-50 and MPP-50.
SUBSTANTIATION: Materials that are limited combustible can burn (i.e. they are not noncombustible) and increase the fire load. Therefore, there is a potential for increased fire hazard or fire risk when any cable, irrespective of whether it is or is not limited combustible, remains as fuel load unnecessarily once it has been taken out of use. Furthermore, all abandoned cables can also affect the safety of plenums because of their weight. There is, thus, no justification for permitting a "limited combustible" cable to remain in a plenum once it is abandoned and not intended for future use.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
ABSTENTION: 1
EXPLANATION OF ABSTENTION:
CAUDILL: The Society of the Plastics Industries could not reach a consensus position on this issue.

(Log #1091)

16- 306 - (800-52(b), Exception): Accept
SUBMITTER: Marcelo M. Hirschler, GBH International/Rep. Plenum Cable Association and Fire Retardent Chemicals Assoc.
COMMENT ON PROPOSAL NO: 16-246
RECOMMENDATION: Continue rejecting the exception for permitting cable to be listed as limited combustible to remain in plenums, in particular CL2PP and CL3PP.
SUBSTANTIATION: Materials that are limited combustible can burn (i.e. they are not noncombustible) and increase the fire load. Therefore, there is a potential for increased fire hazard or fire risk when any cable, irrespective of whether it is or is not limited combustible, remains as fuel load unnecessarily once it has been taken out of use. Furthermore, all abandoned cables can also affect the safety of plenums because of their weight. There is, thus, no justification for permitting a "limited combustible" cable to remain in a plenum once it is abandoned and not intended for future use.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
ABSTENTION: 1
EXPLANATION OF ABSTENTION:
CAUDILL: The Society of the Plastics Industries could not reach a consensus position on this issue.

(Log #1092)

16- 307 - (800-52(b), Exception): Accept
SUBMITTER: Marcelo M. Hirschler, GBH International/Rep. Plenum Cable Association and Fire Retardent Chemicals Assoc.
COMMENT ON PROPOSAL NO: 16-248
RECOMMENDATION: Continue rejecting the exception for permitting cable to be listed as limited combustible to remain in plenums, in particular CMP-50 and MPP-50.
SUBSTANTIATION: Materials that are limited combustible can burn (i.e. they are not noncombustible) and increase the fire load. Therefore, there is a potential for increased fire hazard or fire risk when any cable, irrespective of whether it is or is not limited combustible, remains as fuel load unnecessarily once it has been taken out of use. Furthermore, all abandoned cables can also affect the safety of plenums because of their weight. There is, thus, no justification for permitting a "limited combustible" cable to remain in a plenum once it is abandoned and not intended for future use.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
ABSTENTION: 1
EXPLANATION OF ABSTENTION:
CAUDILL: The Society of the Plastics Industries could not reach a consensus position on this issue.

(Log #1070)

16- 308 - (Table 800-53): Reject

Note: "See Technical Correlating Committee action on Comment 16-98."

SUBMITTER: Marcelo M. Hirschler, GBH International/Rep. Plenum Cable Association and Fire Retardent Chemicals Assoc.

COMMENT ON PROPOSAL NO: 16-254

RECOMMENDATION: This proposal should be rejected, the references to CMP-50 and MPP-50 should be deleted from the Table 800-53 and not incorporated into Figure 800-53 and the CMP-50 and MPP-50 classifications should not be created.

SUBSTANTIATION: The CMP-50 and MPP-50 classifications are unnecessary classification because they are not justified either by requirements for reduction in fire hazard in plenums (fire hazard is the potential for harm associated with fire) or a general reduction in fire risk (fire risk is the combination of fire hazard and the probability of fires resulting in undesirable outcomes). Furthermore, they are based on a research project which is incomplete (according to the Interim Report issued) and they are based on flawed testing technology, as represented by the oxygen bomb calorimeter.

The Plenum Cable Association endorses use of fire hazard assessment and fire risk assessment in order to further develop technically supportable standards, codes and regulations, that ensure reasonable and justifiable classification and control of plastic and other combustible products. The creation of the (CXP-50) marking is not justified based on fire hazard or on fire risk and is simply an effort for one type of material to gain market share at the expense of others. If a search for better fire performance is continued indefinitely, without taking into account the overall fire safety required by the application, clearly the use of plastics and other combustible materials should be discontinued, as a non combustible material can always be found which outperforms any plastic material. Thus, if the National Electrical Code were to support unjustified improvements in fire performance, eventually any use of plastic or other combustible materials would be in jeopardy.

Thus, there are 4 reasons to oppose the CXP-50 classifications: (i) no justification based on fire risk, (ii) no justification based on fire hazard, (iii) the study for the development of the classification by the proponents is incomplete, and (iv) the technique of oxygen bomb calorimetry, and the concept of limited combustible, are technically flawed. These concerns are exemplified as follows:

(i) An analysis of fire performance of cables addresses fire hazard.

Fire hazard analysis: Traditional CMP-rated cables will not cause significant flame spread or smoke obscuration unless the fire source is very large. For example, a CMP cable with a PVC jacket and FEP insulation was shown to have no significant flame spread (out of a possible flame spread of 20 feet) and a peak optical density of much less than 0.2 when exposed to a fire of approximately 1 MW, from a wood crib, in a full scale facility, that simulated a room and plenum [Reference: L.M. Caudill, J.R. Hoover, J.T. Walnock and J.T. Chapin, "Fire Performance of Communications Cables in Concealed Spaces", pages 277-285, NFPRF Fire Risk and Hazard Assessment Symposium, June 26-28, 1996, San Francisco, CA]. The same cable also showed approximately 2 feet flame spread in the NFPA 262 plenum cable test, with a peak optical density not exceeding 0.3, according to the same reference. Clearly, if a cable does not spread flame significantly when a 1 MW fire source is applied, it does not represent any severe fire hazard. In a different scenario, a similar type of cable was studied by the European research project FIPEC, and found to release 42 kW and less than 6 MJ, to spread flame vertically for only 1.1 m, and to give low smoke release when tested in a severe vertical cable tray test (30 kW input at high air flow rate) [Reference: Fire Performance of Electric Cables Report, Interscience Communications, UK, 1999]. This indicates that the fire hazard associated with traditional CMP cables (and this with traditional CL2P and CL3P cables) is very low.

(ii) Analysis of NFPA statistics serves to illustrate fire risk. NFPA statistics address the following types of fires:

* "Non residential concealed space structure fires involving ignition of fixed wiring in ceiling/roof assemblies" {Roof plenums are examples of these spaces}
* "Non residential concealed space structure fires involving ignition of fixed wiring in ceiling/floor assemblies" {Floor plenums are examples of these spaces}

In each case, the statistics can distinguish whether wire and cable insulation was or was not the item first ignited, giving four sets of statistics relevant to plenum cables. These statistics are relevant to the fire risk from plenum cables, as plenum cables are the typical type of wire and cable insulation present in roof plenums or in floor plenums.

Fire risk analysis: The statistics indicate that, between 1980 and 1996, there have been an average of only 584 fires per year, and of those only 171 have started with ignition of a wire and cable product, and the trend has been downwards (see the attached Tables with fire statistics and the attached charts, indicating a similar type of downward trend for both concealed roof spaces and concealed floor spaces). In fact, over the entire period between 1980 and 1996 the total number of fires in concealed roof spaces involving ignition of fixed wiring has been 0.29% of the total number of non residential structure fires (of which less than 30% started in wire and cable) and the total number of fires in concealed floor spaces involving ignition of fixed wiring has been 0.10% of the total number of non residential structure fires (of which ca. 32% started in wire and cable). With regard to fatalities or injuries: out of 3,734 fatalities in non residential structure fires, only 7 occurred in concealed roof or floor spaces involving ignition of fixed wiring (less than 0.19%), and out of 60,950 injuries in non residential structure fires, only 85 occurred in concealed roof or floor spaces involving ignition of fixed wiring (less than 0.14%). At least 4 of the 7 fatalities have been shown not to have resulted from plenum cable fires with the other 3 unknown. Thus, the fire record in a period when the amount of installed plenum cables increased from virtually none to some 20 billion feet, indicates that the fire risk is minimal.

(iii) The classifications of CXP-50 are not yet ready for application, since the NFPA Fire Protection Research Foundation Project developing the classification has not yet issued its final report. The Interim Report (International Limited Combustible Plenum Cable Fire Test Project, Interim Report, by F.B. Clarke and R.G. Gewain, June 2000) is the source of our [Plenum Cable Association] concerns. The first objective of this project was to: "Develop harmonized Steiner Tunnel listing protocols for permanent plenum cables related to NFPA 262/UL 910 and NFPA 255." The Interim Report describes part of Phase I of the project, wherein no harmonized listing protocol has been developed. The Interim Report addresses NFPA 255 and NFPA 259 and states, among other things:

* NFPA 255, flame travel distance: "... The NFPA 255 flame travel distances appear to be highly repeatable {i.e. within one lab} in each laboratory, as evidenced by the small variance of the measurements, *but not particularly reproducible* {i.e. between labs}, as can be seen by comparing this variance with the interlaboratory results. ..." {Emphasis added, but statement comes verbatim from report}
* NFPA 255, smoke index, or SDI: "... With respect to the smoke measurements, multiple determinations of the SDI by a given laboratory on a given cable agree with one another quite closely *but the SDI's reported by the two labs for the same cables do not appear to be close at all*. The results reported by Laboratory 2 are, with one exception, systematically higher than those of Laboratory 1. ..." {Emphasis added, but statement comes verbatim from report}
* NFPA 255 precision: " ... The flame spread and smoke measurements in NFPA 255 show ... *relatively poor reproducibility*, i.e. the result for a cable in a given laboratory can be repeated with precision but the difference in results between laboratories is on average considerably larger than the repeatability error. ..." {Emphasis added, but statement comes verbatim from report}
* Procedure for NFPA 255: "It is possible to test wire and cable following the current NFPA 255 test procedure, using the mounting specified for plastics in Appendix B7 of the standard." Appendix B-7 of NFPA 255 states:

"B-7 Plastics. B-7.1 The term plastics includes foams, reinforced panels, laminates, grids, and transparent or translucent sheets.

B-7.2 Where any plastic remains in position in the tunnel during a fire test, no additional support is necessary. Thermoplastic materials and other plastics that do not remain in place should be supported by 1/4-in. (6.3-mm) round metal rods or 3/16 in. (4.8 mm) thick 2 in. (51 mm) wide steel bars, or 2-in. (51-mm) galvanized hexagonal wire mesh supported with metal bars or rods spanning the width of the tunnel."

It is interesting to compare this with the statements in NFPA 262, as follows:

"1-1.3* Although this test uses equipment similar to that used in NFPA 255, Standard Method of Test of Surface Burning Characteristics of Building Materials, and ASTM E 84, Standard Test Method for Surface Burning Characteristics of Building Materials, sufficient changes have been made to the chamber so that a test conducted in the apparatus used for NFPA 255 or ASTM

E 84 cannot be considered identical or produce comparable results.

A-1-1.3 The changes made in equipment for this test were deemed necessary in order to obtain proper precision from the test when the equipment is used for small quantities of wire and cable, which produce much smaller quantities of heat release and smoke obscuration."

* NFPA 259: "... NFPA 259 has traditionally been carried out on individual materials, and so the potential heat of a finished product like a cable would be calculated as the um of the contributions of each component, each contribution being the potential heat of the component multiplied by the mass fraction of that component in the cable. To produce such a measurement it would be necessary to disassemble the cable into its different components – insulation, jacket, shielding, rip cord and the like – and measure the potential heat of each component. *An obvious question is whether such a cumbersome procedure is necessary* ..." {Emphasis added, but statement comes verbatim from report}.

* Observations on NFPA 259: "One of the labs (Laboratory 2) had both more experience and more advanced equipment ..."

* Procedure for NFPA 259: "... The procedure followed was NFPA 259, Standard Test Method for Potential Heat of Building Materials, 1998 Edition, with modifications to the following sections: ... *This modification should be viewed provisionally since it so far has only been tested on 4-pair unshielded twisted pair (UTP) plenum cable*." {Emphasis added, but statement comes verbatim from report}

(iv) The oxygen bomb calorimeter test used to assess "limited combustible" classifications is severely flawed. NFPA 259 uses the oxygen bomb calorimeter as part of its testing to assess potential heat. The term "limited combustible" was developed for "building construction materials", with the intent of applying it to materials of construction of the plenum and not to cables. NFPA 90A defines "limited combustible" as follows:

"Limited-Combustible Material. A building construction material not complying with the definition of noncombustible material that in the form in which it is used, has a potential heat value not exceeding 3500 Btu/lb (8141 kJ/kg) where tested in accordance with NFPA 259, Standard Test Method for Potential Heat of Building Materials, and complies with (a) or (b):

(a) Materials having a structural base of noncombustible material, with a surfacing not exceeding a thickness of 1/8 in. (3.2 mm), that has a flame spread index not greater than 50; (b) Materials, in the form and thickness used, other than as described in (a), having neither a flame spread index greater than 25 nor evidence of continued progressive combustion, and of such composition that surfaces that would be exposed by cutting through the material on any plane would have neither a flame spread index greater than 25 nor evidence of continued progressive combustion. Materials subject to increase in combustibility or flame spread index beyond the limits herein established through the effects of age, moisture, or other atmospheric condition shall be considered combustible."

The oxygen bomb calorimeter is a method for determining the theoretical (or complete or absolute) calorific energy (or heat of combustion), as opposed to the effective (or practical) values. The reason such instruments are used is to ensure that the correct value is chosen. As such they represent the following chemical equations for combustible fuels containing only carbon, hydrogen and oxygen:

$$C + O_2 = CO_2$$

$$4\,H + O_2 = 2\,H_2O$$

For hydrocarbon fuels: $- C\,H_2 - + O_2 = CO_2 + H_2O$

However, when building materials are more complex, because they contain other elements, there is a certain inconsistency in the equation and in the energy calculated.

1. Cl: Thus, for example, when PVC is burnt in an oxygen bomb, depending on the fraction of hydrogen atoms present, there will be different proportions of the following two equations:

$$(C_2\,H_3\,Cl)_n + 2.5\,n\,O_2 = 2\,n\,CO_2 + n\,H_2O + n\,HCl$$

$$(C_2\,H_3\,Cl)_n + 2.75\,n\,O_2 = 2\,n\,CO_2 + 1.5\,n\,H_2O + 0.5\,n\,Cl_2$$

where the two equations differ by 380 kJ/kg.

2. S: Combustion of materials containing sulphur also depends on the final product. Typically the combustion bomb generates sulphuric acid as the final sulphur containing product, while furnace combustion generates sulphur dioxide (with the sulphur less fully oxidized). Therefore, the convention in bomb calorimetry is to determine values of calorific value of fuels (including coal), by referring to the quantitative conversion to sulphur dioxide, and ignoring the conversion to sulphuric acid (or sulphur trioxide) that occurs, by using a conversion factor based on the sulphur content. Interestingly, gypsum (which is calcium sulphate dihydrate), is a building material containing sulphur. The typical fuel containing sulphur is coal. The difference between conversion to sulphur dioxide and sulphuric acid is 9410 kJ/kg.

3. N: Combustion of materials containing nitrogen also has a convention: the heat of convention is normally calculated assuming that all the nitrogen is converted into molecular nitrogen. However, that is not what happens in oxygen bomb calorimetry, where nitrogen oxides and nitric acid are actually formed. Thus, a correction is applied to account for the following equation:

$HNO_3 = 0.5\,H_2O + 0.5\,N_2 + 1.25\,O_2$, with a net heat of reaction of 1017 kJ/kg.

4. F: Combustion of materials containing fluorine is generally represented as ending in the formation of carbon tetrafluoride (CF_4) and of hydrogen fluoride (HF), in varying proportions. The equation is as follows:

$$C_a\,H_b\,O_c\,F_e + (a+b/4-c/2-e/4)\,O_2 + (n+1/2)*e*(1-x) - b/2)\,H_2O = (a-ex/4)\,CO_2 + ex/4\,CF_4 + e(1-x)\,(HF) + e(1-x)\,n\,H_2O$$

where x is the fraction of fluorine atoms converted to CF_4 as opposed to converted to HF. The energy of the conversion of CF_4 to HF is approximately 192 kJ/kg. Moreover, fluorine materials will attack the walls of the bomb calorimeter.

5. Si: Compounds containing silicon are impossible to convert completely to their final oxidation product, which is silica (SiO_2), by conventional means because as burning proceeds, the material becomes covered by a layer of silica which prevents access of oxygen and leads to the formation of a residue. The only way to obtain a reliable result of heat of combustion of materials containing silicon (such as silicones) is by a method which combines the material with an organic fluorine compound (the value of which has been accurately assessed in advance) in rotating bomb containing also water and aqueous HF. This converts all the Si into fluorosilicic acid, and the results can then be calculated back.

6. P: Compounds containing phosphorus are exceedingly difficult to assess by oxygen bomb combustion calorimetry. There are four major problems: (1) various phosphorus acids with different energies of dilution are formed in various concentrations throughout the oxygen bomb, (2) the combustion products contain different types of phosphorus oxyacids, each one of which has a different heat of formation, (3) the burning compound gets covered by phosphorus oxides and acids, which inhibit further combustion and (4) the bomb calorimeter walls are attacked and metal phosphates are formed, so that the recommended wall materials should be corundum or gold, since Pyrex glass, quartz, stainless steel titanium, porcelain and platinum all suffered heavy weight losses. For example, depending on whether a rotating bomb or a static bomb is used, the fraction of pyrophosphoric acid formed varied from 10 to 18% and that of triphosphoric acid from 1 to 3%.

7. Auxiliary combustion material: When an auxiliary material is used for assessing the heat of combustion, a 1% error in the assessment of the heat of combustion of the auxiliary material (such as benzoic acid), which is typically used in the order of 20% energy loading, corresponds to a 5% error in the total energy/heat measured. Thus, at a value of 1500 kJ/kg that would be an error of 75 kJ/kg, and this would be a systematic error for that series of experiments.

8. Moisture content: the moisture content of the building material is critical, because the combustion reaction considered in the oxygen bomb is that to convert to gaseous water. Thus, if a material contains water, the water will have reaction to vaporize the water content. Thus, results must be expressed as a function of the original moisture content for them to be valid. This matters, of course, for materials that absorb moisture when exposed to the atmosphere.

Bibliography on oxygen bomb calorimetry:

* Mansson, Margret, "Determination of Calorific Values of Building Materials - A Guide", SP Nordtest Report Project 871-90, Swedish National Testing and Research Institute, Boras, Sweden, 1991.

* Head, Arthur J, and Good, William D., "Combustion of Liquid/Solid Compounds with Non-Metallic Hetero Atoms", Chapter 9 in "Combustion Calorimetry", "Volume 1, Experimental

Chemical thermodynamics", Eds. Stig Sunner & Margret M. Mansson), Pergamon Press, Oxford, UK (for Int. Union Pure & Applied Chemistry, IUPAC), 1979.

* Mansson, Margret and Hubbard, Ward N., "Strategies in the Calculation of Standard-State Energies of Combustion from the Experimentally Determined Quantities", Chapter 5 in "Combustion Calorimetry", "Volume 1, Experimental Chemical thermodynamics", Eds. Stig Sunner & Margret M. Mansson), Pergamon Press, Oxford, UK (for Int. Union Pure & Applied Chemistry, IUPAC), 1979.

* Hu, Andrew T., Sinke, G.C., Mansson, Margret and Ringner, Birgitta, "Test Substances for Bomb Combustion Calorimetry, p-Chlorobenzoic Acid". J. Chem. Thermodynamics, 4, 283-99 (1972).

* Mansson, Margret, "Thermochemistry - Some Recent Lines of Development", Pure & Applied Chemistry, 55(3), 417-26 (1983).

* Mansson, Margret, "A 4.5 cm^3 Bomb Combustion Calorimeter and an Ampoule Technique for 5 to 10 mg Samples with Vapour Pressures Below Approximately 3 kPa (20 Torr)", J. Chem. Thermodynamics, 5, 7232 (1973)

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

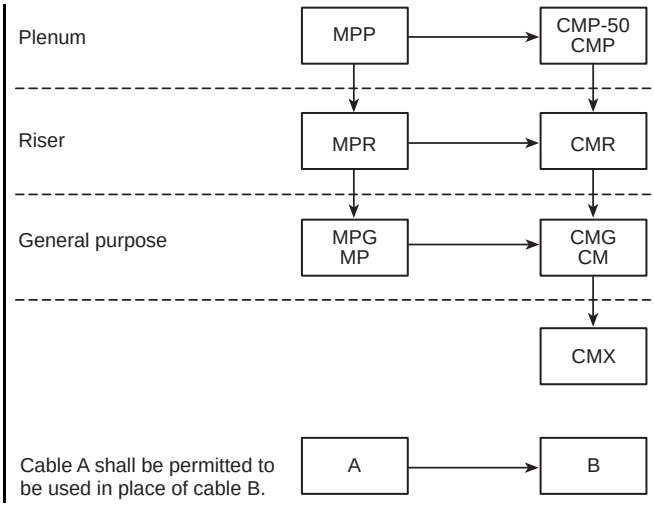
PANEL ACTION: Reject.
PANEL STATEMENT: Refer to panel action and statement on Comment 16-98.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
ABSTENTION: 1
EXPLANATION OF ABSTENTION:
CAUDILL: The Society of the Plastics Industries could not reach a consensus position on this issue.

(Log #1598)

16- 309 - (Table 800-53): Reject
Note: "See Technical Correlating Committee action on Comment 16-98."
SUBMITTER: Wayne G. Carson, Carson Assoc. Inc.
COMMENT ON PROPOSAL NO: 16-254
RECOMMENDATION: Delete reference to MPP-50 and CMP-50 cables in Table 800-53 and Figure 800-53.
SUBSTANTIATION: The new cable classification "Limited Combustible Cable" if deleted as recommended by comments to sections 725.71(b) [16-89]; 760-71(e) [16-149]; 770-51(b) [16-169]; 800-51(h) [16-232]; and 820-51(b) [16-302] will not be included in the Code. This type cable designation is not needed and is premature - see related comments for complete substantiation.
PANEL ACTION: Reject.
PANEL STATEMENT: Refer to panel action and statement on Comment 16-98.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
ABSTENTION: 1
EXPLANATION OF ABSTENTION:
CAUDILL: The Society of the Plastics Industries could not reach a consensus position on this issue.

(Log #275)

16- 310 - (Figure 800-53): Accept
Note: "See Technical Correlating Committee action on Comment 16-98."
SUBMITTER: Stanley Kaufman, Lucent Technologies
COMMENT ON PROPOSAL NO: 16-254
RECOMMENDATION: Revise Figure 800-53 as shown:



SUBSTANTIATION: This comment revises Figure 800-53 to be consistent with Table 800-53.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
ABSTENTION: 1
EXPLANATION OF ABSTENTION:
CAUDILL: The Society of the Plastics Industries could not reach a consensus position on this issue.

(Log #1312)

16- 311 - (800-53(a)): Accept in Principle
SUBMITTER: Allen C. Weidman, The Society of the Plastics Industry, Inc.
COMMENT ON PROPOSAL NO: 16-256
RECOMMENDATION: We support the action of the panel.
SUBSTANTIATION: None.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Refer to the panel action and statement on Comment 16-295.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
ABSTENTION: 1
EXPLANATION OF ABSTENTION:
CAUDILL: The Society of the Plastics Industries could not reach a consensus position on this issue.

ARTICLE 810 — RADIO AND TELEVISION EQUIPMENT

(Log #397)

16- 312 - (810-21(f)(1)d): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
COMMENT ON PROPOSAL NO: 16-266
RECOMMENDATION: Accept in Principle revised:
The nonflexible metallic power service raceway.
SUBSTANTIATION: The Code permits flexible type metallic service raceways. The heading indicates the raceway is used as an electrode. Section 250-70 indicates the grounding conductor shall be connected by welding, pressure connectors, or clamps, none of which appear suitable for connection to flexible raceway. Section 250-118 referred to by the Panel covers types of equipment grounding conductors, which this conductor does not appear to be.
PANEL ACTION: Reject.
PANEL STATEMENT: Section 250-118 permits flexible metal conduit under certain conditions to be used for grounding. Section 250-70(4) allows an equally substantial approved means as a method for attachment to electrodes.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21

ARTICLE 820 — COMMUNITY ANTENNA TELEVISION AND RADIO DISTRIBUTION SYSTEMS

(Log #1576)

16- 313 - (820-2): Accept in Principle
SUBMITTER: Wayne G. Carson, Carson Assoc. Inc.
COMMENT ON PROPOSAL NO: 16-273
RECOMMENDATION: Revise text to read as follows:
Abandoned Cable: Cable that is not ~~neither~~ terminated at both ends, ~~at a connector or other~~ not connected to equipment, or not ~~nor~~ identified for future use with a tag.
SUBSTANTIATION: The term "terminated at a connector" may result in cables being left in place as many cables come with connectors or the installer could add crimp connectors and leave the cables in place. The present language can be easily misunderstood: does the cable have to be terminated and tagged, or is it a choice?
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Refer to panel action and statement on Comment 16-314. The revised definition satisfies the submitter's intent.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21

(Log #1851)

16- 314 - (820-2): Accept in Principle
SUBMITTER: Robert W. Jensen, dbi-Telecommunications Infrastructure Design
COMMENT ON PROPOSAL NO: 16-273
RECOMMENDATION: New wording:
Abandoned Cable. Installed coaxial cable, with or without coaxial connectors, that is neither terminated at equipment (other than a coaxial connector), nor identified for future use with a tag.
SUBSTANTIATION: BICSI is proposing several clarifications to the definition. First, we add the word installed to show that the cable needs to be installed and not in the installers truck. Second, given the definition of "equipment" in Section 100, a coaxial connector is "equipment", and therefore under the definition initially accepted by the Panel, coaxial cable will always be terminated and therefore never abandoned. Consequently, BICSI is proposing additional wording to clarify the Panel intent, meaning "real" equipment, and not just a connector on the end.
PANEL ACTION: Accept in Principle.
Revise the recommendation to read as follows:
"Abandoned Coaxial Cable. Installed coaxial cable that is not terminated at equipment other than a coaxial connector and not identified for future use with a tag."
PANEL STATEMENT: The revised text more clearly expresses the intended definition and complies with the Manual of Style.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21

Note: The sequence no. 16-315 was not used.

(Log #1313)

16- 316 - (820-2-Abandoned Cable (New)): Accept in Principle
SUBMITTER: Allen C. Weidman, The Society of the Plastics Industry, Inc.
COMMENT ON PROPOSAL NO: 16-273
RECOMMENDATION: We support the action of the panel.
SUBSTANTIATION: None.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Refer to panel action and statement on Comment 16-314. The revised definition satisfies the submitter's intent.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21

(Log #1756)

16- 317 - (820-2-Abandoned Cable): Accept in Principle
SUBMITTER: Francis W. Peri, Communications Design Corporation
COMMENT ON PROPOSAL NO: 16-273
RECOMMENDATION: New wording:
Abandoned Cable. Installed coaxial cable, with or without coaxial connectors, that is neither terminated at equipment (other than a coaxial connector), nor identified for future use with a tag.
SUBSTANTIATION: This definition needs clarification. The word installed shows that the cable needs to be installed and not in the installers truck. Also, considering the definition of "equipment" in Section 100, a coaxial connector is "equipment". Therefore, under the definition initially accepted by the panel, coaxial cable will always be terminated and therefore never abandoned. ACP proposes additional wording to clarify the panel intent, meaning "real" equipment, and not just a connector on the end.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Refer to panel action and statement on Comment 16-314. The revised definition satisfies the submitter's intent.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21

(Log #270)

16- 318 - (820-3(a)): Accept in Principle
SUBMITTER: Stanley Kaufman, Lucent Technologies
COMMENT ON PROPOSAL NO: 16-313
RECOMMENDATION: Delete "not intended for future use."
SUBSTANTIATION: It is redundant to state "Abandoned cables not intended for future use...", since abandoned cables are defined as not being intended for future use.
PANEL ACTION: Accept in Principle.
Revise the second sentence of Section 820-3(a) in the panel action of Proposal 16-313 to read as follows:
The accessible portion of abandoned coaxial cables shall not be permitted to remain.
PANEL STATEMENT: The intent is not to remove cables where it would be extremely difficult or damaging to the building or the remaining cables.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21

(Log #1582)

16- 319 - (820-3(a)): Accept in Principle in Part
SUBMITTER: Wayne G. Carson, Carson Assoc. Inc.
COMMENT ON PROPOSAL NO: 16-313
RECOMMENDATION: Revise text to read as follows:
Spread of Fire or Products of Combustion. Installations in hollow spaces, vertical shafts, and ventilation or air-handling ducts shall be made so that the possible spread of fire or products of combustion will not be substantially increased. Openings around penetrations through fire resistance-rated walls, partitions, floors, or ceilings shall be firestopped using approved methods to maintain the fire resistance rating.
Abandoned cables not intended for future use shall not be permitted to remain.
FPN: Directories of electrical construction materials published by qualified testing laboratories contain many listing installation restrictions necessary to maintain the fire-resistive rating of assemblies where penetrations or openings are made.
SUBSTANTIATION: This definition under the section entitled "Spread of Fire or Products of Combustion" is not consistent throughout the Code. This comment uses language from ROP 16-250 [850-52(B)] to provide a consistent requirement throughout the code.
The same comment is being made for the following sections:
640-3A (ROP 16-1a)
645-5D6 (ROP 12-106)
725-3B (ROP 16-80)
760-3A (ROP 16-144)
770-3A (ROP 16-176)
820-3A (ROP 16-313)
830-3A (ROP 16-364)
820-52B (ROP 16-368)
PANEL ACTION: Accept in Principle in Part.
PANEL STATEMENT: The panel accepts in principle the statement regarding abandoned cables. Refer to panel action on Comment 16-318. This satisfies the submitter's concerns.
The current reference to 300-21 satisfies the balance of the comment, which is rejected. That portion of the comment repeats the text of 300-21.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21

(Log #1422)

16- 320 - (820-3(b)): Reject
SUBMITTER: Kari Barrett, American Chemistry Council
COMMENT ON PROPOSAL NO: 16-313
RECOMMENDATION: Delete the following text:
~~Abandoned cables not intended for future use shall not be permitted to remain.~~
SUBSTANTIATION: Removal of abandoned cables in these areas is a "housekeeping" issue. Whether or not to remove them should be the owner's decision and not be mandated by the NEC.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel reaffirms that removal of abandoned cables addresses a significant fire safety issue. The term "housekeeping" is not applicable to abandoned cables. Fire safety and cable installation are within the scope of the NEC.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21

(Log #204)

16- 321 - (820-5): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 16-276
RECOMMENDATION: See Technical Correlating Committee action on Proposal 16-38. It was the action of the Technical Correlating Committee that further consideration be given to the comments expressed in the voting. The Technical Correlating Committee directs that the Action on this Proposal be revised to comply with the NEC Style Manual 3.2.1 relative to use of the unenforceable terms "practicable" and "impracticable". This action will be considered by the Panel as a Public Comment. It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 3 for Comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
PANEL STATEMENT: Refer to the recommendation and substantiation on Comment 16-320a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21

(Log #706)

16- 322 - (820-5): Reject
SUBMITTER: Glenn W. Zieseniss, Crown Point, IN
COMMENT ON PROPOSAL NO: 16-276
RECOMMENDATION: Change the "Accept in Principle" to "Reject".
SUBSTANTIATION: I agree with Mr. Egesdal's and Mr. Speer's negative vote and comment on Proposal 16-192. This proposal is giving a "blanket okay for any type of ceiling tile to support the possible added weight of 3 cables of less than 1/2 in. in diameter on each ceiling tile. The proposal does not affirm that the ceiling tile industry was contacted of adding weight to lay on their product. This product is not part of the building structure, and is not designed to be suitable for supporting cables. I have seen ceiling tiles which look as if made of fiber glass insulation which has a finished surface on the exposed side of the ceiling. It is my belief that this ceiling tile would not accept additional weight upon it. I have contacted three ceiling tile companies or organizations on this proposal. They all suggested that their ceiling tiles are not to support additional weight. I have provided copies of my e-mail contacts.
NOTE: Supporting Material is available at NFPA Headquarters.
PANEL ACTION: Reject.
PANEL STATEMENT: The recommendation of Comment 16-320a provides a reasonable, safe, and practical solution to placing a limited number of unsupported signaling and communications cables in existing construction. The restrictions contained in Comment 16-320a limit both the number and size of wires and cables permitted on each ceiling panel, thereby controlling weight and accumulation so that cables can be easily moved aside to permit access. The submitter's concern about weight is addressed by decreasing the size of the cable to 1/4 inch and limiting the number of cables to three per each 10 ft x 10 ft area.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
SPEER: See my explanation of negative vote on Comment 16-27a.

(Log #863)

16- 323 - (820-5): Accept in Principle in Part
SUBMITTER: Larry F. Miller, National Electrical Manufacturers Association (NEMA)
COMMENT ON PROPOSAL NO: 16-276
RECOMMENDATION: The Panel should continue to Accept the proposal in Principle but revise the Panel action text to read as follows:
820-5. Access to Electrical Equipment Behind Panels Designed to Allow Access.
Access to electrical equipment shall not be denied by an accumulation of wires and cables that prevents removal of panels. Cables shall be installed in such a manner that the cable will not be damaged by normal building use <u>or maintenance.</u> Access to electrical equipment behind ceilings designed to allow access shall comply with (a) or (b).
a. New building construction (e.g., renovation, remodeling, new spaces). Installation of cables shall comply with Section 300.11.
b.<u>1. Installation of cables in suspended lay-in type ceiling spaces shall comply with 300.11.</u>
<u>2. Installation of cables in other than suspended lay-in type ceiling spaces shall comply with 300.11 where the space is accessible.</u>
<u>3.Where the ceiling is not the lay-in type, and the space is not accessible, three cables less than 13 mm (0.5 in). shall be permitted to be installed unsupported by the building structure between access points or access panels.</u>
~~Buildings with existing cabling systems.~~
~~Where practicable, installation of cables shall comply with Section 300.11. Where impracticable to comply with Section 300.11, cables less than 13 mm (0.5 in) in diameter shall be permitted to be installed unsupported by the building structure in accordance with 1 or 2.~~
~~1. In areas having ceilings with access points or access panels, it shall be permissible to fish a maximum of three cables between access points in the ceiling.~~
~~2. In areas having suspended lay-in ceilings, it shall be permissible to install a maximum three supported cables on top of any one ceiling tile. The cables shall be run parallel to the ceiling grid."~~
SUBSTANTIATION: We agree with Mr. Egedsal's and Mr. Speer's negative comments that suspended ceilings are not intended to support electrical wires or cables.
Section 300-11(a)(1) (wiring located within the cavity of a fire-rated floor-ceiling or roof-ceiling) allows an exception for wiring that has been tested as part of the fire-rated assembly. This proposal could compromise the fire-rating of the ceiling by overriding that requirement. The words "or maintenance" have been added because so much of the damage occurs in ceiling spaces as various trades perform maintenance.
The submitter states that he has submitted companion proposals for Articles 725 760, 770, 820 and 830. If each of these articles will allow three cables per ceiling tile, this could result in a total of 18 cables per ceiling tile, which appears to be approaching the "excessive accumulation" the submitter agrees could be a hazard. Limiting the size and quantity of cable permitted to be fished in non-lay-in ceiling spaces will help control the weight of cable (combined with that permitted in the other articles referenced above) on these ceilings.
PANEL ACTION: Accept in Principle in Part.
PANEL STATEMENT: The panel rejects the recommended addition of the word "maintenance." The term "normal building use" includes "maintenance." The balance of the recommendation is accepted in principle. Refer to the recommendation and substantiation on Comment 16-320a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
SPEER: See my explanation of negative vote on Comment 16-27a.

(Log #966)

16- 324 - (820-5): Accept in Part
SUBMITTER: Palmer Hickman, Royersford, PA
COMMENT ON PROPOSAL NO: 16-276
RECOMMENDATION: Reject Proposal 16-276 as amended by Code-Making Panel 16. Accept Proposal 16-276 as submitted by Mr. Brunssen.
SUBSTANTIATION: I request Code-Making Panel 16's reconsideration of their action on this proposal. The proposed 820.5(B)(2) would now permit three cables to be installed on the tiles of a suspended ceiling, without providing any technical substantiation for this allowance.

I understand that this proposed allowance of ceiling support only applies to buildings with existing cabling systems where it is "impracticable" to comply with 300-11. Impracticability does not provide technical substantiation to allow a ceiling assembly that has not been evaluated to support the potential additional load of three cables on each and every ceiling tile.

I am aware that Chapter 8 is independent of other chapters except where specifically referenced therein. Panel 16 has referenced 300-11, and Code-Making Panel 3 is on record reaffirming their prohibition of ceiling assemblies being used beyond the manufacturers design parameters in the Panel Statement to Comments 3-53 and 3-57 of the 1998 ROC, and Proposal 3-68 of the 2001 ROP. In the latter reference, Code-Making Panel 3 states: "The panel reaffirms its position that an independent means of support shall be provided for all wiring, not just branch circuit wiring...".

The substantiation provided by Mr. Brunssen for his proposal does not support the proposed change as amended by Code-Making Panel 16. He claims that "a limited amount of cabling laid directly on a suspended ceiling is permitted..." without stating where this permission is given. The entire substantiation of the submitter seems contrary to the action of the panel. I am not sure he would recognize the end result as the proposal he made. Mr. Brunssen begins his substantiation by stating that "Section 820-5 may be misinterpreted to mean that conductors and cables may not be placed directly on the suspended ceiling." He notes that the 1999 Handbook "Figures, 820-1 and 820-2 lead the reader to conclude that no conductors or cables are permitted to rest directly on the suspended ceilings." The submitter also stated Code-Making Panel 16 responded to a proposal to Article 725 (1992 TCD Comment 16-18) that the proposed requirement "...would still allow some cabling of a limited quantity above the ceiling tile, but not to an excessive amount." Note the words "above the ceiling tile", not on the ceiling tile. I feel these examples are not misinterpretations, but rather correct interpretations, and a case to reject this proposal as amended by Code-Making Panel 16.

In conclusion, I respectfully disagree with the Panel Action on this Proposal. I find no technical substantiation to warrant such a dramatic change. Mr. Brunssen presented a well-researched proposal addressing access, not support. The substantiation of the submitter does not support this change, nor does the Panel Statement.
PANEL ACTION: Accept in Part.
PANEL STATEMENT: The panel accepts the portion of the comment to retain Section 820.5, and rejects the portion of the comment to reject Proposal 16-176. Refer to the recommendation and substantiation on Comment 16-320a. Also refer to the panel action and statement on Comment 16-322.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
SPEER: See my explanation of negative vote on Comment 16-27a.

(Log #1153)

16- 325 - (820-5): Accept in Principle
SUBMITTER: James E. Brunssen, Telcordia Technologies, Inc.
COMMENT ON PROPOSAL NO: 16-276
RECOMMENDATION: Continue to accept in principle.
SUBSTANTIATION: Panel 16 should continue to accept in principle as it provides a reasonable and safe solution to placing a limited number of signaling and communications wires and cables in existing construction. The restrictions contained in the proposed change limit both the number and size of wires and cables permitted on each suspended ceiling panel. In this manner additional weight, as well as an accumulation of wires and cables that would otherwise restrict access above suspended ceiling panels, is controlled and limited. The limited number of cables permitted can easily be moved aside to permit access. Some concern has also been expressed that cables placed directly on the ceiling panels would degrade the fire rating of the ceiling. The suspended ceiling, part of a membrane that is intended to retard fire from spreading into the ceiling cavity, would be unaffected in its ability to retard the spread of fire by a limited number of wires and cables resting on top of the panels. This is a companion comment and is intended to correlate with comments on Proposals 16-38, 16-112, 16-159, 16-192, and 16-332.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Refer to the substantiation on Comment 16-320a. This action meets the intent of the submitter.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
SPEER: See my explanation of negative vote on Comment 16-27a.

(Log #1161)

16- 326 - (820-5): Accept in Principle
SUBMITTER: James E. Brunssen, Telcordia Technologies, Inc.
COMMENT ON PROPOSAL NO: 16-276
RECOMMENDATION: Revise as follows:

820-5. Access to Electrical Equipment Behind Panels Designed to Allow Access. Access to electrical equipment shall not be denied by an accumulation of wires and cables that prevents removal of panels. Cables shall be installed in such a manner that the cable will not be damaged by normal building use. Access to electrical equipment behind ceilings designed to allow access shall comply with (a) or (b).

a. New Building construction (e.g., renovation, remodeling, new spaces). Installation of cables shall comply with Section 300.11.

b. Buildings within existing cabling systems. Where practicable, installation of cables shall comply with Section 300-11. Where impracticable to comply with Section 300-11, cables less than 13 mm (0.5 in.) in diameter shall be permitted to be installed unsupported by the building structure in accordance with 1 or 2.

1. In areas having ceilings with access points or access panels, it shall be permissible to fish a maximum of three cables between access points in the ceiling.

2. In areas having suspended lay-in ceilings, it shall be permissible to install a maximum <u>of</u> three unsupported cables on top of ~~any one~~ <u>each</u> ceiling tile, <u>i.e, up to three wires and cables are permitted to lay on a ceiling tile.</u> The cables shall be run parallel to the ceiling grid.

SUBSTANTIATION: Proposed Section 820-5(b)(2), as presently written in Proposal 16-276, panel action, is confusing and could be interpreted as permitting a total of only three unsupported wires and cables above a suspended ceiling. The intent of the panel was that up to a maximum of three unsupported wires and cables may be routed across each and every ceiling tile. The revision proposed in this comment clarifies and accomplishes the intent of the panel. This is a companion comment and is intended to correlate with comments on Proposals 16-38, 16-112, 16-159, 16-192, and 16-332.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Refer to the recommendation and substantiation on Comment 16-320a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
SPEER: See my explanation of negative vote on Comment 16-27a.

(Log #1167)

16- 327 - (820-5): Accept in Principle
SUBMITTER: James E. Brunssen, Telcordia Technologies, Inc.
COMMENT ON PROPOSAL NO: 16-276
RECOMMENDATION: Revise as follows:

820-5. Access to Electrical Equipment Behind Panels Designed to allow Access. Access to electrical equipment shall not be denied by an accumulation of wires and cables that prevents removal of panels. Cables shall be installed in such a manner that the cable will not be damaged by normal building use. Access to electrical equipment behind ceilings designed to allow access shall comply with (a) or (b).

a. New building construction (e.g., renovation, remodeling, new spaces). Installation of cables shall comply with Section 300.11.

b. Buildings with existing cabling systems. ~~Where practicable, installation of cables shall comply with Section 300.11. Where impracticable to comply with Section 300-11, c~~Cables less than 13

mm (0.5 in.) in diameter shall be permitted to be installed unsupported by the building structure in accordance with 1 or 2.

1. In areas having ceilings with access points or access panels, it shall be permissible to fish a maximum of three cables between access points in the ceiling.

2. In areas having suspended lay-in ceilings, it shall be permissible to install a maximum of three unsupported cables on top of any one ceiling tile. The cables shall be run parallel to the ceiling grid.

Where the maximum number of cables permitted in 1 or 2 will be exceeded,installation of cables shall comply with Section 300.11.

SUBSTANTIATION: The Technical Correlating Committee has directed that Proposal 16-276 be revised to comply with the NEC Style Manual 3.2.1 relative to the use of unenforceable terms. The proposed revision contained in this comment removes the unenforceable terms "practicable" and "impracticable"; the remaining text is in agreement with the NEC Style Manual 3.1.2 using the phrase "shall be permitted" to indicate allowed optional or alternate methods. The added text (final sentence) provides direction on how to proceed if the limits of 800-5(b)(1) or (2) will be exceeded. This is a companion comment and is intended to correlate with comments on Proposals 16-38, 16-112, 16-159, 16-192, and 16-332.

PANEL ACTION: Accept in Principle.

PANEL STATEMENT: Refer to the recommendation and substantiation on Comment 16-320a.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21

VOTE ON PANEL ACTION:

AFFIRMATIVE: 20

NEGATIVE: 1

EXPLANATION OF NEGATIVE:

SPEER: See my explanation of negative vote on Comment 16-27a.

(Log #CC1606)

16- 320a - (820-5, 7): Accept

Note: The Technical Correlating Committee directs that the references to Articles 640 and 650 be deleted because the panel did not accept similar requirements in those articles. The Technical Correlating Committee also directs that the FPN which contains a mandatory requirement be deleted to comply with the NEC Style Manual.

SUBMITTER: CMP 16

COMMENT ON PROPOSAL NO: 16-276

RECOMMENDATION: Retain the existing 1999 code text for Section 820-5 (unmodified).

Add new Section 820.7 to read as follows:

820.7 Installation of Systems.

CATV systems shall be installed in compliance with A or B.

A. New Ceiling Construction. The installation of cables in new ceiling construction shall comply with Section 300-11.

B. Existing Ceilings.

1. Fire-Rated Ceilings. The installation of cables in the cavity of an existing fire-rated ceiling assembly shall comply with Section 300-11.

2. Non-Fire-Rated Ceilings. For installations in the cavity of an existing non-fire-rated ceiling assembly, cables less than 6 mm (0.25 in) in diameter shall be permitted to be installed unsupported from the building structure in accordance with the following:

a. Fixed or Hard Ceilings. In areas having fixed or hard ceilings with access points or access panels, a combined total of three cables from Articles 640, 650, 725, 760, 770, 800, 820 and 830, shall be permitted to be placed between access points or access panels in the ceiling. Additional cables shall be installed in accordance with 300.11.

b. Suspended Lay-In Ceilings. In areas having suspended lay-in ceilings, in any 3 m by 3m (10 ft. x 10 ft) ceiling area, a combined total of three cables from Articles 640, 650, 725, 760, 770, 800, 820 and 830, shall be permitted to be installed directly on the ceiling grid. Additional cables shall be installed in accordance with 300.11.

FPN. Cables of all types are included in the total limit of three cables, not three cables from each article.

SUBSTANTIATION: Proposal 16-276 was accepted in principle to permit the installation of unsupported cables under limited conditions. Proposal 16-276 text, however, was too broad and unclear. The text of this comment clarifies the original intent. The new text includes requirements to comply with Section 300.11. Permitted installation conditions will not compromise the integrity of fire-rated ceilings. For non-fire-rated ceilings, the permitted relief from Section 300.11 is limited to very specific conditions. Section 820.5 is not being modified because the accessibility requirements should remain.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21

VOTE ON PANEL ACTION:

AFFIRMATIVE: 20

NEGATIVE: 1

EXPLANATION OF NEGATIVE:

SPEER: See my explanation of negative vote on Comment 16-27a.

(Log #1757)

16- 328 - (820-5): Accept in Principle

SUBMITTER: Francis W. Peri, Communications Design Corporation

COMMENT ON PROPOSAL NO: 16-276

RECOMMENDATION: Association of Cabling Professionals (ACP) recommends that Code Panel 16 continue to accept this proposal.

SUBSTANTIATION: ACP supports the introduction of complying with Section 300-11. It represents a major improvement in providing safe cabling pathways.

PANEL ACTION: Accept in Principle.

PANEL STATEMENT: Refer to the substantiation on Comment 16-320a. This action meets the intent of the submitter.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21

VOTE ON PANEL ACTION:

AFFIRMATIVE: 20

NEGATIVE: 1

EXPLANATION OF NEGATIVE:

SPEER: See my explanation of negative vote on Comment 16-27a.

(Log #1852)

16- 329 - (820-5): Accept in Principle

SUBMITTER: Robert W. Jensen, dbi-Telecommunications Infrastructure Design

COMMENT ON PROPOSAL NO: 16-276

RECOMMENDATION: BICSI recommends that Code Panel 16 continue to accept this proposal.

SUBSTANTIATION: BICSI supports the introduction of complying with Section 300-11 and recognizes that it represents a significant improvement in providing safe cabling pathways.

PANEL ACTION: Accept in Principle.

PANEL STATEMENT: Refer to the substantiation on Comment 16-320a. This action meets the intent of the submitter.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21

VOTE ON PANEL ACTION:

AFFIRMATIVE: 20

NEGATIVE: 1

EXPLANATION OF NEGATIVE:

SPEER: See my explanation of negative vote on Comment 16-27a.

(Log #744)

16- 330 - (820-5(b)): Accept in Principle in Part

SUBMITTER: Richard P. Owen, City of St. Paul, Electrical Inspection

COMMENT ON PROPOSAL NO: 16-276

RECOMMENDATION: Replace (b) of the proposal with the following text:

(b) Buildings not Covered Under (a) Above. In areas having ceilings with access points or panels and having 900 mm (3 ft) or less vertical clearance above the ceiling, it shall be permissible to fish a maximum of 3 cables, each less than 13 mm (0.5 in.) in diameter, between access points in the ceiling.

SUBSTANTIATION: The Technical Correlating Committee directed Panel 3 Chair Raymond Weber to form a Task Group to review these proposals and to submit the results as comments to Panel 16. Task Group 3-16, consisting of Chair Weber, members Steven Speer; Lee Hewitt; Richard Owen and Ron Maassen held a conference call on October 3, 2000 and developed the above language as a comment. The Task Group was concerned with allowing unsupported cabling above suspended ceilings, since companion proposals for Articles 725, 760, 770, 800, 820 and 830 would also allow this limited cabling without support. The possible accumulation of cable allowed by all these articles would be excessive and would both limit access to a ceiling and conflict with Section 300.11. Rewording of (b) also eliminated the unenforceable terms "practicable" and "impracticable" as directed by the Technical Correlating Committee.

PANEL ACTION: Accept in Principle in Part.

PANEL STATEMENT: The panel rejects the specific limitations in the comment but accepts the principle of permitting a limited number of cables. The recommendation of Comment 16-320a provides a reasonable, safe, and practical solution to placing a limited number of unsupported CATV cables in existing construction.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
SPEER: See my explanation of negative vote on Comment 16-27a.

(Log #1258)

16- 331 - (820-5(b)(2)): Reject
SUBMITTER: J. Paul Spinn, USG Research & Technology Center
COMMENT ON PROPOSAL NO: 16-276
RECOMMENDATION: Delete the following text:
In areas having suspended lay in ceiling, it shall be permissible to install a maximum of three unsupported cables on top of any one ceiling tile. The cables shall be run parallel to the ceiling grid.
SUBSTANTIATION: By allowing a maximum of three unsupported cables on top of any one (or more) ceiling tiles, the fire-rating of the assembly and the Class A surface burning characteristic requirement, which includes flame spread and smoke development, could be jeopardized. By decreasing the fire-rating of the plenum assembly and the surface burning characteristic of the ceiling tile, the life safety of the occupants can be negatively affected. By rejecting this proposal, these problems can be eliminated.
To substantiate the comment made for the proposal, four key points are provided:
[1] For a fire rated floor/ceiling or roof/ceiling assembly, placement of unsupported cables on top of any one ceiling tile or a row of ceiling tiles could invalidate the fire-rating for a particular assembly. The rationale for this argument are:
(a) The weight of the cables could cause premature tile fallout leading to an early failure of the assembly, which is tested in accordance with NFPA 251 or ASTM E 119.
(b) The increased heat of combustion associated with the cable jackets, which commonly use plastics, will add to the total fire load of an assembly. As the total fire load increases for an assembly, the fire endurance of the assembly will decrease, which could jeopardize an assembly's fire-rating.
[2] For a Class A ceiling, placement of unsupported cables on the ceiling can effect flame spread and smoke development performance and jeopardize the required Class A rating for the ceiling tiles. The rationale for this argument are:
(a) The flame spread will increase due to the increased total heat load, which is caused by the plastic on the cable jacket.
(b) The smoke development will increase due to the cable jackets, which are usually plastic such as PVC or CPVC.
[3] The placement of unsupported cables on top of any one or more ceiling tiles presents potential life safety issues for occupants due to the decreased fire-rating of the floor/ceiling or roof/ceiling or an increase in the ceiling surface burning characteristics.
[4] Placement of unsupported cables on top of any one ceiling tile or a row of ceiling tiles would increase ceiling tile sag due to increased weight of the cables on the ceiling tiles, and would impair the accessibility of the ceiling plenum.
PANEL ACTION: Reject.
PANEL STATEMENT: The recommendation of Comment 16-320a provides a reasonable, safe, and practical solution to placing a limited number of unsupported signaling and communications cables in existing construction. The restrictions contained in Comment 16-320a limit both the number and size of cables permitted on each ceiling panel, thereby controlling weight and accumulation so that cables can be easily moved aside to permit access. The submitter's concern about weight is addressed by decreasing the size of the cable to 1/4 inch and limiting the number of cables to three per each 10 ft x 10 ft area. The revised text precludes the installation of cables in all fire-rated ceiling assemblies.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
SPEER: See my explanation of negative vote on Comment 16-27a.

(Log #2087)

16- 332 - (820-5(b)(2) (New)): Accept in Principle in Part
SUBMITTER: Marcelo M. Hirschler, GBH International
COMMENT ON PROPOSAL NO: 16-276
RECOMMENDATION: Revise text as follows:
820-5. Access to Electrical Equipment Behind Panels Designed to Allow Access
Access to equipment shall not be denied by an accumulation of wires and cables that prevents removal of panels. Cables shall be installed in such a manner that the cable will not be damaged by normal building use. Access to electrical equipment behind ceilings designed to allow access shall comply with (a) or (b).
a. New building construction (e.g. renovation, remodeling, new spaces). Installation of cables shall comply with Section 300.11.
b. Buildings with existing cable systems. Where practicable, installation of cables shall comply with Section 300.11. Where impracticable to comply with Section 300.11, in those areas having ceilings with access points or access panels, it shall be permissible to fish a maximum of three cables less than 13 mm (0.5 in) in diameter, between access points in the ceiling. ~~cables less than 13 mm (0.5 in) in diameter shall be permitted to be installed unsupported by the building structure in accordance with 1 or 2.~~
~~1. In areas having ceilings with access points or access panels, it shall be permissible to fish a maximum of three cables between access points in the ceiling.~~
~~2. In areas having suspended lay in ceilings, it shall be permissible to install a maximum of three unsupported cables on top of any one ceiling tile. The cables shall be run parallel to the ceiling grid.~~
SUBSTANTIATION: The permission granted by the panel to install cables on suspended ceiling tiles should be rescinded. Neither cables nor any other item should be installed on top of a suspended ceiling tile. The support systems of suspended ceilings are not designed to resist any significant amount of weight without being deflected or broken.
This issue has been raised on Proposal 16-192 (log 1665) in negative comments by two panel members, Mr Egesdal and Mr Speer, who both correctly point out that suspended ceiling tiles are not intended to support the weight of electrical cables. Mr. Sandy Egesdal repeats his negative comment on this proposal.
The point made by the Technical Correlating Committee on proposal 16-38 that such use would constitute an exposed use of cables is an additional consideration to rejecting this part of the proposal.
PANEL ACTION: Accept in Principle in Part.
PANEL STATEMENT: The panel accepts the principle of permitting a limited number of cables to be installed in a fixed or hard ceiling. The panel rejects the balance of the submitter's recommendation including the limiting of the installation of cables in a suspended lay-in ceiling . The recommendation of Comment 16-320a provides a reasonable, safe, and practical solution to placing a limited number of unsupported signaling and communications cables in existing construction.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
SPEER: See my explanation of negative vote on Comment 16-27a.

(Log #1159)

16- 333 - (820-6): Reject
SUBMITTER: James E. Brunssen, Telcordia Technologies, Inc.
COMMENT ON PROPOSAL NO: 16-276a
RECOMMENDATION: Delete 820-6 and incorporate the information in 820-5 as follows:
820-5. ~~Access to Electrical Equipment Behind Panels Designed to Allow Access.~~ Mechanical Execution of Work. Community antenna television and radio distribution systems shall be installed in a neat and workmanlike manner. Access to electrical equipment shall not be denied by an accumulation of ~~wires and~~ cables that prevents removal of panels. Cables shall be installed in such a manner that the cable will not be damaged by normal building use. ~~Access to electrical equipment behind ceilings designed to allow access~~ Cables installed exposed shall comply with (a) or (b).
a. New building construction (e.g., renovation, remodeling, new spaces). Installation of cables shall comply with Section 300.11 Cables shall be supported by structural components of the building. Such cables shall be attached to structural components at intervals not exceeding 1.52 m (5 ft) and within 305 mm (12 in.) from every cabinet, box or fitting by straps, staples, hangers or

similar fittings designed and installed so as not to damage the cable. The installation shall also conform with Section 300-4(d).

b. Buildings with existing cabling systems. Where practicable, installation of cables shall comply with ~~Section 300-11~~ 820-5(a) Where impracticable to comply with ~~Section 300-11~~ 820-5(a), cables less than 13 mm (0.5 in.) in diameter shall be permitted to be installed unsupported by the building structure in accordance with 1 or 2.

1. In areas having ceilings with access points or access panels, it shall be permissible to fish a maximum of three cables between access points in the ceiling.

2. In areas having suspended lay-in ceilings, it shall be permissible to install a maximum of three unsupported cables on top of any one ceiling tile. The cables shall be run parallel to the ceiling grid.

SUBSTANTIATION: This is a companion comment and is intended to correlate with similar comments on Proposals 16-39, 16-115, 16-159a, 16-192a, and 16-333a. Sections 820-5 and 820-6 actually address the same issue, the mechanical execution of work. Accessibility behind panels designed to allow access is really an "execution of work" issue. Additionally, the Technical Correlating Committee has identified a potential conflict between the panel action on Proposals 16-38 and 16-39, that would also result here in 820. This comment editorially combines 820-5 and 820-6 into a single Section 820-5 requiring attachment to the building structure of exposed cables and conductors and, where impracticable to do so, permits a limited number of cables of specified maximum size to be placed on suspended ceiling tiles. It accommodates the intent of both proposals that cables should be supported by the building structure, but in extenuating circumstances in existing construction, a limited number and weight of cables may be placed on a suspended ceiling. Further, in the first paragraph of 820-5, the phrase "wires and" is deleted as CATV circuits are provided via coaxial cable and not wire.

PANEL ACTION: Reject.

PANEL STATEMENT: The sections should not be combined. Refer to the recommendation and substantiation for Comment 16-320a where these recommendations are addressed.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21

VOTE ON PANEL ACTION:

AFFIRMATIVE: 20

NEGATIVE: 1

EXPLANATION OF NEGATIVE:

SPEER: See my explanation of negative vote on Comment 16-27a.

(Log #1420)

16- 334 - (820-6): Accept in Part

SUBMITTER: Kari Barrett, American Chemistry Council

COMMENT ON PROPOSAL NO: 16-276a

RECOMMENDATION: Delete the following text:

~~Such cables shall be attached to structural components at intervals not exceeding 1.52 m (5 ft) and within 305 mm (12 In.) from every cabinet, box or fitting by straps, staples, hangers or similar fittings designed and installed so as not to damage the cable. The installation shall also conform with Section 300-4(d).~~

SUBSTANTIATION: The addition of this text would make the mandatory requirements of this section appear overly specific. The present wording is sufficient guidance to both the installer and the authority having jurisdiction.

PANEL ACTION: Accept in Part.

Revise the third sentence of the panel action text of Proposal 16-276a to read as follows:

"Such cables shall be attached to structural components by straps, staples, hangers or similar fittings designed and installed so as not to damage the cable."

PANEL STATEMENT: The panel accepts the removal of specific distances for the attachment of the cable. The panel does not agree that the existing code wording is sufficient guidance to both the installer and the authority having jurisdiction.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21

VOTE ON PANEL ACTION:

AFFIRMATIVE: 20

NEGATIVE: 1

EXPLANATION OF NEGATIVE:

SPEER: See my explanation of negative vote on Comment 16-27a.

(Log #1637)

16- 335 - (820-6): Reject

SUBMITTER: Andy Scott, National Cable Television Association

COMMENT ON PROPOSAL NO: 16-276a

RECOMMENDATION: Reject Proposal 16-276a.

SUBSTANTIATION: NCTA, on behalf of the cable television industry, strongly urges Panel 16 to reject these proposals. While attachment every 5 ft may be a practice in many cases, it also may be overly restrictive and unnecessary in others. The requirement to support cables every 5 ft is outside the scope of the code. The NCTA urges Panel 16 not to allow the NEC to serve as an Installation Manual.

PANEL ACTION: Reject.

PANEL STATEMENT: The panel action on Comment 16-199 addresses the concerns in the submitter's substantiation.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21

VOTE ON PANEL ACTION:

AFFIRMATIVE: 20

NEGATIVE: 1

EXPLANATION OF NEGATIVE:

SPEER: See my explanation of negative vote on Comment 16-27a.

(Log #616)

16- 336 - (820-10(c)): Accept in Principle

SUBMITTER: Steven C. Johnson, Time Warner Cable

COMMENT ON PROPOSAL NO: 16-281

RECOMMENDATION: Reject the proposal to prohibit use of service masts for drop attachments.

SUBSTANTIATION: There is no reason to force a homeowner to install a separate mast to accommodate communications (telephone, CATV) service drops wherever the service mast can be listed to do so. An arbitrary prohibition of attaching to electrical masts is not reasonable. Where the mast can be shown to support additional attachments without creating a safety hazard, these attachments should be allowed. Reasonable qualifications would include the ability to support the weight (with ice loading) and not damage the mast or structure, ability to maintain proper clearance, etc.

PANEL ACTION: Accept in Principle.

PANEL STATEMENT: Refer to the panel action and statement on Comment 16-337.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21

VOTE ON PANEL ACTION:

AFFIRMATIVE: 16

NEGATIVE: 5

EXPLANATION OF NEGATIVE:

DORNA: See my explanation of negative vote on Comment 16-271.

KAHN: The comments should be rejected and the original Panel Action to Reject Proposal 16-281 should be sustained.

Code-Making Panel 4 has rejected the Proposal and that panel has primary jurisdiction. In their Panel Statement, they state: "... that they do not believe that the listing of the product will adequately address the personnel issues that are created by the co-mingling of the different systems on a common mast. Issues such as loading can be addressed by the proposed listing, however personnel safety cannot be assured regardless of the listing criteria." I agree with their assessment.

A task group of Code-Making Panel 4 and Code-Making Panel 16 members as suggested in the Panel Statement should be formed to study the problem further if the Technical Correlating deems it advisable.

MANGAN: See my explanation of negative vote on Comment 16-271.

SPEER: See my explanation of negative vote on Comment 16-271.

TODD: See my explanation of negative vote on Comment 16-155.

(Log #1145)

16- 337 - (820-10(c)):

Note: The Technical Correlating Committee directs that this comment be reported as "Reject" to correlate with the action on Proposal 4-73 and Comment 4-51

SUBMITTER: James E. Brunssen, Telcordia Technologies, Inc.

COMMENT ON PROPOSAL NO: 16-281

RECOMMENDATION: Accept the proposal.

SUBSTANTIATION: This is a companion comment to my comment on Proposal 4-73 wherein it was proposed to revise Section 230-28 to permit communications wires and cables to be attached to a service mast that is listed for the purpose. Code-Making Panel 4 has been asked to reconsider their rejection of Proposal 4-73, based on the panel statement that Code-Making

Panel 4 does not "believe" listing will adequately address the personnel safety issues. Code-Making Panel 4's position is contrary to both the industry and NEC accepted method to ensure the safety of wiring, cable, and equipment when used for its intended application, that of listing by a Nationally Recognized Testing Laboratory (NRTL). Listing will ensure that the service mast can adequately support multiple attachments while providing for the safety of power, communications, and CATV technicians who must access the service mast. Code-Making Panel 16 stated that detailed design and installation requirements are not defined. This is the purpose of listing - to establish that a product will be safe when used as intended. It is unreasonable to arbitrarily prohibit attaching to the electric service mast and cause the homeowner to bear the cost of a separate mast for communications. When the mast is listed and installed properly for its intended use, it will be capable of safely supporting, and safely permitting access to, multiple attachments. Code-Making Panel 16 should accept Proposal 16-281 based on the merits of the submitter's original substantiation, contingent upon the action of Code-Making Panel 4.

Note also companion comments to Proposals 16-202 and 16-344.

PANEL ACTION: Accept.

PANEL STATEMENT: CMP 16 understands that CMP 4 has primary jurisdiction over requirements associated with the power service mast. A companion comment has been submitted to CMP 4 to allow relief for the attachment of communications cables to the power service mast. Should CMP 4 continue to reject the proposal, CMP 16 requests that the Technical Correlating Committee assign a task group consisting of members of both panels to review the issues.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21

VOTE ON PANEL ACTION:

AFFIRMATIVE: 16

NEGATIVE: 5

EXPLANATION OF NEGATIVE:

DORNA: See my explanation of negative vote on Comment 16-271.

KAHN: See my explanation of negative vote on Comment 16-336.

MANGAN: See my explanation of negative vote on Comment 16-271.

SPEER: See my explanation of negative vote on Comment 16-271.

TODD: See my explanation of negative vote on Comment 16-155.

(Log #1644)

16- 338 - (820-10(c)):

Note: The Technical Correlating Committee directs that this comment be reported as "Reject" to correlate with the action on Proposal 4-73 and Comment 4-51.

SUBMITTER: Andy Scott, National Cable Television Association

COMMENT ON PROPOSAL NO: 16-281

RECOMMENDATION: Accept Proposal 16-281.

SUBSTANTIATION: NCTA, on behalf of the cable television industry, strongly urges Panel 16 to accept these proposals. An arbitrary prohibition of attaching to electrical masts is not reasonable. Where it can be established that the mast can support additional attachments without creating a safety hazard, these attachments should be allowed. Reasonable substantiation would include the ability to support the weight (with ice loading) and not damage the mast or structure, ability to maintain proper clearance, etc. It is unreasonable to force a homeowner to install a separate mast to accommodate communications (telephone, CATV) service drops when the service mast can be listed to do so.

PANEL ACTION: Accept.

PANEL STATEMENT: Refer to the panel action and statement on Comment 16-337.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21

VOTE ON PANEL ACTION:

AFFIRMATIVE: 16

NEGATIVE: 5

EXPLANATION OF NEGATIVE:

DORNA: See my explanation of negative vote on Comment 16-271.

KAHN: See my explanation of negative vote on Comment 16-336.

MANGAN: See my explanation of negative vote on Comment 16-271.

SPEER: See my explanation of negative vote on Comment 16-271.

TODD: See my explanation of negative vote on Comment 16-155.

(Log #1635)

16- 339 - (820-12): Accept

SUBMITTER: Andy Scott, National Cable Television Association

COMMENT ON PROPOSAL NO: 16-285

RECOMMENDATION: Reject Proposal 16-285.

SUBSTANTIATION: NCTA, on behalf of the cable television industry, strongly supports Panel 16's action to reject this proposal. The proposal contains references to telephony indicating that the requirement should more correctly apply to Articles 800 or 830. However, both 800 and 830 already require protection be installed. Additionally, the proposal references communications wires and cables without metallic shielding. However, in the case of cable television, 820's scope indicates the use of coaxial cables, which inherently include metallic shielding. Furthermore, data collected from cable television set top manufacturers indicate a negligible (less than 0.02 percent) problem with failures due to surges coming in on the coaxial input. To our knowledge, no incidents of harm or damage to consumer owned electronics from the coaxial input that were the result of existing practices have been documented to support this proposal.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21

VOTE ON PANEL ACTION:

AFFIRMATIVE: 21

(Log #1633)

16- 340 - (820-33): Accept in Principle

SUBMITTER: Andy Scott, National Cable Television Association

COMMENT ON PROPOSAL NO: 16-288

RECOMMENDATION: Accept Proposal 16-288.

SUBSTANTIATION: NCTA, on behalf of the cable television industry, strongly urges Panel 16 to accept this proposal. The point of attachment does not necessarily coincide with the point of entrance. Cable industry practice is to attach to the building near its electrical ground and bond at that point. The location of the customer premises equipment necessitates that the cable enters the building near that location. Where this point does not coincide with the location of the building electrical ground, the present code wording requires a technically inferior grounding condition.

PANEL ACTION: Accept in Principle.

PANEL STATEMENT: The panel action text of Proposal 16-288 satisfies the submitter's intent and includes the panel action on Proposal 16-286.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21

VOTE ON PANEL ACTION:

AFFIRMATIVE: 20

NEGATIVE: 1

EXPLANATION OF NEGATIVE:

TODD: See my Explanation of Negative on Comment 16-274.

(Log #1634)

16- 341 - (820-33): Accept in Principle

SUBMITTER: Andy Scott, National Cable Television Association

COMMENT ON PROPOSAL NO: 16-286

RECOMMENDATION: Accept Proposal 16-286.

SUBSTANTIATION: NCTA, on behalf of the cable television industry, strongly urges Panel 16 to accept this proposal. Common cable industry-practice is to ground all installations. This change would make Article 820 grounding requirements consistent with those of Articles 800 and 830. Removing the indicated text would eliminate confusion as to when grounding is necessary by requiring it in all cases.

PANEL ACTION: Accept in Principle.

PANEL STATEMENT: The panel action of Proposal 16-286 satisfies the submitter's intent.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21

VOTE ON PANEL ACTION:

AFFIRMATIVE: 20

NEGATIVE: 1

EXPLANATION OF NEGATIVE:

TODD: See my Explanation of Negative on Comment 16-274.

(Log #1119)

16- 342 - (820-40(a)(4)): Reject

SUBMITTER: Steven C. Johnson, Time Warner Cable

COMMENT ON PROPOSAL NO: 16-293

RECOMMENDATION: Reject Proposal 16-293.

SUBSTANTIATION: 1. The distance between entrances for different services is practically limited to 100 feet for most installations which corresponds to 0.3 ohms for 14 AWG solid copper conductor and 0.05 ohms for 6 AWG solid copper conductor. Neither resistance is significant. The new 820-40(a)(4) proposed would mandate placing an additional electrode wherever the distance between the grounding terminal for communications cables and the electrical service ground is greater than 20 feet. The

additional electrode would not significantly decrease resistance to ground nor increase safety.

2. The practical difference between the existing code and the proposed change is that the grounding conductor size is increased to 6 AWG every time the 20 foot distance rule is violated. This difference results in 0.25 ohm difference in the extreme case of 100 feet grounding conductor run. The difference is usually significantly less than 0.25 ohms since the distance is usually less than 100 feet and the size of the grounding conductor is normally larger than 14 AWG. The requirement for approximately equal ampacity for cable sheath and grounding conductor in 820-40(3) results in larger grounding conductor than 14 AWG in most cases.

3. The proposal provided no technical justification for the quantified 20-foot limitation and no demonstrated improvement in safety. No problems are cited and no incidents of damage or harm are presented that are the result of present installation and bonding practices.

4. The 20 foot rule is not always practical to maintain. The new proposal would result in a backlash from homeowners whenever an additional electrode is to be placed and 6 AWG wire to be used to bond it to the existing electrode system.

PANEL ACTION: Reject.

PANEL STATEMENT: The panel's intent is to limit the potential difference between power and communications circuits during lightning events.

That potential difference is generally a function of conductor inductance (L), which increases in direct proportion to conductor length, and the rate of rise of the current (di/dt). This proposal addresses that issue, encourages short coaxial cable, shield grounding conductors, provides guidance as to a reasonable maximum length, and provide an alternative where it is not practicable to meet the maximum length (20 ft) restriction. The proposed length restriction is limited to one- and two-family residences as it is such installations that are more likely to have diverse power and communications entrances and experience lightning-related
problems (urban/suburban environment with a fewer elevated structures and extensive buried metallic objects).

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21

VOTE ON PANEL ACTION:

AFFIRMATIVE: 19
NEGATIVE: 2

EXPLANATION OF NEGATIVE:

JOHNSON: See my explanation of negative vote on Comment 16-274.

TODD: See my Explanation of Negative on Comment 16-274.

(Log #1648)

16- 343 - (820-40(a)(4)): Reject

SUBMITTER: Andy Scott, National Cable Television Association

COMMENT ON PROPOSAL NO: 16-293

RECOMMENDATION: Reject Proposal 16-293.

SUBSTANTIATION: The Cable Television industry urges the NFPA to reject this proposal. These proposals have no technical merit and no demonstrated improvement in safety. To our knowledge, no incidents of harm or damage that were the result of existing installation and bonding practices have been documented to support such a change in existing practice.

The practice within the cable industry is to maintain grounding conductors as short as practicable. In the majority of installations, the distance between entrances for different services is limited to approximately 100 ft. This distance corresponds to 0.3 ohms for 14 AWG solid copper conductor and 0.05 ohms for 6 AWG solid copper conductor. Neither resistance is significant. Notwithstanding the additional increase in installation cost to the customer, the 20 ft rule cannot be practically maintained, and would result in a negative reaction from homeowners whenever an additional electrode is to be placed and 6 AWG wire to be used to bond it to the existing electrode system.

PANEL ACTION: Reject.

PANEL STATEMENT: Refer to panel action and statement on Comment 16-342.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21

VOTE ON PANEL ACTION:

AFFIRMATIVE: 19
NEGATIVE: 2

EXPLANATION OF NEGATIVE:

JOHNSON: See my explanation of negative vote on Comment 16-274.

TODD: See my Explanation of Negative on Comment 16-274.

(Log #1599)

16- 344 - (Table 820-50): Reject

Note: "See Technical Correlating Committee action on Comment 16-98."

SUBMITTER: Wayne G. Carson, Carson Assoc. Inc.

COMMENT ON PROPOSAL NO: 16-297

RECOMMENDATION: Delete reference to CATVP-50 cables in Table 820-50.

SUBSTANTIATION: The new cable classification "Limited Combustible Cable" if deleted as recommended by comments to sections 725.71(b) [16-89]; 760-71(e) [16-149]; 770-51(b) [16-169]; 800-51(h) [16-232]; and 820-51(b) [16-302] will not be included in the Code. This type cable designation is not needed and is premature - see related comments for complete substantiation.

PANEL ACTION: Reject.

PANEL STATEMENT: Refer to panel action and statement on Comment 16-98.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21

VOTE ON PANEL ACTION:

AFFIRMATIVE: 20
ABSTENTION: 1

EXPLANATION OF ABSTENTION:

CAUDILL: The Society of the Plastics Industries could not reach a consensus position on this issue.

(Log #1314)

16- 345 - (820-51): Accept

SUBMITTER: Allen C. Weidman, The Society of the Plastics Industry, Inc.

COMMENT ON PROPOSAL NO: 16-299

RECOMMENDATION: We support the action of the panel.

SUBSTANTIATION: None.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21

VOTE ON PANEL ACTION:

AFFIRMATIVE: 20
ABSTENTION: 1

EXPLANATION OF ABSTENTION:

CAUDILL: The Society of the Plastics Industries could not reach a consensus position on this issue.

(Log #1486)

16- 346 - (820-51): Accept

Note: "See Technical Correlating Committee action on Comment 16-98."

SUBMITTER: George Thorning, Yale University

COMMENT ON PROPOSAL NO: 16-298

RECOMMENDATION: Yale recommends that Code Making Panel 16 continue to accept this proposal.

SUBSTANTIATION: We believe this cable design would provide a significant improvement in fire safety and protect lives and property. Yale supports the NFPA's acceptance and recognition of limited combustible cable in the 2002 NEC. The NFPRF research project demonstrates that cable can be tested and listed for full compliance to the NFPA 255 and 259 test methods. Limited combustible cable is consistent with the full requirements of NFPA 90A and its originally intended fire safety performance.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21

VOTE ON PANEL ACTION:

AFFIRMATIVE: 20
ABSTENTION: 1

EXPLANATION OF ABSTENTION:

CAUDILL: The Society of the Plastics Industries could not reach a consensus position on this issue.

(Log #1497)

16- 347 - (820-51): Accept

Note: "See Technical Correlating Committee action on Comment 16-98."

SUBMITTER: John Moseley, Suddath Van Lines, Inc.

COMMENT ON PROPOSAL NO: 16-298

RECOMMENDATION: Suddath Van Lines, Inc. recommends that Code Making Panel 16 continue to accept this proposal.

SUBSTANTIATION: Suddath Van Lines, Inc. advocates the endorsement and application of limited combustible cable. This cable design supplies a major upgrade in fire safety offerings. Cable can be tested and listed for full compliance to the NFPA 255 and 259 protocols; the NFPRF has already established this information. Limited combustible cable observes and applies the

current guidelines of NFPA 90A, without the exception, and its fire safety performance tenet.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
ABSTENTION: 1
EXPLANATION OF ABSTENTION:
CAUDILL: The Society of the Plastics Industries could not reach a consensus position on this issue.

(Log #1502)

16- 348 - (820-51): Accept
Note: "See Technical Correlating Committee action on Comment 16-98."
SUBMITTER: Michael Lohr, Staples Communications
COMMENT ON PROPOSAL NO: 16-298
RECOMMENDATION: Staples Communications recommends that Code Making Panel 16 continue to accept this proposal.
SUBSTANTIATION: Staples Communications endorses the acceptance and application of limited combustible cable. This cable design presents a considerable improvement in fire safety. The NFPRF has shown that cable can be tested and listed for full compliance to NFPA 255 and 259 protocols. Limited combustible cable is consistent with the NFPA 90A's full, original requirements and its intended fire safety performance.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
ABSTENTION: 1
EXPLANATION OF ABSTENTION:
CAUDILL: The Society of the Plastics Industries could not reach a consensus position on this issue.

(Log #1507)

16- 349 - (820-51): Accept
Note: "See Technical Correlating Committee action on Comment 16-98."
SUBMITTER: Scott Paulov, Cabling Business Institute
COMMENT ON PROPOSAL NO: 16-298
RECOMMENDATION: Cabling Business Institute recommends that Code Making Panel 16 continue to accept this proposal.
SUBSTANTIATION: Cabling Business Institute encourages the acceptance and utilization of limited combustible cable. This cable design offers a substantial advancement in fire safety. The NFPRF has verified that cable can be tested and listed for complete compliance with the NFPA 255 and 259 protocols. Limited combustible cable is totally consistent with the provisions of NFPA 90A, without the exception, and its desired fire safety performance.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
ABSTENTION: 1
EXPLANATION OF ABSTENTION:
CAUDILL: The Society of the Plastics Industries could not reach a consensus position on this issue.

(Log #1619)

16- 350 - (820-51): Accept
Note: "See Technical Correlating Committee action on Comment 16-98."
SUBMITTER: Phil Brown, Communications Products Inc. (CP)
COMMENT ON PROPOSAL NO: 16-298
RECOMMENDATION: CPI recommends that Code Panel 16 continue to accept this proposal.
SUBSTANTIATION: CPI supports the NFPA's acceptance and recognition of limited combustible cable in the 2002 NEC. This cable design would provide a significant improvement in fire safety and protect lives and property. The NFPRF research project demonstrated that cable can be tested and listed for full compliance to the NFPA 255 and 259 test methods. Limited combustible cable is consistent with the full requirements of NFPA 90A and its originally intended fire safety performance.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
ABSTENTION: 1
EXPLANATION OF ABSTENTION:
CAUDILL: The Society of the Plastics Industries could not reach a consensus position on this issue.

(Log #1758)

16- 351 - (820-51): Accept
Note: "See Technical Correlating Committee action on Comment 16-98."
SUBMITTER: Francis W. Peri, Communications Design Corporation
COMMENT ON PROPOSAL NO: 16-298
RECOMMENDATION: Association of Cabling Professionals (ACP) recommends that Code Panel 16 continue to accept this proposal.
SUBSTANTIATION: ACP supports the acceptance and use of limited combustible cable. This cable design provides a significant improvement in fire safety. The NFPRF has demonstrated that cable can be tested and listed for full compliance to the NFPA 255 and 259 protocols. Limited combustible cable is consistent with the full requirements of NFPA 90A and its intended fire safety performance.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
ABSTENTION: 1
EXPLANATION OF ABSTENTION:
CAUDILL: The Society of the Plastics Industries could not reach a consensus position on this issue.

(Log #1853)

16- 352 - (820-51): Accept
Note: "See Technical Correlating Committee action on Comment 16-98."
SUBMITTER: Robert W. Jensen, dbi-Telecommunications Infrastructure Design
COMMENT ON PROPOSAL NO: 16-298
RECOMMENDATION: BICSI recommends that Code Panel 16 continue to accept this proposal.
SUBSTANTIATION: BICSI supports the introduction of limited combustible cable and recognizes that it represents a significant improvement in fire safety.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
ABSTENTION: 1
EXPLANATION OF ABSTENTION:
CAUDILL: The Society of the Plastics Industries could not reach a consensus position on this issue.

(Log #1078)

16- 353 - (820-51(b) (New)): Reject
Note: "See Technical Correlating Committee action on Comment 16-98."
SUBMITTER: Marcelo M. Hirschler, GBH International/Rep. Plenum Cable Association and Fire Retardent Chemicals Assoc.
COMMENT ON PROPOSAL NO: 16-302
RECOMMENDATION: This proposal should be rejected, the new section 820-51(b) should not be created and the CATVP-50 classification should not be created.
SUBSTANTIATION: The CATVP-50 classification is an unnecessary classification because it is not justified either by requirements for reduction in fire hazard in plenums (fire hazard is the potential for harm associated with fire) or a general reduction in fire risk (fire risk is the combination of fire hazard and the probability of fires resulting in undesirable outcomes). Furthermore, they are based on a research project which is incomplete (according to the Interim Report issued) and they are based on flawed testing technology, as represented by the oxygen bomb calorimeter.

The Plenum Cable Association endorses use of fire hazard assessment and fire risk assessment in order to further develop technically supportable standards, codes and regulations, that ensure reasonable and justifiable classification and control of plastic and other combustible products. The creation of the (CXP-50) marking is not justified based on fire hazard or on fire risk and is simply an effort for one type of material to gain market share at the expense of others. If a search for better fire performance is continued indefinitely, without taking into account the overall fire safety required by the application, clearly the use of

plastics and other combustible materials should be discontinued, as a non combustible material can always be found which outperforms any plastic material. Thus, if the National Electrical Code were to support unjustified improvements in fire performance, eventually any use of plastic or other combustible materials would be in jeopardy.

Thus, there are 4 reasons to oppose the CXP-50 classifications: (i) no justification based on fire risk, (ii) no justification based on fire hazard, (iii) the study for the development of the classification by the proponents is incomplete, and (iv) the technique of oxygen bomb calorimetry, and the concept of limited combustible, are technically flawed. These concerns are exemplified as follows:

(i) An analysis of fire performance of cables addresses fire hazard.

Fire hazard analysis: Traditional CMP-rated cables will not cause significant flame spread or smoke obscuration unless the fire source is very large. For example, a CMP cable with a PVC jacket and FEP insulation was shown to have no significant flame spread (out of a possible flame spread of 20 feet) and a peak optical density of much less than 0.2 when exposed to a fire of approximately 1 MW, from a wood crib, in a full scale facility, that simulated a room and plenum [Reference: L.M. Caudill, J.R. Hoover, J.T. Walnock and J.T. Chapin, "Fire Performance of Communications Cables in Concealed Spaces", pages 277-285, NFPRF Fire Risk and Hazard Assessment Symposium, June 26-28, 1996, San Francisco, CA]. The same cable also showed approximately 2 feet flame spread in the NFPA 262 plenum cable test, with a peak optical density not exceeding 0.3, according to the same reference. Clearly, if a cable does not spread flame significantly when a 1 MW fire source is applied, it does not represent any severe fire hazard. In a different scenario, a similar type of cable was studied by the European research project FIPEC, and found to release 42 kW and less than 6 MJ, to spread flame vertically for only 1.1 m, and to give low smoke release when tested in a severe vertical cable tray test (30 kW input at high air flow rate) [Reference: Fire Performance of Electric Cables Report, Interscience Communications, UK, 1999]. This indicates that the fire hazard associated with traditional CMP cables (and this with traditional CL2P and CL3P cables) is very low.

(ii) Analysis of NFPA statistics serves to illustrate fire risk. NFPA statistics address the following types of fires:

* "Non residential concealed space structure fires involving ignition of fixed wiring in ceiling/roof assemblies" {Roof plenums are examples of these spaces}
* "Non residential concealed space structure fires involving ignition of fixed wiring in ceiling/floor assemblies" {Floor plenums are examples of these spaces}

In each case, the statistics can distinguish whether wire and cable insulation was or was not the item first ignited, giving four sets of statistics relevant to plenum cables. These statistics are relevant to the fire risk from plenum cables, as plenum cables are the typical type of wire and cable insulation present in roof plenums or in floor plenums.

Fire risk analysis: The statistics indicate that, between 1980 and 1996, there have been an average of only 584 fires per year, and of those only 171 have started with ignition of a wire and cable product, and the trend has been downwards (see the attached Tables with fire statistics and the attached charts, indicating a similar type of downward trend for both concealed roof spaces and concealed floor spaces). In fact, over the entire period between 1980 and 1996 the total number of fires in concealed roof spaces involving ignition of fixed wiring has been 0.29% of the total number of non residential structure fires (of which less than 30% started in wire and cable) and the total number of fires in concealed floor spaces involving ignition of fixed wiring has been 0.10% of the total number of non residential structure fires (of which ca. 32% started in wire and cable). With regard to fatalities or injuries: out of 3,734 fatalities in non residential structure fires, only 7 occurred in concealed roof or floor spaces involving ignition of fixed wiring (less than 0.19%), and out of 60,950 injuries in non residential structure fires, only 85 occurred in concealed roof or floor spaces involving ignition of fixed wiring (less than 0.14%). At least 4 of the 7 fatalities have been shown not to have resulted from plenum cable fires with the other 3 unknown. Thus, the fire record in a period when the amount of installed plenum cables increased from virtually none to some 20 billion feet, indicates that the fire risk is minimal.

(iii) The classifications of CXP-50 are not yet ready for application, since the NFPA Fire Protection Research Foundation Project developing the classification has not yet issued its final report. The Interim Report (International Limited Combustible Plenum Cable Fire Test Project, Interim Report, by F.B. Clarke and R.G. Gewain, June 2000) is the source of our [Plenum Cable Association] concerns. The first objective of this project was to: "Develop harmonized Steiner Tunnel listing protocols for permanent plenum cables related to NFPA 262/UL 910 and NFPA 255." The Interim Report describes part of Phase I of the project, wherein no harmonized listing protocol has been developed. The Interim Report addresses NFPA 255 and NFPA 259 and states, among other things:

* NFPA 255, flame travel distance: "... The NFPA 255 flame travel distances appear to be highly repeatable {i.e. within one lab} in each laboratory, as evidenced by the small variance of the measurements, *but not particularly reproducible* {i.e. between labs}, as can be seen by comparing this variance with the interlaboratory results. ..." {Emphasis added, but statement comes verbatim from report}
* NFPA 255, smoke index, or SDI: "... With respect to the smoke measurements, multiple determinations of the SDI by a given laboratory on a given cable agree with one another quite closely *but the SDI's reported by the two labs for the same cables do not appear to be close at all*. The results reported by Laboratory 2 are, with one exception, systematically higher than those of Laboratory 1. ..." {Emphasis added, but statement comes verbatim from report}
* NFPA 255 precision: " ... The flame spread and smoke measurements in NFPA 255 show ... *relatively poor reproducibility*, i.e. the result for a cable in a given laboratory can be repeated with precision but the difference in results between laboratories is on average considerably larger than the repeatability error. ..." {Emphasis added, but statement comes verbatim from report}
* Procedure for NFPA 255: "It is possible to test wire and cable following the current NFPA 255 test procedure, using the mounting specified for plastics in Appendix B7 of the standard." Appendix B-7 of NFPA 255 states:

"B-7 Plastics. B-7.1 The term plastics includes foams, reinforced panels, laminates, grids, and transparent or translucent sheets.

B-7.2 Where any plastic remains in position in the tunnel during a fire test, no additional support is necessary. Thermoplastic materials and other plastics that do not remain in place should be supported by 1/4-in. (6.3-mm) round metal rods or 3/16 in. (4.8 mm) thick 2 in. (51 mm) wide steel bars, or 2-in. (51-mm) galvanized hexagonal wire mesh supported with metal bars or rods spanning the width of the tunnel."

It is interesting to compare this with the statements in NFPA 262, as follows:

"1-1.3* Although this test uses equipment similar to that used in NFPA 255, Standard Method of Test of Surface Burning Characteristics of Building Materials, and ASTM E 84, Standard Test Method for Surface Burning Characteristics of Building Materials, sufficient changes have been made to the chamber so that a test conducted in the apparatus used for NFPA 255 or ASTM E 84 cannot be considered identical or produce comparable results.

A-1-1.3 The changes made in equipment for this test were deemed necessary in order to obtain proper precision from the test when the equipment is used for small quantities of wire and cable, which produce much smaller quantities of heat release and smoke obscuration."

* NFPA 259: "... NFPA 259 has traditionally been carried out on individual materials, and so the potential heat of a finished product like a cable would be calculated as the um of the contributions of each component, each contribution being the potential heat of the component multiplied by the mass fraction of that component in the cable. To produce such a measurement it would be necessary to disassemble the cable into its different components – insulation, jacket, shielding, rip cord and the like – and measure the potential heat of each component. *An obvious question is whether such a cumbersome procedure is necessary* ..." {Emphasis added, but statement comes verbatim from report}.
* Observations on NFPA 259: "One of the labs (Laboratory 2) had both more experience and more advanced equipment ..."
* Procedure for NFPA 259: "... The procedure followed was NFPA 259, Standard Test Method for Potential Heat of Building Materials, 1998 Edition, with modifications to the following sections: ... *This modification should be viewed provisionally since it so far has only been tested on 4-pair unshielded twisted pair (UTP) plenum cable*." {Emphasis added, but statement comes verbatim from report}

(iv) The oxygen bomb calorimeter test used to assess "limited combustible" classifications is severely flawed. NFPA 259 uses the oxygen bomb calorimeter as part of its testing to assess potential heat. The term "limited combustible" was developed for "building construction materials", with the intent of applying it to materials

of construction of the plenum and not to cables. NFPA 90A defines "limited combustible" as follows:

"Limited-Combustible Material. A building construction material not complying with the definition of noncombustible material that in the form in which it is used, has a potential heat value not exceeding 3500 Btu/lb (8141 kJ/kg) where tested in accordance with NFPA 259, Standard Test Method for Potential Heat of Building Materials, and complies with (a) or (b):

(a) Materials having a structural base of noncombustible material, with a surfacing not exceeding a thickness of 1/8 in. (3.2 mm), that has a flame spread index not greater than 50; (b) Materials, in the form and thickness used, other than as described in (a), having neither a flame spread index greater than 25 nor evidence of continued progressive combustion, and of such composition that surfaces that would be exposed by cutting through the material on any plane would have neither a flame spread index greater than 25 nor evidence of continued progressive combustion. Materials subject to increase in combustibility or flame spread index beyond the limits herein established through the effects of age, moisture, or other atmospheric condition shall be considered combustible."

The oxygen bomb calorimeter is a method for determining the theoretical (or complete or absolute) calorific energy (or heat of combustion), as opposed to the effective (or practical) values. The reason such instruments are used is to ensure that the correct value is chosen. As such they represent the following chemical equations for combustible fuels containing only carbon, hydrogen and oxygen:

$$C + O_2 = CO_2$$

$$4\,H + O_2 = 2\,H_2O$$

For hydrocarbon fuels: $- C\,H_2 - + O_2 = CO_2 + H_2O$

However, when building materials are more complex, because they contain other elements, there is a certain inconsistency in the equation and in the energy calculated.

1. Cl: Thus, for example, when PVC is burnt in an oxygen bomb, depending on the fraction of hydrogen atoms present, there will be different proportions of the following two equations:

$$(C_2\,H_3\,Cl)_n + 2.5\,n\,O_2 = 2\,n\,CO_2 + n\,H_2O + n\,HCl$$

$$(C_2\,H_3\,Cl)_n + 2.75\,n\,O_2 = 2\,n\,CO_2 + 1.5\,n\,H_2O + 0.5\,n\,Cl_2$$

where the two equations differ by 380 kJ/kg.

2. S: Combustion of materials containing sulphur also depends on the final product. Typically the combustion bomb generates sulphuric acid as the final sulphur containing product, while furnace combustion generates sulphur dioxide (with the sulphur less fully oxidized). Therefore, the convention in bomb calorimetry is to determine values of calorific value of fuels (including coal), by referring to the quantitative conversion to sulphur dioxide, and ignoring the conversion to sulphuric acid (or sulphur trioxide) that occurs, by using a conversion factor based on the sulphur content. Interestingly, gypsum (which is calcium sulphate dihydrate), is a building material containing sulphur. The typical fuel containing sulphur is coal. The difference between conversion to sulphur dioxide and sulphuric acid is 9410 kJ/kg.

3. N: Combustion of materials containing nitrogen also has a convention: the heat of convention is normally calculated assuming that all the nitrogen is converted into molecular nitrogen. However, that is not what happens in oxygen bomb calorimetry, where nitrogen oxides and nitric acid are actually formed. Thus, a correction is applied to account for the following equation:

$HNO_3 = 0.5\,H_2O + 0.5\,N_2 + 1.25\,O_2$, with a net heat of reaction of 1017 kJ/kg.

4. F: Combustion of materials containing fluorine is generally represented as ending in the formation of carbon tetrafluoride (CF_4) and of hydrogen fluoride (HF), in varying proportions. The equation is as follows:

$$C_a\,H_b\,O_c\,F_e + (a+b/4-c/2-e/4)\,O_2 + (n+1/2)*e*(1-x) - b/2)\,H_2O = (a-ex/4)\,CO_2 + + ex/4\,CF_4 + e(1-x)\,(HF) + e(1-x)\,n\,H_2O$$

where x is the fraction of fluorine atoms converted to CF_4 as opposed to converted to HF. The energy of the conversion of CF_4 to HF is approximately 192 kJ/kg. Moreover, fluorine materials will attack the walls of the bomb calorimeter.

5. Si: Compounds containing silicon are impossible to convert completely to their final oxidation product, which is silica (SiO_2), by conventional means because as burning proceeds, the material becomes covered by a layer of silica which prevents access of oxygen and leads to the formation of a residue. The only way to obtain a reliable result of heat of combustion of materials containing silicon (such as silicones) is by a method which combines the material with an organic fluorine compound (the value of which has been accurately assessed in advance) in rotating bomb containing also water and aqueous HF. This converts all the Si into fluorosilicic acid, and the results can then be calculated back.

6. P: Compounds containing phosphorus are exceedingly difficult to assess by oxygen bomb combustion calorimetry. There are four major problems: (1) various phosphorus acids with different energies of dilution are formed in various concentrations throughout the oxygen bomb, (2) the combustion products contain different types of phosphorus oxyacids, each one of which has a different heat of formation, (3) the burning compound gets covered by phosphorus oxides and acids, which inhibit further combustion and (4) the bomb calorimeter walls are attacked and metal phosphates are formed, so that the recommended wall materials should be corundum or gold, since Pyrex glass, quartz, stainless steel titanium, porcelain and platinum all suffered heavy weight losses. For example, depending on whether a rotating bomb or a static bomb is used, the fraction of pyrophosphoric acid formed varied from 10 to 18% and that of triphosphoric acid from 1 to 3%.

7. Auxiliary combustion material: When an auxiliary material is used for assessing the heat of combustion, a 1% error in the assessment of the heat of combustion of the auxiliary material (such as benzoic acid), which is typically used in the order of 20% energy loading, corresponds to a 5% error in the total energy/heat measured. Thus, at a value of 1500 kJ/kg that would be an error of 75 kJ/kg, and this would be a systematic error for that series of experiments.

8. Moisture content: the moisture content of the building material is critical, because the combustion reaction considered in the oxygen bomb is that to convert to gaseous water. Thus, if a material contains water, the water will have reaction to vaporize the water content. Thus, results must be expressed as a function of the original moisture content for them to be valid. This matters, of course, for materials that absorb moisture when exposed to the atmosphere.

Bibliography on oxygen bomb calorimetry:

* Mansson, Margret, "Determination of Calorific Values of Building Materials - A Guide", SP Nordtest Report Project 871-90, Swedish National Testing and Research Institute, Boras, Sweden, 1991.

* Head, Arthur J, and Good, William D., "Combustion of Liquid/Solid Compounds with Non-Metallic Hetero Atoms", Chapter 9 in "Combustion Calorimetry", "Volume 1, Experimental Chemical thermodynamics", Eds. Stig Sunner & Margret M. Mansson), Pergamon Press, Oxford, UK (for Int. Union Pure & Applied Chemistry, IUPAC), 1979.

* Mansson, Margret and Hubbard, Ward N., "Strategies in the Calculation of Standard-State Energies of Combustion from the Experimentally Determined Quantities", Chapter 5 in "Combustion Calorimetry", "Volume 1, Experimental Chemical thermodynamics", Eds. Stig Sunner & Margret M. Mansson), Pergamon Press, Oxford, UK (for Int. Union Pure & Applied Chemistry, IUPAC), 1979.

* Hu, Andrew T., Sinke, G.C., Mansson, Margret and Ringner, Birgitta, "Test Substances for Bomb Combustion Calorimetry, p-Chlorobenzoic Acid". J. Chem. Thermodynamics, 4, 283-99 (1972).

* Mansson, Margret, "Thermochemistry - Some Recent Lines of Development", Pure & Applied Chemistry, 55(3), 417-26 (1983).

* Mansson, Margret, "A 4.5 cm^3 Bomb Combustion Calorimeter and an Ampoule Technique for 5 to 10 mg Samples with Vapour Pressures Below Approximately 3 kPa (20 Torr)", J. Chem. Thermodynamics, 5, 7232 (1973).

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

PANEL ACTION: Reject.

PANEL STATEMENT: Refer to panel action and statement on Comment 16-98.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21

VOTE ON PANEL ACTION:
AFFIRMATIVE: 18
NEGATIVE: 2
ABSTENTION: 1
EXPLANATION OF NEGATIVE:
JOHNSON: See my explanation of negative vote on Comment 16-88.
WADEHRA: See my explanation of negative vote on Comment 16-88.
COMMENT ON AFFIRMATIVE:
KAHN: See my comment on affirmative vote on Comment 16-88.
KAUFMAN: See my comment on affirmative vote on Comment 16-88.
EXPLANATION OF ABSTENTION:
CAUDILL: The Society of the Plastics Industries could not reach a consensus position on this issue.

(Log #1315)

16- 354 - (820-51(b)): Accept
Note: "See Technical Correlating Committee action on Comment 16-98."
SUBMITTER: Allen C. Weidman, The Society of the Plastics Industry, Inc.
COMMENT ON PROPOSAL NO: 16-302
RECOMMENDATION: We support the action of the panel.
SUBSTANTIATION: None.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
ABSTENTION: 1
EXPLANATION OF ABSTENTION:
CAUDILL: The Society of the Plastics Industries could not reach a consensus position on this issue.

(Log #1590)

16- 355 - (820-51(b)): Reject
Note: "See Technical Correlating Committee action on Comment 16-98."
SUBMITTER: Wayne G. Carson, Carson Assoc. Inc.
COMMENT ON PROPOSAL NO: 16-302
RECOMMENDATION: Delete proposed section 820-51(b) and associated notes.
SUBSTANTIATION: The introduction of a new class of cable ("Limited Combustible Cable") is premature at this time for the following reasons:
A. The note to the definition section 725.71(B), FPN No. 1 references NFPA 90A, Standard for the Installation of Air-Conditioning and Ventilating Systems for the definition of limited combustible. That definition is as follows:
"Limited-Combustible Material. A building construction material not complying with the definition of noncombustible material that in the form in which it is used, has a potential heat value not exceeding 3500 Btu/lb (8141J/kg) where tested in accordance with NFPA 259, Standard Test Method for Potential Heat of Building Materials, and complies with (a) or (b):
a. Materials having a structural base of noncombustible material, with a surfacing not exceeding a thickness of 1/8 in. (3.2 mm), that has a flame spread index not greater than 50;
b. Materials, in the form and thickness used, other than as described in (a), having neither a flame spread index greater than 25 nor evidence of continued progressive combustion, and of such composition that surfaces that would be exposed by cutting through the material on any plane would have neither a flame spread index greater than 25 nor evidence of continued progressive combustion. Materials subject to increase in combustibility or flame spread index beyond the limits herein established through the effects of age, moisture, or other atmospheric condition shall be combustible."
This definition was established and is applied to building construction materials and not to specific wiring methods or technologies for use in buildings. NFPA 255 and NFPA 259 were never intended for the evaluation of multi-component systems such as electrical and optical cable. More current test methods (other than NFPA 255 and 259), such as NFPA 262, the cone calorimeter, etc. provide reproducible smoke obscuration, flame spread, or heat release (not heat value) information and are more appropriate for measuring the fire hazards of cable. Not all parts of this "Limited Combustible" definition have been applied to the broad scope of cables. Until this definition can be shown as appropriate for cables (attainable and reproducible) it should not be deemed credible and supported by the National Electrical Code at this time. Referencing this inappropriate definition in the National Electrical Code is misleading and bad code.
B. The note references NFPA 255 as the test standard for smoke developed index. This test is not an appropriate test for cables for the following reasons:
a. NFPA 255 has not been harmonized, as has NFPA 262. NFPA 262 has a proven record, unlike NFPA 255.
b. NFPA 255 is not reproducible, whereas NFPA 262 has been shown to be reproducible. This lack of reproducibility has been demonstrated numerous times in round-robin testing of building materials among multiple labs.
The most recent example of this reproducibility problem has been demonstrated in the Interim Report of the Fire Protection Research Foundation (FPRF) "Limited Combustible Cable" (ex. "Permanent Plenum Cable") project, dated June 2000. This report states "The flame spread and smoke measurements in NFPA 255 show good repeatability but relatively poor reproducibility, i.e., the result for a cable in a given laboratory can be repeated with precision but the difference in results between laboratories is on average considerably larger than the repeatability error." (Page 9, section 4.1.2). In this case, with only two laboratories participating, errors in reproducibility were in the range of 100 percent. Given that numerous fire-testing tunnels exist, the range of error can be expected to be even larger.
This test is inappropriate for cables as the cables are installed against the top of the tunnel. This orientation is not similar to normal cable installations, and cable placement on top of the wire mesh is random in the tunnel.
C. Cable installed above ceilings does not become involved in the fire until near or at flashover. At that point in the fire development, the ceiling tile is falling to expose the cable. Cables in walls or below floors are generally exposed to the fire conditions even later in the fire development. These cables do not spread flame more than 5 ft when tested in accordance with NFPA 262. The proposed restrictions on cable appear excessive based on the fire record.
D. There is not a need established (fire record or hazard analysis) for a new cable category. There are two research projects that are intended to provide information on the fire hazard of cables. The ASHRAE project has not yet begun. This ASHRAE Project is being conducted by the National Research Council of Canada and is a broad based fire hazard assessment program developed to evaluate the hazard presented by the accumulation of plenum cables. This question has not yet been answered and developing cable categories to address a hazard that has not yet been defined is premature. The project when completed will assist in developing appropriate language for NFPA 90A and/or the National Electrical Code.
The FPRF project has only issued an interim report dated June 2000. This project has only accomplished a cursory review of one cable type in NFPA 255 and NFPA 259 and has just begun the experimental work on broader aspects of the "limited combustible" definition.
The proposals for the National Electrical Code that have been accepted by Code Making Panel 16 for the removal of all abandoned cable broadly addresses this problem now. The adoption of these proposals for removing all abandoned cable will significantly reduce the fuel load created by excessive cable accumulation.
E. The International Mechanical Code (IMC), the Uniform Mechanical Code (UMC), and the NFPA 90A (the membership and the NFPA Standards Council) have each recently rejected similar provisions to the ones being proposed for the National Electrical Code. These proposals for "limited combustible cables" have been rejected for several reasons including:
a. They will present confusion in the field;
b. They are not good code based on sound engineering principles;
c. They are not based on good fire hazard assessment information; and
d. Questions regarding the appropriateness and accuracy of the test protocols NFPA 255 and NFPA 259.
PANEL ACTION: Reject.
PANEL STATEMENT: Refer to panel action and statement on Comment 16-98.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 18
NEGATIVE: 2
ABSTENTION: 1

EXPLANATION OF NEGATIVE:
JOHNSON: See my explanation of negative vote on Comment 16-88.
WADEHRA: See my explanation of negative vote on Comment 16-88.
COMMENT ON AFFIRMATIVE:
KAHN: See my comment on affirmative vote on Comment 16-88.
KAUFMAN: See my comment on affirmative vote on Comment 16-88.
EXPLANATION OF ABSTENTION:
CAUDILL: The Society of the Plastics Industries could not reach a consensus position on this issue.

(Log #307)

16- 356 - (820-52(b)): Accept
SUBMITTER: Stanley Kaufman, Lucent Technologies
COMMENT ON PROPOSAL NO: 16-311
RECOMMENDATION: Delete section 820.52(B) and renumber the sections C, D, and E to B, C, and D, respectively.
SUBSTANTIATION: Proposal 16-313 accomplished the same purpose (and more) as Proposal 16-311. Section 820.52(B) is redundant with section 820.3(A).
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21

(Log #1098)

16- 357 - (820-52(b)): Accept in Principle
SUBMITTER: Marcelo M. Hirschler, GBH International/Rep. Plenum Cable Association and Fire Retardent Chemicals Assoc.
COMMENT ON PROPOSAL NO: 16-313
RECOMMENDATION: Continue accepting this proposal in principle, by retaining the phrase: "Abandoned cables, not intended for future use shall not be permitted to remain."
SUBSTANTIATION: There is a potential for increased fire hazard or fire risk when any cable, irrespective of whether it is or is not limited combustible, remains as fuel load unnecessarily once it has been taken out of use. Materials that are limited combustible can also burn (i.e., they are not noncombustible) and also increase the fire load. Furthermore, all abandoned cables can also affect the safety of plenums because of their weight. There is, thus, no justification for permitting any cable to remain in a plenum once it is abandoned and not intended for future use.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Refer to panel action and statement on Comment 16-318.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21

(Log #1316)

16- 358 - (820-52(b)): Accept in Principle
SUBMITTER: Allen C. Weidman, The Society of the Plastics Industry, Inc.
COMMENT ON PROPOSAL NO: 16-310
RECOMMENDATION: We support the action of the panel.
SUBSTANTIATION: None.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Refer to the panel action and statement on Comment 16-295.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21

(Log #1317)

16- 359 - (820-52(b)): Accept in Principle
SUBMITTER: Allen C. Weidman, The Society of the Plastics Industry, Inc.
COMMENT ON PROPOSAL NO: 16-312
RECOMMENDATION: We support the action of the panel.
SUBSTANTIATION: None.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Refer to the panel action and statement on Comment 16-295.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21

(Log #1318)

16- 360 - (820-52(b)): Accept in Principle
SUBMITTER: Allen C. Weidman, The Society of the Plastics Industry, Inc.
COMMENT ON PROPOSAL NO: 16-313
RECOMMENDATION: We support the action of the panel.
SUBSTANTIATION: None.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Refer to panel action and statement on Comment 16-318.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21

(Log #1583)

16- 361 - (820-52(b)): Accept in Principle in Part
SUBMITTER: Wayne G. Carson, Carson Assoc. Inc.
COMMENT ON PROPOSAL NO: 6-311
RECOMMENDATION: Revise text to read as follows:
Spread of Fire or Products of Combustion. Installations in hollow spaces, vertical shafts, and ventilation or air-handling ducts shall be made so that the possible spread of fire or products of combustion will not be substantially increased. Openings around penetrations through fire resistance-rated walls, partitions, floors, or ceilings shall be firestopped using approved methods to maintain the fire resistance rating.
Abandoned cables not intended for future use shall not be permitted to remain.
FPN: Directories of electrical construction materials published by qualified testing laboratories contain many listing installation restrictions necessary to maintain the fire-resistive rating of assemblies where penetrations or openings are made.
SUBSTANTIATION: This definition under the section entitled "Spread of Fire or Products of Combustion" is not consistent throughout the Code. This comment uses language from ROP 16-250 [850-52(B)] to provide a consistent requirement throughout the code.
The same comment is being made for the following sections:
640-3A (ROP 16-1a)
645-5D6 (ROP 12-106)
725-3B (ROP 16-80)
760-3A (ROP 16-144)
770-3A (ROP 16-176)
820-3A (ROP 16-313)
820-3A (ROP 16-364)
830-58B (ROP 16-368)
PANEL ACTION: Accept in Principle in Part.
PANEL STATEMENT: Refer to panel action and statement on Comment 16-319.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21

(Log #1093)

16- 362 - (820-52(b), Exception): Accept
SUBMITTER: Marcelo M. Hirschler, GBH International/Rep. Plenum Cable Association and Fire Retardent Chemicals Assoc.
COMMENT ON PROPOSAL NO: 16-310
RECOMMENDATION: Continue rejecting the exception for permitting cable to be listed as limited combustible to remain in plenums, in particular CATVP-50.
SUBSTANTIATION: Materials that are limited combustible can burn (i.e. they are not noncombustible) and increase the fire load. Therefore, there is a potential for increased fire hazard or fire risk when any cable, irrespective of whether it is or is not limited combustible, remains as fuel load unnecessarily once it has been taken out of use. Furthermore, all abandoned cables can also affect the safety of plenums because of their weight. There is, thus, no justification for permitting a "limited combustible" cable to remain in a plenum once it is abandoned and not intended for future use.
PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
ABSTENTION: 1
EXPLANATION OF ABSTENTION:
CAUDILL: The Society of the Plastics Industries could not reach a consensus position on this issue.

(Log #1069)

16- 363 - (820-53): Reject
Note: "See Technical Correlating Committee action on Comment 16-98."
SUBMITTER: Marcelo M. Hirschler, GBH International/Rep. Plenum Cable Association and Fire Retardent Chemicals Assoc.
COMMENT ON PROPOSAL NO: 16-316
RECOMMENDATION: This proposal should be rejected, the references to CATVP-50 should be deleted from the Table 820-53 and not incorporated into Figure 820-53 and the CATVP-50 classification should not be created.
SUBSTANTIATION: The CATVP-50 classification is an unnecessary classification because it is not justified either by requirements for reduction in fire hazard in plenums (fire hazard is the potential for harm associated with fire) or a general reduction in fire risk (fire risk is the combination of fire hazard and the probability of fires resulting in undesirable outcomes). Furthermore, they are based on a research project which is incomplete (according to the Interim Report issued) and they are based on flawed testing technology, as represented by the oxygen bomb calorimeter.

The Plenum Cable Association endorses use of fire hazard assessment and fire risk assessment in order to further develop technically supportable standards, codes and regulations, that ensure reasonable and justifiable classification and control of plastic and other combustible products. The creation of the (CXP-50) marking is not justified based on fire hazard or on fire risk and is simply an effort for one type of material to gain market share at the expense of others. If a search for better fire performance is continued indefinitely, without taking into account the overall fire safety required by the application, clearly the use of plastics and other combustible materials should be discontinued, as a non combustible material can always be found which outperforms any plastic material. Thus, if the National Electrical Code were to support unjustified improvements in fire performance, eventually any use of plastic or other combustible materials would be in jeopardy.

Thus, there are 4 reasons to oppose the CXP-50 classifications: (i) no justification based on fire risk, (ii) no justification based on fire hazard, (iii) the study for the development of the classification by the proponents is incomplete, and (iv) the technique of oxygen bomb calorimetry, and the concept of limited combustible, are technically flawed. These concerns are exemplified as follows:

(i) An analysis of fire performance of cables addresses fire hazard.

Fire hazard analysis: Traditional CMP-rated cables will not cause significant flame spread or smoke obscuration unless the fire source is very large. For example, a CMP cable with a PVC jacket and FEP insulation was shown to have no significant flame spread (out of a possible flame spread of 20 feet) and a peak optical density of much less than 0.2 when exposed to a fire of approximately 1 MW, from a wood crib, in a full scale facility, that simulated a room and plenum [Reference: L.M. Caudill, J.R. Hoover, J.T. Walnock and J.T. Chapin, "Fire Performance of Communications Cables in Concealed Spaces", pages 277-285, NFPRF Fire Risk and Hazard Assessment Symposium, June 26-28, 1996, San Francisco, CA]. The same cable also showed approximately 2 feet flame spread in the NFPA 262 plenum cable test, with a peak optical density not exceeding 0.3, according to the same reference. Clearly, if a cable does not spread flame significantly when a 1 MW fire source is applied, it does not represent any severe fire hazard. In a different scenario, a similar type of cable was studied by the European research project FIPEC, and found to release 42 kW and less than 6 MJ, to spread flame vertically for only 1.1 m, and to give low smoke release when tested in a severe vertical cable tray test (30 kW input at high air flow rate) [Reference: Fire Performance of Electric Cables Report, Interscience Communications, UK, 1999]. This indicates that the fire hazard associated with traditional CMP cables (and this with traditional CL2P and CL3P cables) is very low.

(ii) Analysis of NFPA statistics serves to illustrate fire risk. NFPA statistics address the following types of fires:

* "Non residential concealed space structure fires involving ignition of fixed wiring in ceiling/roof assemblies" {Roof plenums are examples of these spaces}
* "Non residential concealed space structure fires involving ignition of fixed wiring in ceiling/floor assemblies" {Floor plenums are examples of these spaces}

In each case, the statistics can distinguish whether wire and cable insulation was or was not the item first ignited, giving four sets of statistics relevant to plenum cables. These statistics are relevant to the fire risk from plenum cables, as plenum cables are the typical type of wire and cable insulation present in roof plenums or in floor plenums.

Fire risk analysis: The statistics indicate that, between 1980 and 1996, there have been an average of only 584 fires per year, and of those only 171 have started with ignition of a wire and cable product, and the trend has been downwards (see the attached Tables with fire statistics and the attached charts, indicating a similar type of downward trend for both concealed roof spaces and concealed floor spaces). In fact, over the entire period between 1980 and 1996 the total number of fires in concealed roof spaces involving ignition of fixed wiring has been 0.29% of the total number of non residential structure fires (of which less than 30% started in wire and cable) and the total number of fires in concealed floor spaces involving ignition of fixed wiring has been 0.10% of the total number of non residential structure fires (of which ca. 32% started in wire and cable). With regard to fatalities or injuries: out of 3,734 fatalities in non residential structure fires, only 7 occurred in concealed roof or floor spaces involving ignition of fixed wiring (less than 0.19%), and out of 60,950 injuries in non residential structure fires, only 85 occurred in concealed roof or floor spaces involving ignition of fixed wiring (less than 0.14%). At least 4 of the 7 fatalities have been shown not to have resulted from plenum cable fires with the other 3 unknown. Thus, the fire record in a period when the amount of installed plenum cables increased from virtually none to some 20 billion feet, indicates that the fire risk is minimal.

(iii) The classifications of CXP-50 are not yet ready for application, since the NFPA Fire Protection Research Foundation Project developing the classification has not yet issued its final report. The Interim Report (International Limited Combustible Plenum Cable Fire Test Project, Interim Report, by F.B. Clarke and R.G. Gewain, June 2000) is the source of our [Plenum Cable Association] concerns. The first objective of this project was to: "Develop harmonized Steiner Tunnel listing protocols for permanent plenum cables related to NFPA 262/UL 910 and NFPA 255." The Interim Report describes part of Phase I of the project, wherein no harmonized listing protocol has been developed. The Interim Report addresses NFPA 255 and NFPA 259 and states, among other things:

* NFPA 255, flame travel distance: "... The NFPA 255 flame travel distances appear to be highly repeatable {i.e. within one lab} in each laboratory, as evidenced by the small variance of the measurements, *but not particularly reproducible* {i.e. between labs}, as can be seen by comparing this variance with the interlaboratory results. ..." {Emphasis added, but statement comes verbatim from report}
* NFPA 255, smoke index, or SDI: "... With respect to the smoke measurements, multiple determinations of the SDI by a given laboratory on a given cable agree with one another quite closely *but the SDI's reported by the two labs for the same cables do not appear to be close at all*. The results reported by Laboratory 2 are, with one exception, systematically higher than those of Laboratory 1. ..." {Emphasis added, but statement comes verbatim from report}
* NFPA 255 precision: " ... The flame spread and smoke measurements in NFPA 255 show ... *relatively poor reproducibility*, i.e. the result for a cable in a given laboratory can be repeated with precision but the difference in results between laboratories is on average considerably larger than the repeatability error. ..." {Emphasis added, but statement comes verbatim from report}
* Procedure for NFPA 255: "It is possible to test wire and cable following the current NFPA 255 test procedure, using the mounting specified for plastics in Appendix B7 of the standard." Appendix B-7 of NFPA 255 states:

"B-7 Plastics. B-7.1 The term plastics includes foams, reinforced panels, laminates, grids, and transparent or translucent sheets.

B-7.2 Where any plastic remains in position in the tunnel during a fire test, no additional support is necessary. Thermoplastic materials and other plastics that do not remain in place should be supported by 1/4-in. (6.3-mm) round metal rods or 3/16 in. (4.8 mm) thick 2 in. (51 mm) wide steel bars, or 2-in.

(51-mm) galvanized hexagonal wire mesh supported with metal bars or rods spanning the width of the tunnel."

It is interesting to compare this with the statements in NFPA 262, as follows:

"1-1.3* Although this test uses equipment similar to that used in NFPA 255, Standard Method of Test of Surface Burning Characteristics of Building Materials, and ASTM E 84, Standard Test Method for Surface Burning Characteristics of Building Materials, sufficient changes have been made to the chamber so that a test conducted in the apparatus used for NFPA 255 or ASTM E 84 cannot be considered identical or produce comparable results.

A-1-1.3 The changes made in equipment for this test were deemed necessary in order to obtain proper precision from the test when the equipment is used for small quantities of wire and cable, which produce much smaller quantities of heat release and smoke obscuration."

* NFPA 259: "... NFPA 259 has traditionally been carried out on individual materials, and so the potential heat of a finished product like a cable would be calculated as the um of the contributions of each component, each contribution being the potential heat of the component multiplied by the mass fraction of that component in the cable. To produce such a measurement it would be necessary to disassemble the cable into its different components – insulation, jacket, shielding, rip cord and the like – and measure the potential heat of each component. *An obvious question is whether such a cumbersome procedure is necessary* ..." {Emphasis added, but statement comes verbatim from report}.

* Observations on NFPA 259: "One of the labs (Laboratory 2) had both more experience and more advanced equipment ..."

* Procedure for NFPA 259: "... The procedure followed was NFPA 259, Standard Test Method for Potential Heat of Building Materials, 1998 Edition, with modifications to the following sections: ... *This modification should be viewed provisionally since it so far has only been tested on 4-pair unshielded twisted pair (UTP) plenum cable*." {Emphasis added, but statement comes verbatim from report}

(iv) The oxygen bomb calorimeter test used to assess "limited combustible" classifications is severely flawed. NFPA 259 uses the oxygen bomb calorimeter as part of its testing to assess potential heat. The term "limited combustible" was developed for "building construction materials", with the intent of applying it to materials of construction of the plenum and not to cables. NFPA 90A defines "limited combustible" as follows:

"Limited-Combustible Material. A building construction material not complying with the definition of noncombustible material that in the form in which it is used, has a potential heat value not exceeding 3500 Btu/lb (8141 kJ/kg) where tested in accordance with NFPA 259, Standard Test Method for Potential Heat of Building Materials, and complies with (a) or (b):

(a) Materials having a structural base of noncombustible material, with a surfacing not exceeding a thickness of 1/8 in. (3.2 mm), that has a flame spread index not greater than 50; (b) Materials, in the form and thickness used, other than as described in (a), having neither a flame spread index greater than 25 nor evidence of continued progressive combustion, and of such composition that surfaces that would be exposed by cutting through the material on any plane would have neither a flame spread index greater than 25 nor evidence of continued progressive combustion. Materials subject to increase in combustibility or flame spread index beyond the limits herein established through the effects of age, moisture, or other atmospheric condition shall be considered combustible."

The oxygen bomb calorimeter is a method for determining the theoretical (or complete or absolute) calorific energy (or heat of combustion), as opposed to the effective (or practical) values. The reason such instruments are used is to ensure that the correct value is chosen. As such they represent the following chemical equations for combustible fuels containing only carbon, hydrogen and oxygen:

$$C + O_2 = CO_2$$

$$4\,H + O_2 = 2\,H_2O$$

For hydrocarbon fuels: $- C\,H_2 - + O_2 = CO_2 + H_2O$

However, when building materials are more complex, because they contain other elements, there is a certain inconsistency in the equation and in the energy calculated.

1. Cl: Thus, for example, when PVC is burnt in an oxygen bomb, depending on the fraction of hydrogen atoms present, there will be different proportions of the following two equations:

$$(C_2\,H_3\,Cl)_n + 2.5\,n\,O_2 = 2\,n\,CO_2 + n\,H_2O + n\,HCl$$

$$(C_2\,H_3\,Cl)_n + 2.75\,n\,O_2 = 2\,n\,CO_2 + 1.5\,n\,H_2O + 0.5\,n\,Cl_2$$

where the two equations differ by 380 kJ/kg.

2. S: Combustion of materials containing sulphur also depends on the final product. Typically the combustion bomb generates sulphuric acid as the final sulphur containing product, while furnace combustion generates sulphur dioxide (with the sulphur less fully oxidized). Therefore, the convention in bomb calorimetry is to determine values of calorific value of fuels (including coal), by referring to the quantitative conversion to sulphur dioxide, and ignoring the conversion to sulphuric acid (or sulphur trioxide) that occurs, by using a conversion factor based on the sulphur content. Interestingly, gypsum (which is calcium sulphate dihydrate), is a building material containing sulphur. The typical fuel containing sulphur is coal. The difference between conversion to sulphur dioxide and sulphuric acid is 9410 kJ/kg.

3. N: Combustion of materials containing nitrogen also has a convention: the heat of convention is normally calculated assuming that all the nitrogen is converted into molecular nitrogen. However, that is not what happens in oxygen bomb calorimetry, where nitrogen oxides and nitric acid are actually formed. Thus, a correction is applied to account for the following equation:

$HNO_3 = 0.5\,H_2O + 0.5\,N_2 + 1.25\,O_2$, with a net heat of reaction of 1017 kJ/kg.

4. F: Combustion of materials containing fluorine is generally represented as ending in the formation of carbon tetrafluoride (CF_4) and of hydrogen fluoride (HF), in varying proportions. The equation is as follows:

$$C_a\,H_b\,O_c\,F_e + (a+b/4-c/2-e/4)\,O_2 + (n+1/2)*e*(1-x) - b/2)\,H_2O = (a-ex/4)\,CO_2 + + ex/4\,CF_4 + e(1-x)\,(HF) + e(1-x)\,n\,H_2O$$

where x is the fraction of fluorine atoms converted to CF_4 as opposed to converted to HF. The energy of the conversion of CF_4 to HF is approximately 192 kJ/kg. Moreover, fluorine materials will attack the walls of the bomb calorimeter.

5. Si: Compounds containing silicon are impossible to convert completely to their final oxidation product, which is silica (SiO_2), by conventional means because as burning proceeds, the material becomes covered by a layer of silica which prevents access of oxygen and leads to the formation of a residue. The only way to obtain a reliable result of heat of combustion of materials containing silicon (such as silicones) is by a method which combines the material with an organic fluorine compound (the value of which has been accurately assessed in advance) in rotating bomb containing also water and aqueous HF. This converts all the Si into fluorosilicic acid, and the results can then be calculated back.

6. P: Compounds containing phosphorus are exceedingly difficult to assess by oxygen bomb combustion calorimetry. There are four major problems: (1) various phosphorus acids with different energies of dilution are formed in various concentrations throughout the oxygen bomb, (2) the combustion products contain different types of phosphorus oxyacids, each one of which has a different heat of formation, (3) the burning compound gets covered by phosphorus oxides and acids, which inhibit further combustion and (4) the bomb calorimeter walls are attacked and metal phosphates are formed, so that the recommended wall materials should be corundum or gold, since Pyrex glass, quartz, stainless steel titanium, porcelain and platinum all suffered heavy weight losses. For example, depending on whether a rotating bomb or a static bomb is used, the fraction of pyrophosphoric acid formed varied from 10 to 18% and that of triphosphoric acid from 1 to 3%.

7. Auxiliary combustion material: When an auxiliary material is used for assessing the heat of combustion, a 1% error in the assessment of the heat of combustion of the auxiliary material (such as benzoic acid), which is typically used in the order of 20% energy loading, corresponds to a 5% error in the total energy/heat measured. Thus, at a value of 1500 kJ/kg that would be an error of 75 kJ/kg, and this would be a systematic error for that series of experiments.

8. Moisture content: the moisture content of the building material is critical, because the combustion reaction considered in

the oxygen bomb is that to convert to gaseous water. Thus, if a material contains water, the water will have reaction to vaporize the water content. Thus, results must be expressed as a function of the original moisture content for them to be valid. This matters, of course, for materials that absorb moisture when exposed to the atmosphere.

Bibliography on oxygen bomb calorimetry:

* Mansson, Margret, "Determination of Calorific Values of Building Materials - A Guide", SP Nordtest Report Project 871-90, Swedish National Testing and Research Institute, Boras, Sweden, 1991.

* Head, Arthur J, and Good, William D., "Combustion of Liquid/Solid Compounds with Non-Metallic Hetero Atoms", Chapter 9 in "Combustion Calorimetry", "Volume 1, Experimental Chemical thermodynamics", Eds. Stig Sunner & Margret M. Mansson), Pergamon Press, Oxford, UK (for Int. Union Pure & Applied Chemistry, IUPAC), 1979.

* Mansson, Margret and Hubbard, Ward N., "Strategies in the Calculation of Standard-State Energies of Combustion from the Experimentally Determined Quantities", Chapter 5 in "Combustion Calorimetry", "Volume 1, Experimental Chemical thermodynamics", Eds. Stig Sunner & Margret M. Mansson), Pergamon Press, Oxford, UK (for Int. Union Pure & Applied Chemistry, IUPAC), 1979.

* Hu, Andrew T., Sinke, G.C., Mansson, Margret and Ringner, Birgitta, "Test Substances for Bomb Combustion Calorimetry, p-Chlorobenzoic Acid". J. Chem. Thermodynamics, 4, 283-99 (1972).

* Mansson, Margret, "Thermochemistry - Some Recent Lines of Development", Pure & Applied Chemistry, 55(3), 417-26 (1983).

* Mansson, Margret, "A 4.5 cm^3 Bomb Combustion Calorimeter and an Ampoule Technique for 5 to 10 mg Samples with Vapour Pressures Below Approximately 3 kPa (20 Torr)", J. Chem. Thermodynamics, 5, 7232 (1973).

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

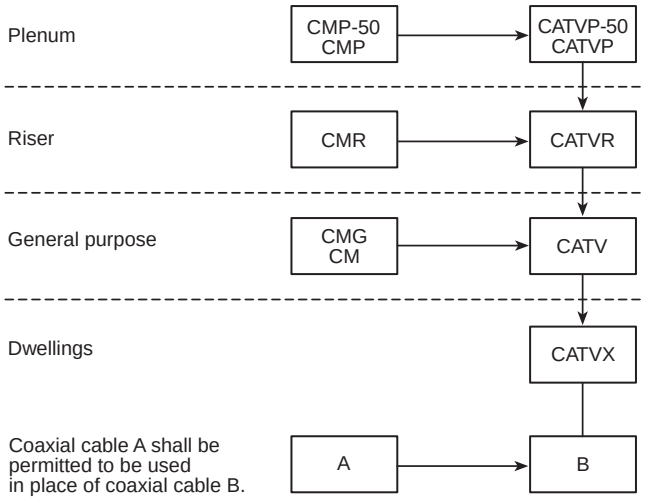
PANEL ACTION: Reject.
PANEL STATEMENT: Refer to panel action and statement on Comment 16-98.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
ABSTENTION: 1
EXPLANATION OF ABSTENTION:
CAUDILL: The Society of the Plastics Industries could not reach a consensus position on this issue.

(Log #1600)

16- 364 - (Table 820-53): Reject
Note: "See Technical Correlating Committee action on Comment 16-98."
SUBMITTER: Wayne G. Carson, Carson Assoc. Inc.
COMMENT ON PROPOSAL NO: 16-316
RECOMMENDATION: Delete reference to CATVP-50 cables in Table 820-53 and Figure 820-53.
SUBSTANTIATION: The new cable classification "Limited Combustible Cable" if deleted as recommended by comments to sections 725.71(b) [16-89]; 760-71(e) [16-149]; 770-51(b) [16-169]; 800-51(h) [16-232]; and 820-51(b) [16-302] will not be included in the Code. This type cable designation is not needed and is premature - see related comments for complete substantiation.
PANEL ACTION: Reject.
PANEL STATEMENT: Refer to panel action and statement on Comment 16-98.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
ABSTENTION: 1
EXPLANATION OF ABSTENTION:
CAUDILL: The Society of the Plastics Industries could not reach a consensus position on this issue.

(Log #276)

16- 365 - (Figure 820-53): Accept
Note: "See Technical Correlating Committee action on Comment 16-98."
SUBMITTER: Stanley Kaufman, Lucent Technologies
COMMENT ON PROPOSAL NO: 16-316
RECOMMENDATION: Revise Figure 820-53 as shown:



Revise Table 820-53 as shown below: **(Additions are shown in bold)**
SUBSTANTIATION: This comment adds Type CMP 50 to the cable substitution table and adds a consistent revision of the cable substitution figure. Note that the inclusion of Type CMX in Figure 820-53 in the 1999 NEC is an error; Table 820-53 does not permit CMX coaxial cable to substitute for Type CATVX.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
ABSTENTION: 1
EXPLANATION OF ABSTENTION:
CAUDILL: The Society of the Plastics Industries could not reach a consensus position on this issue.

(Log #1319)

16- 366 - (820-53(a)): Accept in Principle
SUBMITTER: Allen C. Weidman, The Society of the Plastics Industry, Inc.
COMMENT ON PROPOSAL NO: 16-318
RECOMMENDATION: We support the action of the panel.
SUBSTANTIATION: None.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Refer to the panel action and statement on Comment 16-295.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
ABSTENTION: 1
EXPLANATION OF ABSTENTION:
CAUDILL: The Society of the Plastics Industries could not reach a consensus position on this issue.

Table 820-53. Coaxial Cable Uses and Permitted Substitutions

Cable Type	Use	References	Permitted Substitutions
CATVP	**Coaxial plenum cable**	**820-53(a)**	CMP-50, **CATVP-50, CMP**
CATVR	**Coaxial riser cable**	**820-53(b)**	CMP-50, **CATVP-50, CATVP, CMP, CMR**
CATV	**Coaxial general-purpose cable**	**820-53(c)**	CMP-50, **CATVP-50, CATVP, CMP, CATVR, CMR, CMG, CM**
CATVX	**Coaxial cable, limited use**	**820-53(c)**	CMP-50, **CATVP-50, CATVP, CMP, CATVR, CMR, CATV, CMG, CM**

(Log #1413)

16- 367 - (820-53(d) and (e)):

Note: It was the action of the Technical Correlating Committee that this Comment be reported as "Reject" since Code-Making Panel 14 rejected Comments 14-63 and 14-92.

SUBMITTER: Kari Barrett, American Chemistry Council
COMMENT ON PROPOSAL NO: 16-319
RECOMMENDATION: Continue to support the Panel action to add a new 820-53(e) as follows:

(e) Hazardous (Classified) Locations. Where the use of Type CATVP, CATVR, and CATV cable is permitted in Sections 501-4(b), 502-4(b), and 504-20, the cable shall be installed in cable trays; in raceways; supported by messenger wire, or otherwise adequately supported and mechanically protected by angles, struts, channels, or by other mechanical means.

SUBSTANTIATION: This Committee should reject the Technical Correlating Committee action to reject this proposal, as Code-Making Panel 14 action to use coaxial cable is contingent upon this panel's action.
PANEL ACTION: Accept in Principle.
Accept the submitter's recommendation except change the semicolons to commas in the submitters recommendation.
PANEL STATEMENT: Commas are more appropriate.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21

(Log #1320)

16- 368 - (820-54(e) (New)): Accept in Principle
SUBMITTER: Allen C. Weidman, The Society of the Plastics Industry, Inc.
COMMENT ON PROPOSAL NO: 16-320
RECOMMENDATION: We support the action of the panel.
SUBSTANTIATION: None.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Refer to the panel action and statement on Comment 16-295.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
ABSTENTION: 1
EXPLANATION OF ABSTENTION:
CAUDILL: The Society of the Plastics Industries could not reach a consensus position on this issue.

(Log #1321)

16- 369 - (820-54(e) (New)): Accept in Principle
SUBMITTER: Allen C. Weidman, The Society of the Plastics Industry, Inc.
COMMENT ON PROPOSAL NO: 16-321
RECOMMENDATION: We support the action of the panel.
SUBSTANTIATION: None.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Refer to the panel action and statement on Comment 16-318.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
ABSTENTION: 1
EXPLANATION OF ABSTENTION:
CAUDILL: The Society of the Plastics Industries could not reach a consensus position on this issue.

ARTICLE 830 — NETWORK-POWERED BROADBAND COMMUNICATIONS SYSTEMS

(Log #308)

16- 370a - (830-2-Abandoned Cable): Accept in Principle
SUBMITTER: Stanley Kaufman, Lucent Technologies
COMMENT ON PROPOSAL NO: 16-364
RECOMMENDATION: Include a definition of Abandoned Cable in section 830.2. Use the definition adopted for section 820.2 in Proposal 16-273.
SUBSTANTIATION: This article should have a definition of abandoned cable. This comment corrects and oversight.
PANEL ACTION: Accept in Principle.
Add the following definition to 830.2: "Abandoned Network-Powered Broadband Communications Cable. Installed network-powered broadband communications cable that is not terminated at equipment other than a connector and not identified for future use with a tag."
PANEL STATEMENT: Refer to panel action and statement on Comment 16-314. The revised text meets the intent of the submitter.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21

(Log #1570)

16- 370 - (830-2-Abandoned Cable): Accept in Principle
SUBMITTER: Wayne G. Carson, Carson Assoc. Inc.
COMMENT ON PROPOSAL NO: 16-364
RECOMMENDATION: Add definition:

Abandoned Cable: Cable that is not terminated at both ends, not connected to equipment, or not identified for future use with a tag.

SUBSTANTIATION: Section 830.55(A) includes a requirement to remove abandoned cable but abandoned cable is not defined in this section. It is not believed that this is new material as the term "abandoned cable" was added. Also, the definition has been added to five other sections (725-2, 760-2, 770-2, 800-2, and 820-2). This comment provides consistency between sections of the code and assists the user in understanding terms used in the code.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Refer to the panel action and statement on Comment 16-315.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21

(Log #271)

16- 371 - (830-3(a)): Accept in Principle
SUBMITTER: Stanley Kaufman, Lucent Technologies
COMMENT ON PROPOSAL NO: 16-364
RECOMMENDATION: Delete "not intended for future use."
SUBSTANTIATION: It is redundant to state "Abandoned cables not intended for future use...", since abandoned cables are defined as not being intended for future use.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Refer to panel action and statement on Comment 16-397.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21

(Log #1584)

16- 372 - (830-3(a)): Accept in Principle in Part
SUBMITTER: Wayne G. Carson, Carson Assoc. Inc.
COMMENT ON PROPOSAL NO: 16-364
RECOMMENDATION: Revise text to read as follows:

Spread of Fire or Products of Combustion. Installations in hollow spaces, vertical shafts, and ventilation or air-handling ducts shall be made so that the possible spread of fire or products of combustion will not be substantially increased. Openings around penetrations through fire resistance-rated walls, partitions, floors, or ceilings shall be firestopped using approved methods to maintain the fire resistance rating.

Abandoned cables not intended for future use shall not be permitted to remain.

FPN: Directories of electrical construction materials published by qualified testing laboratories contain many listing installation restrictions necessary to maintain the fire-resistive rating of assemblies where penetrations or openings are made.

SUBSTANTIATION: This definition under the section entitled "Spread of Fire or Products of Combustion" is not consistent throughout the Code. This comment uses language from ROP 16-250 [850-52(B)] to provide a consistent requirement throughout the code.

The same comment is being made for the following sections:
640-3A (ROP 16-1a)
645-5D6 (ROP 12-106)
725-3B (ROP 16-80)
760-3A (ROP 16-144)
770-3A (ROP 16-176)
820-3A (ROP 16-313)
820-52 B (ROP 16-311)
830-58B (ROP 16-368)

PANEL ACTION: Accept in Principle in Part.

PANEL STATEMENT: The panel accepts in principle the statement regarding abandoned cables. Refer to panel action on Comment 16-397. This satisfies the submitter's concerns.

The current reference to 300-21 satisfies the balance of the comment, which is rejected. That portion of the comment repeats the text of 300-21.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21

VOTE ON PANEL ACTION:

AFFIRMATIVE: 21

(Log #1424)

16- 373 - (830-3(b)): Reject

SUBMITTER: Kari Barrett, American Chemistry Council

COMMENT ON PROPOSAL NO: 16-364

RECOMMENDATION: Delete the following text:

~~Abandoned cables not intended for future use shall not be permitted to remain.~~

SUBSTANTIATION: Removal of abandoned cables in these areas is a "housekeeping" issue. Whether or not to remove them should be the owner's decision and not be mandated by the NEC.

PANEL ACTION: Reject.

PANEL STATEMENT: The panel reaffirms that removal of abandoned cables addresses a significant fire safety issue. The term "housekeeping" is not applicable to abandoned cables. Fire safety and cable installation are within the scope of the NEC.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21

VOTE ON PANEL ACTION:

AFFIRMATIVE: 21

(Log #1322)

16- 374 - (830-5): Accept

SUBMITTER: Allen C. Weidman, The Society of the Plastics Industry, Inc.

COMMENT ON PROPOSAL NO: 16-327

RECOMMENDATION: We support the action of the panel.

SUBSTANTIATION: None.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21

VOTE ON PANEL ACTION:

AFFIRMATIVE: 21

(Log #2088)

16- 375 - (830-5(b)(2) (New)): Accept in Principle in Part

SUBMITTER: Marcelo M. Hirschler, GBH International

COMMENT ON PROPOSAL NO: 16-332

RECOMMENDATION: Revise text as follows:

830-5. Access to Electrical Equipment Behind Panels Designed to Allow Access

Access to equipment shall not be denied by an accumulation of wires and cables that prevents removal of panels. Cables shall be installed in such a manner that the cable will not be damaged by normal building use. Access to electrical equipment behind ceilings designed to allow access shall comply with (a) or (b).

a. New building construction (e.g. renovation, remodeling, new spaces). Installation of cables shall comply with Section 300.11.

b. Buildings with existing cable systems. Where practicable, installation of cables shall comply with Section 300.11. Where impracticable to comply with Section 300.11, in those areas having ceilings with access points or access panels, it shall be permissible to fish a maximum of three cables less than 13 mm (0.5 in) in diameter, between access points in the ceiling. ~~cables less than 13 mm (0.5 in) in diameter shall be permitted to be installed unsupported by the building structure in accordance with 1 or 2.~~

~~1. In areas having ceilings with access points or access panels, it shall be permissible to fish a maximum of three cables between access points in the ceiling.~~

~~2. In areas having suspended lay-in ceilings, it shall be permissible to install a maximum of three unsupported cables on top of any one ceiling tile. The cables shall be run parallel to the ceiling grid.~~

SUBSTANTIATION: The permission granted by the panel to install cables on suspended ceiling tiles should be rescinded. Neither cables nor any other item should be installed on top of a suspended ceiling tile. The support systems of suspended ceilings are not designed to resist any significant amount of weight without being deflected or broken.

This issue has been raised on Proposal 16-192 (log 1665) in negative comments by two panel members, Mr Egesdal and Mr Speer, who both correctly point out that suspended ceiling tiles are not intended to support the weight of electrical cables. Mr. Sandy Egesdal repeats his negative comment on this proposal.

The point made by the Technical Correlating Committee on proposal 16-38 that such use would constitute an exposed use of cables is an additional consideration to rejecting this part of the proposal.

PANEL ACTION: Accept in Principle in Part.

PANEL STATEMENT: The panel accepts the principle of permitting a limited number of cables to be installed in a fixed or hard ceiling. The panel rejects the balance of the submitter's recommendation including the limiting of the installation of cables in a suspended lay-in ceiling . The recommendation of Comment 16-375a provides a reasonable, safe, and practical solution to placing a limited number of unsupported signaling and communications cables in existing construction.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21

VOTE ON PANEL ACTION:

AFFIRMATIVE: 20

NEGATIVE: 1

EXPLANATION OF NEGATIVE:

SPEER: See my explanation of negative vote on Comment 16-27a.

(Log #205)

16- 376 - (830-6): Accept

SUBMITTER: Technical Correlating Committee National Electrical Code

COMMENT ON PROPOSAL NO: 16-332

RECOMMENDATION: See Technical Correlating Committee action on Proposal 16-38. It was the action of the Technical Correlating Committee that further consideration be given to the comments expressed in the voting. The Technical Correlating Committee directs that the Action on this Proposal be revised to comply with the NEC Style Manual 3.2.1 relative to use of the unenforceable terms "practicable" and "impracticable". This action will be consideed by the Panel as a Public Comment. It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 3 for Comment.

SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.

PANEL ACTION: Accept.

PANEL STATEMENT: Refer to the recommendation and substantiation on Comment 16-375a.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21

VOTE ON PANEL ACTION:

AFFIRMATIVE: 21

(Log #707)

16- 377 - (830-6): Reject

SUBMITTER: Glenn W. Zieseniss, Crown Point, IN

COMMENT ON PROPOSAL NO: 16-332

RECOMMENDATION: Change the "Accept in Principle" to "Reject".

SUBSTANTIATION: I agree with Mr. Egesdal's and Mr. Speer's negative vote and comment on Proposal 16-192. This proposal is giving a "blanket okay for any type of ceiling tile to support the possible added weight of 3 cables of less than 1/2 in. in diameter on each ceiling tile. The proposal does not affirm that the ceiling tile industry was contacted of adding weight to lay on their product. This product is not part of the building structure, and is not designed to be suitable for supporting cables. I have seen ceiling tiles which look as if made of fiber glass insulation which has a finished surface on the exposed side of the ceiling. It is my belief that this ceiling tile would not accept additional weight upon it. I have contacted three ceiling tile companies or organizations on this proposal. They all suggested that their ceiling tiles are not to support additional weight. I have provided copies of my e-mail contacts.

NOTE: Supporting Material is available at NFPA Headquarters.

PANEL ACTION: Reject.

PANEL STATEMENT: The recommendation of Comment 16-375a provides a reasonable, safe, and practical solution to placing a limited number of unsupported signaling and communications cables in existing construction. The restrictions contained in Comment 16-375a limit both the number and size of wires and cables permitted on each ceiling panel, thereby controlling weight and accumulation so that cables can be easily moved aside to permit access. The submitter's concern about weight is addressed

by decreasing the size of the cable to 1/4 inch and limiting the number of cables to three per each 10 ft x 10 ft area.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
SPEER: See my explanation of negative vote on Comment 16-27a.

(Log #864)

16- 378 - (830-6): Accept in Principle in Part
SUBMITTER: Larry F. Miller, National Electrical Manufacturers Association (NEMA)
COMMENT ON PROPOSAL NO: 16-332
RECOMMENDATION: The Panel shold continue to Accept the proposal in Principle but revise the Panel action text to read as follows:

830-6. Access to Electrical Equipment Behind panels Designed to Allow Access.

Access to electrical equipment shall not be denied by an accumulation of wires and cables that prevents removal of panels. Cables shall be installed in such a manner that the cable will not be damaged by normal building use or maintenance. Access to electrical equipment behind ceilings designed to allow access shall comply with (a) or (b).

a. New building construction (e.g., renovation, remodeling, new spaces). Installation of cables shall comply with Section 300.11.

b.1. Installation of cables in suspended lay-in type ceiling spaces shall comply with 300.11.

2. Installation of cables in other than suspended lay-in type ceiling spaces shall comply with 300.11 where the space is accessible.

3.Where the ceiling is not the lay-in type, and the space is not accessible, three cables less than 13 mm (0.5 in.) shall be permitted to be installed unsupported by the building structure between access points or access panels.

~~Buildings with existing cabling systems.~~

~~Where practicable, installation of cables shall comply with Section 300.11. Where impracticable to comply with Section 300.11, cables less than 13 mm (0.5 in) in diameter shall be permitted to be installed unsupported by the building structure in accordance with 1 or 2.~~

~~1. In areas having ceilings with access points or access panels, it shall be permissible to fish a maximum of three cables between access points in the ceiling.~~

~~2. In areas having suspended lay-in ceilings, it shall be permissible to install a maximum three supported cables on top of any one ceiling tile. The cables shall be run parallel to the ceiling grid.~~"

SUBSTANTIATION: We agree with Mr. Egedsal's and Mr. Speer's negative comments that suspended ceilings are not intended to support electrical wires or cables.

Section 300-11(a)(1) (wiring located within the cavity of a fire-rated floor-ceiling or roof-ceiling) allows an exception for wiring that has been tested as part of the fire-rated assembly. This proposal could compromise the fire-rating of the ceiling by overriding that requirement. The words "or maintenance" have been added because so much of the damage occurs in ceiling spaces as various trades perform maintenance.

The submitter states that he has submitted companion proposals for Articles 725 760, 770, 820 and 830. If each of these articles will allow three cables per ceiling tile, this could result in a total of 18 cables per ceiling tile, which appears to be approaching the "excessive accumulation" the submitter agrees could be a hazard. Limiting the size and quantity of cable permitted to be fished in non-lay-in ceiling spaces will help control the weight of cable (combined with that permitted in the other articles referenced above) on these ceilings.
PANEL ACTION: Accept in Principle in Part.
PANEL STATEMENT: The panel rejects the recommended addition of the word "maintenance." The term "normal building use" includes "maintenance." The balance of the recommendation is accepted in principle. Refer to the recommendation and substantiation on Comment 16-375a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
SPEER: See my explanation of negative vote on Comment 16-27a.

(Log #965)

16- 379 - (830-6): Accept in Part
SUBMITTER: Palmer Hickman, Royersford, PA
COMMENT ON PROPOSAL NO: 16-332
RECOMMENDATION: Reject Proposal 16-332 as amended by Code Panel 16. Accept the Proposal as submitted by Mr. Brunssen.
SUBSTANTIATION: I recommend reconsideration of Code-Making Panel 16's action on this proposal. The proposed 830.6(B)(2) would now permit three cables to be installed on the tiles of a suspended ceiling, without providing any technical substantiation for this allowance.

I understand that this proposed allowance of ceiling support only applies to buildings with existing cabling systems where it is "impracticable" to comply with 300-11. Impracticability does not provide technical substantiation to allow a ceiling assembly that has not been evaluated to support the potential additional load of three cables on each and every ceiling tile.

I am aware that Chapter 8 is independent of other chapters except where specifically referenced therein. Panel 16 has referenced 300-11, and Code-Making Panel 3 is on record reaffirming their prohibition of ceiling assemblies being used beyond the manufacturers design parameters in the Panel Statement to Comments 3-53 and 3-57 of the 1998 ROC, and Proposal 3-68 of the 2001 ROP. In the latter reference, Code-Making Panel 3 states: "The panel reaffirms its position that an independent means of support shall be provided for all wiring, not just branch circuit wiring. . .".

The substantiation provided by Mr. Brunssen for his proposal does not support the proposed change as amended by Code-Making Panel 16. He claims that "a limited amount of cabling laid directly on a suspended ceiling is permitted..." without stating where this permission is given. The entire substantiation of the submitter seems contrary to the action of the panel. I am not sure he would recognize the end result as the proposal he made. Mr. Brunssen begins his substantiation by stating that "Section 830-6 may be misinterpreted to mean that cables may not be placed directly on suspended ceilings." He notes that the 1999 NEC Handbook "Figures 830-2 and 830-3 lead the reader to conclude that no cables are permitted to rest directly on the suspended ceiling." The submitter also stated Code-Making Panel 16 responded to a proposal to Article 725 (1992 TCD Comment 16-18) that the proposed requirement "...would still allow some cabling of a limited quantity above the ceiling tile, but not to an excessive amount." Note the words "above the ceiling tile", not on the ceiling tile. I feel these examples are not misinterpretations, but rather correct interpretations, and a case to reject this proposal as amended by Code-Making Panel 16.

In conclusion, I respectfully disagree with the Panel Action on this Proposal. I find no technical substantiation to warrant such a dramatic change. Mr. Brunssen presented a well-researched proposal addressing access, not support. The substantiation of the submitter does not support this change as amended, nor does the Panel Statement.
PANEL ACTION: Accept in Part.
PANEL STATEMENT: The panel accepts the portion of the comment to retain Section 830.6, and rejects the portion of the comment to reject Proposal 16-332. Refer to the recommendation and substantiation on Comment 16-375. Also refer to the panel action and statement on Comment 16-377.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
SPEER: See my explanation of negative vote on Comment 16-27a.

(Log #1154)

16- 380 - (830-6): Accept in Principle
SUBMITTER: James E. Brunssen, Telcordia Technologies, Inc.
COMMENT ON PROPOSAL NO: 16-332
RECOMMENDATION: Continue to accept in principle.
SUBSTANTIATION: Panel 16 should continue to accept in principle as it provides a reasonable and safe solution to placing a limited number of signaling and communications wires and cables in existing construction. The restrictions contained in the proposed change limit both the number and size of wires and cables permitted on each suspended ceiling panel. In this manner additional weight, as well as an accumulation of wires and cables that would otherwise restrict access above suspended ceiling panels, is controlled and limited. The limited number of cables permitted can easily be moved aside to permit access. Some concern has also been expressed that cables placed directly on the ceiling panels would degrade the fire rating of the ceiling. The

suspended ceiling, part of a membrane that is intended to retard fire from spreading into the ceiling cavity, would be unaffected in its ability to retard the spread of fire by a limited number of wires and cables resting on top of the panels. This is a companion comment and is intended to correlate with comments on Proposals 16-38, 16-112, 16-159, 16-192, and 16-278.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Refer to the substantiation on Comment 16-375a. This action meets the intent of the submitter.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
SPEER: See my explanation of negative vote on Comment 16-27a.

(Log #1162)

16- 381 - (830-6): Accept in Principle
SUBMITTER: James E. Brunssen, Telcordia Technologies, Inc.
COMMENT ON PROPOSAL NO: 16-332
RECOMMENDATION: Revise as follows:
830-6. Access to Electrical Equipment Behind Panels Designed to Allow Access. Access to electrical equipment shall not be denied by an accumulation of wires and cables that prevents removal of panels. Cables shall be installed in such a manner that the cable will not be damaged by normal building use. Access to electrical equipment behind ceilings designed to allow access shall comply with (a) or (b).
a. New building construction (e.g., renovation, remodeling, new spaces). Installation of cables shall comply with Section 300.11.
b. Buildings with existing cabling systems. Where practicable, installation of cables shall comply with Section 300-11. Where impracticable to comply with Section 300-11, cables less than 13 mm (0.5 in.) in diameter shall be permitted to be installed unsupported by the building structure in accordance with 1 or 2.
1. In areas having ceilings with access points or access panels, it shall be permissible to fish a maximum of three cables between access points in the ceiling.
2. In areas having suspended lay-in ceilings, it shall be permissible to install a maximum of three unsupported cables on top of ~~any one~~ each ceiling tile, i.e., up to three wires and cables are permitted to lay on a ceiling tile. The cables shall be run parallel to the ceiling grid.
SUBSTANTIATION: Proposed Section 830-6(b)(2) as presently written in Proposal 16-332, panel action, is confusing and could be interpreted as permitting a total of only three unsupported wires and cables above a suspended ceiling. The intent of the panel was that up to a maximum of three unsupported wires and cables may be routed across each and every ceiling tile. The revision proposed in this comment clarifies and accomplishes the intent of the panel. This is a companion comment and is intended to correlate with comments on Proposals 16-38, 16-112, 16-159, 16-192, and 16-276.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Refer to the recommendation and substantiation on Comment 16-375a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
SPEER: See my explanation of negative vote on Comment 16-27a.

(Log #1168)

16- 382 - (830-6): Accept in Principle
SUBMITTER: James E. Brunssen, Telcordia Technologies, Inc.
COMMENT ON PROPOSAL NO: 16-332
RECOMMENDATION: Revise as follows:
830-6. Access to Electrical Equipment Behind Panels Designed to Allow Access. Access to electrical equipment shall not be denied by an accumulation of wires and cables that prevents removal of panels. Cables shall be installed in such a manner that the cable will not be damaged by normal building use. Access to electrical equipment behind ceilings designed to allow access shall comply with (a) or (b).
a. New building construction (e.g., renovation, remodeling, new spaces). Installation of cables shall comply with Section 300.11.
b. Buildings with existing cable systems. ~~Where practicable, installation of cables shall comply with Section 300.11. Where impracticable to comply with Section 300-11, c~~Cables less than 13 mm (0.5 in.) in diameter shall be permitted to be installed unsupported by the building structure in accordance with 1 or 2.
1. In areas having ceilings with access points or access panels, it shall be permissible to fish a maximum of three cables between access points in the ceiling.
2. In areas having suspended lay-in ceilings, it shall be permissible to install a maximum of three unsupported cables on top of any one ceiling tile. The cables shall be run parallel to the ceiling grid.
Where the maximum number of cables permitted in 1 or 2 will be exceeded, installation of cables shall comply with Section 300.11.
SUBSTANTIATION: The Technical Correlating Committee has directed that Proposal 16-332 be revised to comply with the NEC Style Manual 3.2.1 relative to the use of unenforceable terms. The proposed revision contained in this comment removes the unenforceable terms "practicable" and "impracticable"; the remaining text is in agreement with the NEC Style Manual 3.1.2 using the phrase "shall be permitted" to indicate allowed optional or alternate methods. The added text (final sentence) provides direction on how to proceed if the limits of 800-5(b)(1) or (2) will be exceeded. This is a companion comment and is intended to correlate with comments on Proposals 16-38, 16-112, 16-159, 16-192, and 16-276.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Refer to the recommendation and substantiation on Comment 16-375a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
SPEER: See my explanation of negative vote on Comment 16-27a.

(Log #CC1607)

16- 375a - (830-6, 8, 9, 10, 11): Accept
Note: The Technical Correlating Committee directs that the references to Articles 640 and 650 be deleted because the panel did not accept similar requirements in those articles. The Technical Correlating Committee also directs that the FPN which contains a mandatory requirement be deleted to comply with the NEC Style Manual.
SUBMITTER: CMP 16
COMMENT ON PROPOSAL NO: 16-332
RECOMMENDATION: Renumber current Section 830-8 as 830-9.
Renumber current Section 830-9 as 830-10.
Renumber current Section 830-10 as 830-11.
Renumber current Section 830-11 as 830-12.
Retain the existing 1999 code text for Section 830-6 (unmodified).
Add new Section 830.8 to read as follows:
830.8 Installation of Circuits.
Network-powered broadband communications systems shall be installed in compliance with A or B.
A. New Ceiling Construction. The installation of cables in new ceiling construction shall comply with Section 300-11.
B. Existing Ceilings.
1. Fire-Rated Ceilings. The installation of cables in the cavity of an existing fire-rated ceiling assembly shall comply with Section 300-11.
2. Non-Fire-Rated Ceilings. For installations in the cavity of an existing non-fire-rated ceiling assembly, cables less than 6 mm (0.25 in) in diameter shall be permitted to be installed unsupported from the building structure in accordance with the following:
a. Fixed or Hard Ceilings. In areas having fixed or hard ceilings with access points or access panels, a combined total of three cables from Articles 640, 650, 725, 760, 770, 800, 820 and 830, shall be permitted to be placed between access points or access panels in the ceiling. Additional cables shall be installed in accordance with 300.11.
b. Suspended Lay-In Ceilings. In areas having suspended lay-in ceilings, in any 3 m by 3m (10 ft. x 10 ft) ceiling area, a combined total of three cables from Articles 640, 650, 725, 760, 770, 800, 820 and 830, shall be permitted to be installed directly on the ceiling grid. Additional cables shall be installed in accordance with 300.11.
FPN. Cables of all types are included in the total limit of three cables, not three cables from each article.
SUBSTANTIATION: Proposal 16-332 was accepted in principle to permit the installation of unsupported cables under limited conditions. Proposal 16-332 text, however, was too broad and unclear. The text of this comment clarifies the original intent. The new text includes requirements to comply with Section 300.11. Permitted installation conditions will not compromise the integrity of fire-rated ceilings. For non-fire-rated ceilings, the permitted

relief from Section 300.11 is limited to very specific conditions. Section 830.6 is not being modified because the accessibility requirements should remain.

The sections have been renumbered so that they appear in a logical order.

PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
SPEER: See my explanation of negative vote on Comment 16-27a.

(Log #1759)

16- 383 - (830-6): Accept in Principle
SUBMITTER: Francis W. Peri, Communications Design Corporation
COMMENT ON PROPOSAL NO: 16-332
RECOMMENDATION: BICSI recommends that Code Panel 16 continue to accept this proposal.
SUBSTANTIATION: ACP supports the introduction of complying with Section 300-11 and recognizes that it represents a major improvement in providing safe cabling pathways.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Refer to the substantiation on Comment 16-375a. This action meets the intent of the submitter.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
SPEER: See my explanation of negative vote on Comment 16-27a.

(Log #1855)

16- 384 - (830-6): Accept in Principle
SUBMITTER: Robert W. Jensen, dbi-Telecommunications Infrastructure Design
COMMENT ON PROPOSAL NO: 16-332
RECOMMENDATION: BICSI recommends that Code Panel 16 continue to accept this proposal.
SUBSTANTIATION: BICSI supports the introduction of complying with Section 300-11 and recognizes that it represents a significant improvement in providing safe cabling pathways.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Refer to the substantiation on Comment 16-375a. This action meets the intent of the submitter.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
SPEER: See my explanation of negative vote on Comment 16-27a.

(Log #745)

16- 385 - (830-6(b)): Accept in Principle in Part
SUBMITTER: Richard P. Owen, City of St. Paul, Electrical Inspection
COMMENT ON PROPOSAL NO: 16-332
RECOMMENDATION: Replace (b) of the proposal with the following text:

(b) Buildings not Covered Under (a) Above. In areas having ceilings with access points or panels and having 900 mm (3 ft) or less vertical clearance above the ceiling, it shall be permissible to fish a maximum of 3 cables, each less than 13 mm (0.5 in.) in diameter, between access points in the ceiling.

SUBSTANTIATION: The Technical Correlating Committee directed Panel 3 Chair Raymond Weber to form a Task Group to review these proposals and to submit the results as comments to Panel 16. Task Group 3-16, consisting of Chair Weber, members Steven Speer; Lee Hewitt; Richard Owen and Ron Maassen held a conference call on October 3, 2000 and developed the above language as a comment. The Task Group was concerned with allowing unsupported cabling above suspended ceilings, since companion proposals for Articles 725, 760, 770, 800, 820 and 830 would also allow this limited cabling without support. The possible accumulation of cable allowed by all these articles would be excessive and would both limit access to a ceiling and conflict with Section 300.11. Rewording of (b) also eliminated the unenforceable terms "practicable" and "impracticable" as directed by the Technical Correlating Committee.
PANEL ACTION: Accept in Principle in Part.
PANEL STATEMENT: The panel rejects the specific limitations in the comment but accepts the principle of permitting a limited number of cables. The recommendation of Comment 16-375a provides a reasonable, safe, and practical solution to placing a limited number of unsupported network-powered broadband communications cables in existing construction.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
SPEER: See my explanation of negative vote on Comment 16-27a.

(Log #1259)

16- 386 - (830-6(b)(2)): Reject
SUBMITTER: J. Paul Spinn, USG Research & Technology Center
COMMENT ON PROPOSAL NO: 16-332
RECOMMENDATION: Delete the following text:

In areas having suspended lay in ceiling, it shall be permissible to install a maximum of three unsupported cables on top of any one ceiling tile. The cables shall be run parallel to the ceiling grid.

SUBSTANTIATION: By allowing a maximum of three unsupported cables on top of any one (or more) ceiling tiles, the fire-rating of the assembly and the Class A surface burning characteristic requirement, which includes flame spread and smoke development, could be jeopardized. By decreasing the fire-rating of the plenum assembly and the surface burning characteristic of the ceiling tile, the life safety of the occupants can be negatively affected. By rejecting this proposal, these problems can be eliminated.

To substantiate the comment made for the proposal, four key points are provided:

[1] For a fire rated floor/ceiling or roof/ceiling assembly, placement of unsupported cables on top of any one ceiling tile or a row of ceiling tiles could invalidate the fire-rating for a particular assembly. The rationale for this argument are:
(a) The weight of the cables could cause premature tile fallout leading to an early failure of the assembly, which is tested in accordance with NFPA 251 or ASTM E 119.
(b) The increased heat of combustion associated with the cable jackets, which commonly use plastics, will add to the total fire load of an assembly. As the total fire load increases for an assembly, the fire endurance of the assembly will decrease, which could jeopardize an assembly's fire-rating.

[2] For a Class A ceiling, placement of unsupported cables on the ceiling can effect flame spread and smoke development performance and jeopardize the required Class A rating for the ceiling tiles. The rationale for this argument are:
(a) The flame spread will increase due to the increased total heat load, which is caused by the plastic on the cable jacket.
(b) The smoke development will increase due to the cable jackets, which are usually plastic such as PVC or CPVC.

[3] The placement of unsupported cables on top of any one or more ceiling tiles presents potential life safety issues for occupants due to the decreased fire-rating of the floor/ceiling or roof/ceiling or an increase in the ceiling surface burning characteristics.

[4] Placement of unsupported cables on top of any one ceiling tile or a row of ceiling tiles would increase ceiling tile sag due to increased weight of the cables on the ceiling tiles, and would impair the accessibility of the ceiling plenum.

PANEL ACTION: Reject.
PANEL STATEMENT: The recommendation of Comment 16-375a provides a reasonable, safe, and practical solution to placing a limited number of unsupported signaling and communications cables in existing construction. The restrictions contained in Comment 16-375a limit both the number and size of cables permitted on each ceiling panel, thereby controlling weight and accumulation so that cables can be easily moved aside to permit access. The submitter's concern about weight is addressed by decreasing the size of the cable to 1/4 inch and limiting the number of cables to three per each 10 ft x 10 ft area. The revised text precludes the installation of cables in all fire-rated ceiling assemblies.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
SPEER: See my explanation of negative vote on Comment 16-27a.

(Log #1160)

16- 387 - (830-7): Reject
SUBMITTER: James E. Brunssen, Telcordia Technologies, Inc.
COMMENT ON PROPOSAL NO: 16-333a
RECOMMENDATION: Delete 830-7 and incorporate the information in 830-6 as follows:

830-6. ~~Access to Electrical Equipment Behind Panels Designed to Allow Access.~~ Mechanical Execution of Work. Network-powered broadband communications circuits and equipment shall be installed in a neat and workmanlike manner. Access to electrical equipment shall not be denied by an accumulation of ~~wires and~~ cables that prevents removal of panels. Cables shall be installed in such a manner that the cable will not be damaged by normal building use. ~~Access to electrical equipment behind ceilings designed to allow access~~ Cables installed exposed shall comply with (a) or (b).

a. New building construction (e.g., renovation, remodeling, new spaces). Installation of cables shall comply with Section 300.11. Cables shall be supported by structural components of the building. Such cables shall be attached to structural components at intervals not exceeding 1.52 m (5 ft) and within 305 mm (12 in.) from every cabinet, box, or fitting by straps, staples, hangers or similar fittings designed and installed so as not to damage the cable. The installation shall also conform with Section 300-4(d).

b. Buildings with existing cabling systems. Where practicable, installation of cables shall comply with ~~Section 300-11~~ 830-6(a) Where impracticable to comply with ~~Section 300-11~~ 830-6(a) cables less than 13 mm (0.5 in.) in diameter shall be permitted to be installed unsupported by the building structure in accordance with 1 or 2.

1. In areas having ceilings with access points or access panels, it shall be permissible to fish a maximum of three cables between access points in the ceiling.

2. In areas having suspended lay-in ceilings, it shall be permissible to install a maximum of three unsupported cables on top of any one ceiling tile. The cables shall be run parallel to the ceiling grid.

SUBSTANTIATION: This is a companion comment and is intended to correlate with similar comments on Proposals 16-39, 16-115, 16-159a, 16-192a, and 16-276a. Sections 830-6 and 830-7 actually address the same issue, the mechanical execution of work. Accessibility behind panels designed to allow access is really an "execution of work" issue. Additionally, the Technical Correlating Committee has identified a potential conflict between the panel action on Proposals 16-38 and 16-39, that would also result here in 830. This comment editorially combines 830-6 and 830-7 into a single Section 830-6 requiring attachment to the building structure of exposed cables and conductors and, where impracticable to do so, permits a limited number of cables of specified maximum size to be placed on suspended ceiling tiles. It accommodates the intent of both proposals that cables should be supported by the building structure, but in extenuating circumstances in existing construction, a limited number and weight of cables may be placed on a suspended ceiling. Further, in the first paragraph of 830-6, the phrase "wires and" is deleted as network-powered broadband circuits are provided via cable and not wire.
PANEL ACTION: Reject.
PANEL STATEMENT: The sections should not be combined. Refer to the recommendation and substantiation for Comment 16-375a where these recommendations are addressed.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
SPEER: See my explanation of negative vote on Comment 16-27a.

(Log #1423)

16- 388 - (830-7): Accept in Part
SUBMITTER: Kari Barrett, American Chemistry Council
COMMENT ON PROPOSAL NO: 16-333a
RECOMMENDATION: Delete the following text:

~~Such cables shall be attached to structural components at intervals not exceeding 1.52 m (5 ft) and within 305 mm (12 In.) from every cabinet, box or fitting by straps, staples, hangers or similar fittings designed and installed so as not to damage the cable. The installation shall also conform with Section 300-4(d).~~

SUBSTANTIATION: The addition of this text would make the mandatory requirements of this section overly specific. The present wording is sufficient guidance to both the installer and the authority having jurisdiction.
PANEL ACTION: Accept in Part.
Revise the third sentence of the panel action text of Proposal 16-333a to read as follows:
"Such cables shall be attached to structural components by straps, staples, hangers or similar fittings designed and installed so as not to damage the cable."
PANEL STATEMENT: The panel accepts the removal of specific distances for the attachment of the cable. The panel does not agree that the existing code wording is sufficient guidance to both the installer and the authority having jurisdiction.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
SPEER: See my explanation of negative vote on Comment 16-27a.

(Log #1636)

16- 389 - (830-7): Reject
SUBMITTER: Andy Scott, National Cable Television Association
COMMENT ON PROPOSAL NO: 16-333a
RECOMMENDATION: Reject Proposal 16-333a.
SUBSTANTIATION: NCTA, on behalf of the cable television industry, strongly urges Panel 16 to reject these proposals. While attachment every 5 ft may be a practice in many cases, it also may be overly restrictive and unnecessary in others. The requirement to support cables every 5 ft is outside the scope of the code. The NCTA urges Panel 16 not to allow the NEC to serve as an Installation Manual.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel action on Comment 16-335 addresses the concerns in the submitter's substantiation.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
SPEER: See my explanation of negative vote on Comment 16-27a.

(Log #414)

16- 390 - (830-7(a)): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
COMMENT ON PROPOSAL NO: 16-336
RECOMMENDATION: Accept in Part revised, and relocate after (d):

"except that overhead (aerial) cable shall be permitted to be attached to the exterior of a raceway-type mast intended for the attachment and support of such cables."

SUBSTANTIATION: The function and type mast is specified to provide the same wording as that in Panel Action for Proposal 16-314.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel is unclear as to the change intended by the submitter in both the proposal and comment.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21
COMMENT ON AFFIRMATIVE:
TODD: The power service mast interface between NEC and NESC wiring does not need NEC ruling on attachments other than power conductors.

The submitter's comment is rejected for these reasons:

1. Panel 4 has continued to reject any attachments other than the power service conductors in article 230-28.

2. UL will not list this mast with unknowns of utility NESC span lengths, conductor loading levels (i.e., ice, wind, etc.) and multiple point sub-attachments, such as CATV and telephone service drop cables.

3. The electric utility industry has safety and subsequent liability concerns with power conductors on multiple attachment masts. This concern relates to the increased risk of snagging of the nonpower attachments and tearing down the power conductors.

This interface concern should be resolved between local power utility and telecommunication companies, not in the NEC. It is in the interest of fire and public safety to keep the power service mast for the exclusive safe environment of power conductors.

(See NEC Panel 16 statement to Proposal 16-202 from the October, 2000 Report on Proposals - ROP.)

(Log #617)

16- 391 - (830-10(j)): Accept in Principle
SUBMITTER: Steven C. Johnson, Time Warner Cable
COMMENT ON PROPOSAL NO: 16-344
RECOMMENDATION: Reject the proposal to prohibit use of service masts for drop attachments.
SUBSTANTIATION: There is no reason to force a homeowner to install a separate mast to accommodate communications (telephone, CATV) service drops wherever the service mast can be listed to do so. An arbitrary prohibition of attaching to electrical masts is not reasonable. Where the mast can be shown to support additional attachments without creating a safety hazard, these attachments should be allowed. Reasonable qualifications would include the ability to support the weight (with ice loading) and not damage the mast or structure, ability to maintain proper clearance, etc.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Refer to panel action and comment on Comment 16-392.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16
NEGATIVE: 5
EXPLANATION OF NEGATIVE:
DORNA: See my explanation of negative vote on Comment 16-271.
KAHN: The comments should be rejected and the original Panel Action to Reject Proposal 16-344 should be sustained.
Code-Making Panel 4 has rejected the Proposal and that panel has primary jurisdiction. In their Panel Statement, they state: "... that they do not believe that the listing of the product will adequately address the personnel issues that are created by the co-mingling of the different systems on a common mast. Issues such as loading can be addressed by the proposed listing, however personnel safety cannot be assured regardless of the listing criteria." I agree with their assessment.
A task group of Code-Making Panel 4 and Code-Making Panel 16 members as suggested in the Panel Statement should be formed to study the problem further if the Technical Correlating Committee deems it advisable.
MANGAN: See my explanation of negative vote on Comment 16-271.
SPEER: See my explanation of negative vote on Comment 16-271.
TODD: See my explanation of negative vote on Comment 16-155.

(Log #1146)

16- 392 - (830-10(j) (New)):
Note: The Technical Correlating Committee directs that this comment be reported as "Reject" to correlate with the action on Proposal 4-73 and Comment 4-51.
SUBMITTER: James E. Brunssen, Telcordia Technologies, Inc.
COMMENT ON PROPOSAL NO: 16-344
RECOMMENDATION: Accept the proposal.
SUBSTANTIATION: This is a companion comment to my comment on Proposal 4-73 wherein it was proposed to revise Section 230-28 to permit communications wires and cables to be attached to a service mast that is listed for the purpose. Code-Making Panel 4 has been asked to reconsider their rejection of Proposal 4-73, based on the panel statement that Code-Making Panel 4 does not "believe" listing will adequately address the personnel safety issues. Code-Making Panel 4's position is contrary to both the industry and NEC accepted method to ensure the safety of wiring, cable, and equipment when used for its intended application, that of listing by a Nationally Recognized Testing Laboratory (NRTL). Listing will ensure that the service mast can adequately support multiple attachments while providing for the safety of power, communications, and CATV technicians who must access the service mast. Code-Making Panel 16 stated that detailed design and installation requirements are not defined. This is the purpose of listing - to establish that a product will be safe when used as intended. It is unreasonable to arbitrarily prohibit attaching to the electric service mast and cause the homeowner to bear the cost of a separate mast for communications. When the mast is listed and installed properly for its intended use, it will be capable of safely supporting, and safely permitting access to, multiple attachments. Code-Making Panel 16 should accept Proposal 16-281 based on the merits of the submitter's original substantiation, contingent upon the action of Code-Making Panel 4.
Note also companion comments to Proposals 16-202 and 16-344.
PANEL ACTION: Accept.
PANEL STATEMENT: CMP 16 understands that CMP 4 has primary jurisdiction over requirements associated with the power service mast. A companion comment has been submitted to CMP 4 to allow relief for the attachment of communications cables to the power service mast. Should CMP 4 continue to reject the proposal, CMP 16 requests that the Technical Correlating Committee assign a task group consisting of members of both panels to review the issues.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16
NEGATIVE: 5
EXPLANATION OF NEGATIVE:
DORNA: See my explanation of negative vote on Comment 16-271.
KAHN: See my explanation of negative vote on Comment 16-391.
MANGAN: See my explanation of negative vote on Comment 16-271.
SPEER: See my explanation of negative vote on Comment 16-271.
TODD: See my explanation of negative vote on Comment 16-155.

(Log #1643)

16- 393 - (830-10(j)):
Note: The Technical Correlating Committee directs that this comment be reported as "Reject" to correlate with the action on Proposal 4-73 and Comment 4-51.
SUBMITTER: Andy Scott, National Cable Television Association
COMMENT ON PROPOSAL NO: 16-344
RECOMMENDATION: Accept Proposal 16-344.
SUBSTANTIATION: NCTA, on behalf of the cable television industry, strongly urges Panel 16 to accept these proposals. An arbitrary prohibition of attaching to electrical masts is not reasonable. Where it can be established that the mast can support additional attachments without creating a safety hazard, these attachments should be allowed. Reasonable substantiation would include the ability to support the weight (with ice loading) and not damage the mast or structure, ability to maintain proper clearance, etc. It is unreasonable to force a homeowner to install a separate mast to accommodate communications (telephone, CATV) service drops when the service mast can be listed to do so.
PANEL ACTION: Accept.
PANEL STATEMENT: Refer to panel action and statement on Comment 16-392.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16
NEGATIVE: 5
EXPLANATION OF NEGATIVE:
DORNA: See my explanation of negative vote on Comment 16-271.
KAHN: See my explanation of negative vote on Comment 16-391.
MANGAN: See my explanation of negative vote on Comment 16-271.
SPEER: See my explanation of negative vote on Comment 16-271.
TODD: See my explanation of negative vote on Comment 16-155.

(Log #1120)

16- 394 - (830-40(a)(4)): Reject
SUBMITTER: Steven C. Johnson, Time Warner Cable
COMMENT ON PROPOSAL NO: 16-357
RECOMMENDATION: Reject Proposal 16-357.
SUBSTANTIATION: 1. The distance between entrances for different services is practically limited to 100 feet for most installations which corresponds to 0.3 ohms for 14 AWG solid copper conductor and 0.05 ohms for 6 AWG solid copper conductor. Neither resistance is significant. The new 830-40(a)(4) proposed would mandate placing an additional electrode wherever the distance between the grounding terminal for communications cables and the electrical service ground is greater than 20 feet. The additional electrode would not significantly decrease resistance to ground nor increase safety.
2. The practical difference between the existing code and the proposed change is that the grounding conductor size is increased to 6 AWG every time the 20-foot distance rule is violated. This difference results in 0.25 ohm difference in the extreme case of 100 feet grounding conductor run. The difference is usually significantly less than 0.25 ohms since the distance is usually less than 100 ft and the size of the grounding conductor is normally larger than 14 AWG. The requirement for approximately equal ampacity for cable sheath and grounding conductor in 830-40(3) results in larger grounding conductor than 14 AWG in most cases.

3. The proposal provided no technical justification for the quantified 20-foot limitation and no demonstrated improvement in safety. No problems are cited and no incidents of damage or harm are presented that are the result of present installation and bonding practices.
4. The 20 foot rule is not always practical to maintain. The new proposal would result in a backlash from homeowners whenever an additional electrode is to be placed and 6 AWG wire to be used to bond it to the existing electrode system.

PANEL ACTION: Reject.
PANEL STATEMENT: The panel's intent is to limit the potential difference between power and communications circuits during lightning events.

That potential difference is generally a function of conductor inductance (L), which increases in direct proportion to conductor length, and the rate of rise of the current (di/dt). This proposal addresses that issue, encourages short cable, shield grounding conductors, provides guidance as to a reasonable maximum length, and provide an alternative where it is not practicable to meet the maximum length (20 ft) restriction. The proposed length restriction is limited to one- and two-family residences as it is such installations that are more likely to have diverse power and communications entrances and experience lightning-related problems (urban/suburban environment with a fewer elevated structures and extensive buried metallic objects).
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 19
NEGATIVE: 2
EXPLANATION OF NEGATIVE:
JOHNSON: See my explanation of negative vote on Comment 16-274.
TODD: See my Explanation of Negative on Comment 16-274.

(Log #1646)

16- 395 - (830-40(a)(4)): Reject
SUBMITTER: Andy Scott, National Cable Television Association
COMMENT ON PROPOSAL NO: 16-357
RECOMMENDATION: Reject Proposal 16-357.
SUBSTANTIATION: The Cable Television industry urges the NFPA to reject this proposal. These proposals have no technical merit and no demonstrated improvement in safety. To our knowledge, no incidents of harm or damage that were the result of existing installation and bonding practices have been documented to support such a change in existing practice.

The practice within the cable industry is to maintain grounding conductors as short as practicable. In the majority of installations, the distance between entrances for different services is limited to approximately 100 ft. This distance corresponds to 0.3 ohms for 14 AWG solid copper conductor and 0.05 ohms for 6 AWG solid copper conductor. Neither resistance is significant. Notwithstanding the additional increase in installation cost to the customer, the 20 ft rule cannot be practically maintained, and would result in a negative reaction from homeowners whenever an additional electrode is to be placed and 6 AWG wire to be used to bond it to the existing electrode system.
PANEL ACTION: Reject.
PANEL STATEMENT: Refer to the panel action and statement on Comment 16-394.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 19
NEGATIVE: 2
EXPLANATION OF NEGATIVE:
JOHNSON: See my explanation of negative vote on Comment 16-274.
TODD: See my Explanation of Negative on Comment 16-274.

(Log #398)

16- 396 - (830-40(b)(1)d): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
COMMENT ON PROPOSAL NO: 16-359
RECOMMENDATION: Accept proposal.
SUBSTANTIATION: Section 830-40(a)(4) and (b) indicate the raceway is an electrode. Section 250-70 indicates the grounding conductor shall be connected by welding, pressure connectors, or clamps, none of which appear to be suitable for connection to flexible raceway.
PANEL ACTION: Reject.
PANEL STATEMENT: Refer to the panel action and statement on Comment 16-312.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21

(Log #302)

16- 397 - (830-55(a)): Accept in Principle
SUBMITTER: Gerald Lee Dorna, Belden Wire & Cable Co.
COMMENT ON PROPOSAL NO: 16-364
RECOMMENDATION: The revised wording for 830-3(a) should read as follows:

(a) Spread of Fire or Products of Combustion. Section 300-21. Abandoned cables ~~not intended for future use~~ shall not be permitted to remain.

SUBSTANTIATION: To make this article correspondent with Articles 725, 760, 770, 800 and 820, the above wording should be used. I have also put in a companion comment to add the definition of "Abandoned Cable" which is also needed in this article. If the definition that I propose is accepted (which will be the same as we accepted in Article 820) then the words "not intended for future use" will be irrelevant.
PANEL ACTION: Accept in Principle.
In the submitter's recommendation change the second sentence of 830-3(a) to read:
"The accessible portion of abandoned network-powered broadband communications cables shall not be permitted to remain."

The balance of the recommendation remains unchanged.
PANEL STATEMENT: The text was revised to correlate with similar requirements in other sections (e.g. see Comment 16-83).
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21

(Log #1099)

16- 398 - (830-55(a)): Accept in Principle
SUBMITTER: Marcelo M. Hirschler, GBH International/Rep. Plenum Cable Association and Fire Retardant Chemicals Assoc.
COMMENT ON PROPOSAL NO: 16-364
RECOMMENDATION: Continue accepting this proposal in principle, by retaining the phrase: "Abandoned cables, not intended for future use shall not be permitted to remain."
SUBSTANTIATION: There is a potential for increased fire hazard or fire risk when any cable, irrespective of whether it is or is not limited combustible, remains as fuel load unnecessarily once it has been taken out of use. Materials that are limited combustible can also burn (i.e., they are not noncombustible) and also increase the fire load. Furthermore, all abandoned cables can also affect the safety of plenums because of their weight. There is, thus, no justification for permitting any cable to remain in a plenum once it is abandoned and not intended for future use.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Refer to panel action and statement on Comment 16-397.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21

(Log #1323)

16- 399 - (830-55(a)): Accept in Principle
SUBMITTER: Allen C. Weidman, The Society of the Plastics Industry, Inc.
COMMENT ON PROPOSAL NO: 16-364
RECOMMENDATION: We support the action of the panel.
SUBSTANTIATION: None.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Refer to panel action and statement on Comment 16-397.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21

(Log #303)

16- 400 - (830-55(a)-Abandoned Cable): Accept in Principle
SUBMITTER: Gerald Lee Dorna, Belden Wire & Cable Co.
COMMENT ON PROPOSAL NO: 16-364
RECOMMENDATION: A definition of "Abandoned Cable" is needed here to clarify the situation. It is probably more appropriate that this definition goes under 830-2 "Definitions." The definition that needs to be added is as follows:

Abandoned Cable. Cable that is neither terminated at equipment, nor identified for future use with a tag.

This is the same definition that we accepted in Proposal 16-273.
SUBSTANTIATION: To make this article correspondent with Articles 725, 760, 770, 800 and 820, the above wording should be used. This will also clarify for the authority having jurisdiction exactly what is an "Abandoned Cable."
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Refer to panel action and statement on Comment 16-315.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21

(Log #1253)

16- 401 - (Table 830-58): Accept in Principle
SUBMITTER: Irving Mande, Edwards Systems Technology (EST)
COMMENT ON PROPOSAL NO: 16-366
RECOMMENDATION: Accept this proposal.
SUBSTANTIATION: This Comment should also be accepted if my Comment for Proposal 16-223 is accepted.
PANEL ACTION: Accept in Principle.
Delete MPP, MPR, MPG and MP from Table 830-58 and delete the FPN below the table.
PANEL STATEMENT: The application of multipurpose cables have been retained but including multipurpose cables in Table 830-58 is not necessary because the table includes communications cables and Article 800 provides for substituting multipurpose cables for communications cables. The original proposal had an option and the panel action has accepted the option of deleting the FPN.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21

(Log #749)

16- 402 - (Figure 830-58): Accept in Principle
SUBMITTER: Irving Mande, Edwards System Technology (EST)
COMMENT ON PROPOSAL NO: 16-366
RECOMMENDATION: Accept this proposal.
SUBSTANTIATION: This comment should also be accepted if my comment for Proposal 16-223 is accepted.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Refer to the panel action and statement on Comment 16-401. The panel notes that there is no Figure 830-58.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21

(Log #1324)

16- 403 - (830-58(b)): Accept in Principle
SUBMITTER: Allen C. Weidman, The Society of the Plastics Industry, Inc.
COMMENT ON PROPOSAL NO: 16-369
RECOMMENDATION: We support the action of the panel.
SUBSTANTIATION: None.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Refer to the panel action and statement on Comment 16-397.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21

(Log #1585)

16- 404 - (830-58(b)): Accept in Principle in Part
SUBMITTER: Wayne G. Carson, Carson Assoc. Inc.
COMMENT ON PROPOSAL NO: 16-368
RECOMMENDATION: Revise text to read as follows:

Spread of Fire or Products of Combustion. Installations in hollow spaces, vertical shafts, and ventilation or air-handling ducts shall be made so that the possible spread of fire or products of combustion will not be substantially increased. Openings around penetrations through fire resistance-rated walls, partitions, floors, or ceilings shall be firestopped using approved methods to maintain the fire resistance rating.

Abandoned cables not intended for future use shall not be permitted to remain.

FPN: Directories of electrical construction materials published by qualified testing laboratories contain many listing installation restrictions necessary to maintain the fire-resistive rating of assemblies where penetrations or openings are made.
SUBSTANTIATION: This definition under the section entitled "Spread of Fire or Products of Combustion" is not consistent throughout the Code. This comment uses language from ROP 16-250 [850-52(B)] to provide a consistent requirement throughout the code.

The same comment is being made for the following sections:
640-3A (ROP 16-1-a)
645-5D6 (ROP 12-106)
725-3B (ROP 16-80)
760-3A (ROP 16-144)
770-3A (ROP 16-176)
820-3A (ROP 16-313)
820-52B (ROP 16-311)
830-3A (ROP 16-364)
PANEL ACTION: Accept in Principle in Part.
PANEL STATEMENT: Refer to panel action and statement on Comment 16-372.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21

CHAPTER 9 — TABLES

(Log #763)

8- 98 - (Chapter 9 Table 4): Accept
SUBMITTER: Richard E. Loyd, Perryville, AR
COMMENT ON PROPOSAL NO: 8-455
RECOMMENDATION: I urge the panel to revisit this proposal and accept it as written based on the negative comments.
SUBSTANTIATION: Adding the word "nominal" makes the user aware that the measurements listed in the table may vary slightly due to allowable tolerances. I agree with the negative comments. Sheet materials used to manufacture conduit and tubing have a small variation in the thickness that is unavoidable. This will have a slight effect on the I.D. measurement since the I.D. is derived by subtracting 2 times the wall thickness from the (nominal) O.D. Technically, since the standard does allow for these tolerances the term "nominal" is appropriate.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NEGATIVE: 2
EXPLANATION OF NEGATIVE:
KENDALL: In the case of conduit and tubing, the word "nominal" applies to "Trade Size". There are dimensions shown on internal diameter that are based on either average, minimum or maximum wall thickness and/or outside diameter. Changing the heading will not harmonize these dimensions. Since all of these dimensions are within the required product standards and that the heading does not indicate a minimum, maximum or average, a safety issue is not present. As the submitter states, nothing changes from past practices with or without this change. The change will only introduce confusion among the inspection and electrical contractors.

I favor and recommend that a NEC Task Group be developed to review the internal diameter used in these tables and harmonize on which inside diameter is to be used. The column than can be labeled "Maximum, Minimum or Average".

See my explanation of negative vote on Comment 8-98a.

LILLY: I agree with Mr. Kendall. The word "nominal" does apply to trade size and not to the actual internal diameter. A task group should be given the responsibility of developing a proposal to harmonize the diameters and establish a column heading utilizing "Minimum", "Average", or "Maximum".
COMMENT ON AFFIRMATIVE:

(Log #CC801)

8- 98a - (Chapter 9, Table 4): Accept
SUBMITTER: CMP 8
COMMENT ON PROPOSAL NO: 8-453
RECOMMENDATION: Revise Table 4 to read as shown on the pages 687 through 692:
SUBSTANTIATION: This action corrects errors found in the conversion to metric dimensions and adds a new column for 60% raceway fill (Comment 8-99). The panel directs staff to correct title errors (2002 NEC Draft) in Flexible Metal Conduit and Rigid Metal Conduit.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 3
EXPLANATION OF NEGATIVE:
KENDALL: This comment should be put on "hold". I agree with Wayne Lilly and the IAEI negative statement on Comment 8-98a. I believe a Task Group should be developed to ensure that the correct values be used in this table. The 60 percent column can be added at that time (Comment 8-99) and the term "Nominal" (Comment 8-98) can be decided upon by the same Task Group.

LILLY: The action on this comment should be to hold with a recommendation that a task group be appointed to analyze the proposed Table 4, verify the numbers contained are correct, establish and place in the code a means by which the numbers are verifiable, and correlate Table 4 with Appendix C. This comment was generated by Code Making Panel 8. It contains the present Table 4, a new 60 percent column for nipple fill, and a new metric column for each of the present columns and the new 60 percent column. Additionally, there are several changes to the present Table 4 numbers. All of the new numbers are new material and have not had the benefit of public review.

The current Table 4 and Appendix C are the result of a NEMA submitted proposal. That proposal expanded Table 4 so that it provided fill percentages and raceway diameters for each trade size of each of the circular raceway types. The previous Table 4 only provided for a single diameter and raceway fill percentages for each raceway trade size.

This comment was generated to correct errors in the fill percentage numbers for the raceways. There was no information provided to indicate why the numbers in the existing Table 4 are wrong. What makes the numbers in the proposed Table 4 more correct than those in the existing Table 4?

The panel was not provided any math to indicate how the calculations were determined. For example, was pi used as 3.141 or 3.142? How many places to the right of decimal were used? What method was used to round up or round down, if any? Were the methods utilized the same as those utilized by NEMA for the original proposal? If the method used was not the same as that used by NEMA then the numbers in Appendix C may be compromised and the numbers being changed in Table 4 may not reflect the original intent.

There was no correlation made with the proposed changes to the 40 percent column and Appendix C. For example, the maximum number of number 14 THHN conductors permitted in 2-inch Type A LFNC using the current Table 4 40 percent fill and as found in Table C6 of Appendix C is 137. The comment would permit 138 such conductors. It is important that a comparison be made to maintain the correctness of Appendix C. Although this is a very small change, the panel should not knowingly create incorrect code.

ROWE: The information contained in the current NEC, (NFPA 70-1999) is the product of a Joint Task Group effort, which combined members from Code-Making Panel 6 and Code-Making Panel 8. I am not aware of the method that Task Group used to calculate the information contained in the 1999 NEC, nor, am I fully understanding of the method used to prepare the calculations proposed to be included in the 2002 NEC, contingent on panel acceptance of this panel generated comment, (8-98a).

I believe it is a mistake to further amend this section the NEC until there is a full understanding and acceptance of the method and resultant calculations advocated by this comment.
COMMENT ON AFFIRMATIVE:

BERMAN: Discussion of Chapter 9, Table 4 and Appendix C has resulted in some confusion regarding the source and accuracy of the information on raceway internal diameters and wire fills. To examine these values and also to help maintain consistency in performing wire fill calculations, it is recommended that a Task Group be convened.

DAUBERGER: There seems to be some confusion regarding the wire fill information that was provided. Rather than include information that may not be accurate, I agree with the recommendation of convening a Task Group to review this information before we include it in the Code.

LOYD: I believe the technical committee was remiss in not clarifying the method used to determine that this new table contained errors, and to explain how many decimals were used in developing the corrected tables. Annex C was not reviewed for corrections. I would suggest that a Task Group of Code-Making Panel 8 members be formed to complete this work prior to the 2005 NEC development.

(Log #1710)

8- 99 - (Chapter 9 Table 4): Accept in Principle
SUBMITTER: Robert White, E Lansing, MI
COMMENT ON PROPOSAL NO: 8-456
RECOMMENDATION: Revise text as follows:

Add 60 percent column to Table 4 in Chapter 9, to aid in determining conduit fill for nipples. Values are included on the following revised Table 4 on pages 693 through 696:
SUBSTANTIATION: Nipples are frequently used in the field and there needs to be a quick, convenient way to determine maximum fill.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Comment 8-98a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NEGATIVE: 2

See Articles on the following 6 pages
(LOG #CC801)

Article 348 -- Electrical Metallic Tubing (EMT)

Metric Designator	Trade Size	Internal Diameter		Total Area 100%		2 Wires 31%		Over 2 Wires 40%		1 Wire 53%		60%	
		mm	in.	mm^2	$in.^2$	mm^2	$in.^2$	mm^2	$in.^2$	mm^2	$in.^2$	mm^2	$in.^2$
16	1/2	15.8	0.622	196	0.304	61	0.094	78	0.122	104	0.161	118	0.182
21	3/4	20.9	0.824	343	0.533	106	0.165	137	0.213	182	0.283	206	0.320
27	1	26.6	1.049	556	0.864	172	0.268	222	0.346	295	0.458	333	0.519
35	1-1/4	35.1	1.380	968	1.496	300	0.464	387	0.598	513	0.793	581	0.897
41	1-1/2	40.9	1.610	1314	2.036	407	0.631	526	0.814	696	1.079	788	1.221
53	2	52.5	2.067	2165	3.356	671	1.040	866	1.342	1147	1.778	1299	2.013
63	2-1/2	69.4	2.731	3783	5.858	1173	1.816	1513	2.343	2005	3.105	2270	3.515
78	3	85.2	3.356	5701	8.846	1767	2.742	2280	3.538	3022	4.688	3421	5.307
91	3-1/2	97.4	3.834	7451	11.545	2310	3.579	2980	4.618	3949	6.119	4471	6.927
103	4	110.1	4.334	9521	14.753	2951	4.573	3808	5.901	5046	7.819	5712	8.852

Article 331 -- Electrical Nonmetallic Tubing (ENT)

Metric Designator	Trade Size	Internal Diameter		Total Area 100%		2 Wires 31%		Over 2 Wires 40%		1 Wire 53%		60%	
		mm	in.	mm^2	$in.^2$	mm^2	$in.^2$	mm^2	$in.^2$	mm^2	$in.^2$	mm^2	$in.^2$
16	1/2	14.2	0.560	158	0.246	49	0.076	63	0.099	84	0.131	95	0.148
21	3/4	19.3	0.760	293	0.454	91	0.141	117	0.181	155	0.240	176	0.272
27	1	25.4	1.000	507	0.785	157	0.243	203	0.314	269	0.416	304	0.471
35	1-1/4	34.0	1.340	908	1.410	281	0.437	363	0.564	481	0.747	545	0.846
41	1-1/2	39.9	1.570	1250	1.936	388	0.600	500	0.774	663	1.026	750	1.162
53	2	51.3	2.020	2067	3.205	641	0.993	827	1.282	1095	1.699	1240	1.923
63	2-1/2												
78	3												
91	3-1/2												

Article 350 -- Flexible Metal Conduit (FMC)

Metric Designator	Trade Size	Internal Diameter		Total Area 100%		2 Wires 31%		Over 2 Wires 40%		1 Wire 53%		60%	
		mm	in.	mm^2	$in.^2$	mm^2	$in.^2$	mm^2	$in.^2$	mm^2	$in.^2$	mm^2	$in.^2$
12	3/8	9.7	0.384	74	0.116	23	0.036	30	0.046	39	0.061	44	0.069
16	1/2	16.1	0.635	204	0.317	63	0.098	81	0.127	108	0.168	122	0.190
21	3/4	20.9	0.824	343	0.533	106	0.165	137	0.213	182	0.283	206	0.320
27	1	25.9	1.020	527	0.817	163	0.253	211	0.327	279	0.433	316	0.490
35	1-1/4	32.4	1.275	824	1.277	256	0.396	330	0.511	437	0.677	495	0.766
41	1-1/2	39.1	1.538	1201	1.858	372	0.576	480	0.743	636	0.985	720	1.115
53	2	51.8	2.040	2107	3.269	653	1.013	843	1.307	1117	1.732	1264	1.961
63	2-1/2	63.5	2.500	3167	4.909	982	1.522	1267	1.963	1678	2.602	1900	2.945
78	3	76.2	3.000	4560	7.069	1414	2.191	1824	2.827	2417	3.746	2736	4.241
91	3-1/2	88.9	3.500	6207	9.621	1924	2.983	2483	3.848	3290	5.099	3724	5.773
103	4	101.6	4.000	8107	12.566	2513	3.896	3243	5.027	4297	6.660	4864	7.540

Article 345 -- Intermediate Metal Conduit (IMC)

Metric Designator	Trade Size	Internal Diameter		Total Area 100%		2 Wires 31%		Over 2 Wires 40%		1 Wire 53%		60%	
		mm	in.	mm^2	$in.^2$	mm^2	$in.^2$	mm^2	$in.^2$	mm^2	$in.^2$	mm^2	$in.^2$
12	3/8												
16	1/2	16.8	0.660	222	0.342	69	0.106	89	0.137	117	0.181	133	0.205
21	3/4	21.9	0.864	377	0.586	117	0.182	151	0.235	200	0.311	226	0.352
27	1	28.1	1.105	620	0.959	192	0.297	248	0.384	329	0.508	372	0.575
35	1-1/4	36.8	1.448	1064	1.647	330	0.510	425	0.659	564	0.873	638	0.988
41	1-1/2	42.7	1.683	1432	2.225	444	0.690	573	0.890	759	1.179	859	1.335
53	2	54.6	2.150	2341	3.630	726	1.125	937	1.452	1241	1.924	1405	2.178
63	2-1/2	64.9	2.557	3308	5.135	1026	1.592	1323	2.054	1753	2.722	1985	3.081
78	3	80.7	3.176	5115	7.922	1586	2.456	2046	3.169	2711	4.199	3069	4.753
91	3-1/2	93.2	3.671	6822	10.584	2115	3.281	2729	4.234	3616	5.610	4093	6.351
103	4	105.4	4.166	8725	13.631	2705	4.226	3490	5.452	4624	7.224	5235	8.179

Article 3YY -- Liquidtight Flexible Nonmetallic Conduit (LFNC-B)

Metric Designator	Trade Size	Internal Diameter		Total Area 100%		2 Wires 31%		Over 2 Wires 40%		1 Wire 53%		60%	
		mm	in.	mm^2	$in.^2$	mm^2	$in.^2$	mm^2	$in.^2$	mm^2	$in.^2$	mm^2	$in.^2$
12	3/8	12.5	0.494	123	0.192	38	0.059	49	0.077	65	0.102	74	0.115
16	1/2	16.1	0.632	204	0.314	63	0.097	81	0.125	108	0.166	122	0.188
21	3/4	21.1	0.830	350	0.541	108	0.168	140	0.216	185	0.287	210	0.325
27	1	26.8	1.054	564	0.873	175	0.270	226	0.349	299	0.462	338	0.524
35	1-1/4	35.4	1.395	984	1.528	305	0.474	394	0.611	522	0.810	591	0.917
41	1-1/2	40.3	1.588	1276	1.981	395	0.614	510	0.792	676	1.050	765	1.188
53	2	51.6	2.033	2091	3.246	648	1.006	836	1.298	1108	1.720	1255	1.948

Article 3YY-- Liquidtight Flexible Nonmetallic Conduit (LFNC-A)

Metric Designator	Trade Size	Internal Diameter		Total Area 100%		2 Wires 31%		Over 2 Wires 40%		1 Wire 53%		60%	
		mm	in.	mm^2	$in.^2$	mm^2	$in.^2$	mm^2	$in.^2$	mm^2	$in.^2$	mm^2	$in.^2$
12	3/8	12.6	0.495	125	0.192	39	0.060	50	0.077	66	0.102	75	0.115
16	1/2	16.0	0.630	201	0.312	62	0.097	80	0.125	107	0.165	121	0.187
21	3/4	21.0	0.825	346	0.535	107	0.166	139	0.214	184	0.283	208	0.321
27	1	26.5	1.043	552	0.854	171	0.265	221	0.342	292	0.453	331	0.513
35	1-1/4	35.1	1.383	968	1.502	300	0.466	387	0.601	513	0.796	581	0.901
41	1-1/2	40.7	1.603	1301	2.018	403	0.626	520	0.807	690	1.070	781	1.211
53	2	52.4	2.063	2157	3.343	669	1.036	863	1.337	1143	1.772	1294	2.006

Article 3XX -- Liquidtight Flexible Metal Conduit (LFMC)

Metric Designator	Trade Size	Internal Diameter		Total Area 100%		2 Wires 31%		Over 2 Wires 40%		1 Wire 53%		60%	
		mm	in.	mm^2	$in.^2$	mm^2	$in.^2$	mm^2	$in.^2$	mm^2	$in.^2$	mm^2	$in.^2$
12	3/8	12.5	0.494	123	0.192	38	0.059	49	0.077	65	0.102	74	0.115
16	1/2	16.1	0.632	204	0.314	63	0.097	81	0.125	108	0.166	122	0.188
21	3/4	21.1	0.830	350	0.541	108	0.168	140	0.216	185	0.287	210	0.325
27	1	26.8	1.054	564	0.873	175	0.270	226	0.349	299	0.462	338	0.524
35	1-1/4	35.4	1.395	984	1.528	305	0.474	394	0.611	522	0.810	591	0.917
41	1-1/2	40.3	1.588	1276	1.981	395	0.614	510	0.792	676	1.050	765	1.188
53	2	51.6	2.033	2091	3.246	648	1.006	836	1.298	1108	1.720	1255	1.948
63	2-1/2	63.3	2.493	3147	4.881	976	1.513	1259	1.953	1668	2.587	1888	2.929
78	3	78.4	3.085	4827	7.475	1497	2.317	1931	2.990	2559	3.962	2896	4.485
91	3-1/2	89.4	3.520	6277	9.731	1946	3.017	2511	3.893	3327	5.158	3766	5.839
103	4	102.1	4.020	8187	12.692	2538	3.935	3275	5.077	4339	6.727	4912	7.615
129	5												
155	6												

Article 346 -- Rigid Metal Conduit (RMC)

Metric Designator	Trade Size	Internal Diameter		Total Area 100%		2 Wires 31%		Over 2 Wires 40%		1 Wire 53%		60%	
		mm	in.	mm^2	$in.^2$	mm^2	$in.^2$	mm^2	$in.^2$	mm^2	$in.^2$	mm^2	$in.^2$
12	3/8												
16	1/2	16.1	0.632	204	0.314	63	0.097	81	0.125	108	0.166	122	0.188
21	3/4	21.2	0.836	353	0.549	109	0.170	141	0.220	187	0.291	212	0.329
27	1	27.0	1.063	573	0.887	177	0.275	229	0.355	303	0.470	344	0.532
35	1-1/4	35.4	1.394	984	1.526	305	0.473	394	0.610	522	0.809	591	0.916
41	1-1/2	41.2	1.624	1333	2.071	413	0.642	533	0.829	707	1.098	800	1.243
53	2	52.9	2.083	2198	3.408	681	1.056	879	1.363	1165	1.806	1319	2.045
63	2-1/2	63.2	2.489	3137	4.866	972	1.508	1255	1.946	1663	2.579	1882	2.919
78	3	78.5	3.090	4840	7.499	1500	2.325	1936	3.000	2565	3.974	2904	4.499
91	3-1/2	90.7	3.570	6461	10.010	2003	3.103	2584	4.004	3424	5.305	3877	6.006
103	4	102.9	4.050	8316	12.882	2578	3.994	3326	5.153	4408	6.828	4990	7.729
129	5	128.9	5.073	13050	20.212	4045	6.266	5220	8.085	6916	10.713	7830	12.127
155	6	154.8	6.093	18821	29.158	5834	9.039	7528	11.663	9975	15.454	11292	17.495

Article 347 -- Rigid PVC Conduit (RNC), Schedule 80

Metric Designator	Trade Size	Internal Diameter		Total Area 100%		2 Wires 31%		Over 2 Wires 40%		1 Wire 53%		60%	
		mm	in.	mm^2	$in.^2$	mm^2	$in.^2$	mm^2	$in.^2$	mm^2	$in.^2$	mm^2	$in.^2$
12	3/8												
16	1/2	13.4	0.526	141	0.217	44	0.067	56	0.087	75	0.115	85	0.130
21	3/4	18.3	0.722	263	0.409	82	0.127	105	0.164	139	0.217	158	0.246
27	1	23.8	0.936	445	0.688	138	0.213	178	0.275	236	0.365	267	0.413
35	1-1/4	31.9	1.255	799	1.237	248	0.383	320	0.495	424	0.656	480	0.742
41	1-1/2	37.5	1.476	1104	1.711	342	0.530	442	0.684	585	0.907	663	1.027
53	2	48.6	1.913	1855	2.874	575	0.891	742	1.150	983	1.523	1113	1.725
63	2-1/2	58.2	2.290	2660	4.119	825	1.277	1064	1.647	1410	2.183	1596	2.471
78	3	72.7	2.864	4151	6.442	1287	1.997	1660	2.577	2200	3.414	2491	3.865
91	3-1/2	84.5	3.326	5608	8.688	1738	2.693	2243	3.475	2972	4.605	3365	5.213
103	4	96.2	3.786	7268	11.258	2253	3.490	2907	4.503	3852	5.967	4361	6.755
129	5	121.1	4.768	11518	17.855	3571	5.535	4607	7.142	6105	9.463	6911	10.713
155	6	145.0	5.709	16513	25.598	5119	7.935	6605	10.239	8752	13.567	9908	15.359

Article 347- Rigid PVC Conduit (RNC), Schedule 40, and HDPE Conduit

Metric Designator	Trade Size	Internal Diameter		Total Area 100%		2 Wires 31%		Over 2 Wires 40%		1 Wire 53%		60%	
		mm	in.	mm^2	$in.^2$	mm^2	$in.^2$	mm^2	$in.^2$	mm^2	$in.^2$	mm^2	$in.^2$
12	3/8												
16	1/2	15.3	0.602	184	0.285	57	0.088	74	0.114	97	0.151	110	0.171
21	3/4	20.4	0.804	327	0.508	101	0.157	131	0.203	173	0.269	196	0.305
27	1	26.1	1.029	535	0.832	166	0.258	214	0.333	284	0.441	321	0.499
35	1-1/4	34.5	1.360	935	1.453	290	0.450	374	0.581	495	0.770	561	0.872
41	1-1/2	40.4	1.590	1282	1.986	397	0.616	513	0.794	679	1.052	769	1.191
53	2	52.0	2.047	2124	3.291	658	1.020	849	1.316	1126	1.744	1274	1.975
63	2-1/2	62.1	2.445	3029	4.695	939	1.455	1212	1.878	1605	2.488	1817	2.817
78	3	77.3	3.042	4693	7.268	1455	2.253	1877	2.907	2487	3.852	2816	4.361
91	3-1/2	89.4	3.521	6277	9.737	1946	3.018	2511	3.895	3327	5.161	3766	5.842
103	4	101.5	3.998	8091	12.554	2508	3.892	3237	5.022	4288	6.654	4855	7.532
129	5	127.4	5.016	12748	19.761	3952	6.126	5099	7.904	6756	10.473	7649	11.856
155	6	153.2	6.031	18433	28.567	5714	8.856	7373	11.427	9770	15.141	11060	17.140

Article 347 -- Type A, Rigid PVC Conduit (RNC)

Metric Designator	Trade Size	Internal Diameter		Total Area 100%		2 Wires 31%		Over 2 Wires 40%		1 Wire 53%		60%	
		mm	in.	mm^2	$in.^2$	mm^2	$in.^2$	mm^2	$in.^2$	mm^2	$in.^2$	mm^2	$in.^2$
16	1/2	17.8	0.700	249	0.385	77	0.119	100	0.154	132	0.204	149	0.231
21	3/4	23.1	0.910	419	0.650	130	0.202	168	0.260	222	0.345	251	0.390
27	1	29.8	1.175	697	1.084	216	0.336	279	0.434	370	0.575	418	0.651
35	1-1/4	38.1	1.500	1140	1.767	353	0.548	456	0.707	604	0.937	684	1.060
41	1-1/2	43.7	1.720	1500	2.324	465	0.720	600	0.929	795	1.231	900	1.394
53	2	54.7	2.155	2350	3.647	728	1.131	940	1.459	1245	1.933	1410	2.188
63	2-1/2	66.9	2.635	3515	5.453	1090	1.690	1406	2.181	1863	2.890	2109	3.272
78	3	82.0	3.230	5281	8.194	1637	2.540	2112	3.278	2799	4.343	3169	4.916
91	3-1/2	93.7	3.690	6896	10.694	2138	3.315	2758	4.278	3655	5.668	4137	6.416
103	4	106.2	4.180	8858	13.723	2746	4.254	3543	5.489	4695	7.273	5315	8.234
129	5												
155	6												

Article 347 -- Type EB, PVC Conduit (RNC)

Metric Designator	Trade Size	Internal Diameter		Total Area 100%		2 Wires 31%		Over 2 Wires 40%		1 Wire 53%		60%	
		mm	in.	mm^2	$in.^2$	mm^2	$in.^2$	mm^2	$in.^2$	mm^2	$in.^2$	mm^2	$in.^2$
16	1/2												
21	3/4												
27	1												
35	1-1/4												
41	1-1/2												
53	2	56.4	2.221	2498	3.874	774	1.201	999	1.550	1324	2.053	1499	2.325
63	2-1/2												
78	3	84.6	3.330	5621	8.709	1743	2.700	2248	3.484	2979	4.616	3373	5.226
91	3-1/2	96.6	3.804	7329	11.365	2272	3.523	2932	4.546	3884	6.023	4397	6.819
103	4	108.9	4.289	9314	14.448	2887	4.479	3726	5.779	4937	7.657	5589	8.669
129	5	135.0	5.316	14314	22.195	4437	6.881	5726	8.878	7586	11.763	8588	13.317
155	6	160.9	6.336	20333	31.530	6303	9.774	8133	12.612	10776	16.711	12200	18.918

Table 4. Dimensions and Percent Area of Conduit and Tubing (Areas of Conduit or Tubing for the Combinations of Wires Permitted in Table 1, (Chapter 9) (ROP 8-453, 8-457)

Article 348 — Electrical Metallic Tubing (EMT)

Metric Designator	Trade Size	Internal Diameter		Total Area 100%		2 Wires 31%		Over 2 Wires 40%		1 Wire 53%		Total Area 60%	
		(mm)	(in.)	(mm^2)	($in.^2$)	(mm^2)	($in.^2$)	(mm^2)	($in.^2$)	(mm^2)	($in.^2$)	(mm^2)	($in.^2$)
16	1/2	15.8	0.622	196	0.304	61	0.094	79	0.122	104	0.161	118	.182
21	3/4	20.9	0.824	344	0.533	106	0.165	137	0.213	183	0.283	206	.320
27	1	26.6	1.049	557	0.864	173	0.268	223	0.346	295	0.458	334	.518
35	1 1/4	35.1	1.380	965	1.496	299	0.464	386	0.598	512	0.793	579	.898
41	1 1/2	40.9	1.610	1314	2.036	407	0.631	525	0.814	696	1.079	788	1.222
53	2	52.5	2.067	2165	3.356	671	1.040	866	1.342	1147	1.778	1299	2.014
63	2 1/2	69.4	2.731	3779	5.858	1172	1.816	1512	2.343	2003	3.105	2267	3.515
78	3	85.2	3.356	5707	8.846	1769	2.742	2283	3.538	3025	4.688	3424	5.308
91	3 1/2	97.4	3.834	7448	11.545	2309	3.579	2979	4.618	3948	6.119	4469	6.927
103	4	110.1	4.334	9518	14.753	2950	4.573	3807	5.901	5045	7.819	5711	8.852

Article 331 — Electrical Nonmetallic Tubing (ENT)

Metric Designator	Trade Size	Internal Diameter		Total Area 100%		2 Wires 31%		Over 2 Wires 40%		1 Wire 53%		Total Area 60%	
		(mm)	(in.)	(mm^2)	($in.^2$)	(mm^2)	($in.^2$)	(mm^2)	($in.^2$)	(mm^2)	($in.^2$)	(mm^2)	($in.^2$)
16	1/2	14.2	0.560	159	0.246	49	0.076	64	0.099	85	0.131	95	.148
21	3/4	19.3	0.760	293	0.454	91	0.141	117	0.181	155	0.240	176	.272
27	1	25.4	1.000	506	0.785	157	0.243	203	0.314	268	0.416	304	.471
35	1 1/4	34.0	1.340	910	1.410	282	0.437	364	0.564	482	0.747	546	.846
41	1 1/2	39.9	1.570	1249	1.936	387	0.600	499	0.774	662	1.026	749	1.162
53	2	51.3	2.020	2068	3.205	641	0.994	827	1.282	1096	1.699	1241	1.923
63	2 1/2	—	—	—	—	—	—	—	—	—	—	—	—
78	3	—	—	—	—	—	—	—	—	—	—	—	—
91	3 1/2	—	—	—	—	—	—	—	—	—	—	—	—

Article 350 —Flexible Metal Conduit (FMT)

Metric Designator	Trade Size	Internal Diameter		Total Area 100%		2 Wires 31%		Over 2 Wires 40%		1 Wire 53%		Total Area 60%	
		(mm)	(in.)	(mm^2)	($in.^2$)	(mm^2)	($in.^2$)	(mm^2)	($in.^2$)	(mm^2)	($in.^2$)	(mm^2)	($in.^2$)
12	3/8	9.7	0.384	75	0.116	23	0.036	30	0.046	39	0.061	45	.070
16	1/2	16.1	0.635	205	0.317	63	0.098	82	0.127	108	0.168	123	.190
21	3/4	20.9	0.824	344	0.533	106	0.165	137	0.213	182	0.282	206	.320
27	1	25.9	1.020	527	0.817	163	0.253	211	0.327	279	0.433	316	.490
35	1 1/4	32.4	1.275	824	1.277	255	0.396	330	0.511	437	0.677	494	.766
41	1 1/2	39.1	1.538	1198	1.857	372	0.576	479	0.743	635	0.984	719	1.114
53	2	51.8	2.040	2109	3.269	654	1.013	843	1.307	1117	1.732	1265	1.961
63	2 1/2	63.5	2.500	3167	4.909	982	1.522	1267	1.964	1679	2.602	1900	2.945
78	3	76.2	3.000	4561	7.069	1414	2.191	1824	2.827	2417	3.746	2737	4.241
91	3 1/2	88.9	3.500	6207	9.621	1925	2.983	2483	3.848	3290	5.099	3724	5.773
103	4	101.6	4.000	8107	12.566	2514	3.896	3243	5.027	4297	6.660	4864	7.540

Article 345 — Intermediate Metal Conduit (IMC)

Metric Designator	Trade Size	Internal Diameter		Total Area 100%		2 Wires 31%		Over 2 Wires 40%		1 Wire 53%		Total Area 60%	
		(mm)	(in.)	(mm²)	(in.²)	(mm²)	(in.²)	(mm²)	(in.²)	(mm²)	(in.²)	(mm²)	(in.²)
12	3/8	—	—	—	—	—	—	—	—	—	—	—	—
16	1/2	16.8	0.660	221	0.342	68.4	0.106	88	0.137	117	0.181	133	.205
21	3/4	21.9	0.864	378	0.586	117	0.182	152	0.235	201	0.311	227	.352
27	1	28.1	1.105	619	0.959	192	0.297	248	0.384	328	0.508	371	.575
35	1 1/4	36.8	1.448	1062	1.646	329	0.510	425	0.658	563	0.827	637	.988
41	1 1/2	42.7	1.683	1434	2.223	445	0.689	574	0.889	760	1.178	860	1.334
53	2	54.6	2.150	2341	3.629	726	1.125	937	1.452	1241	1.923	1405	2.177
63	2 1/2	64.9	2.557	3313	5.135	1027	1.592	1325	2.054	1756	2.722	1988	3.081
78	3	80.7	3.176	5111	7.922	1585	2.456	2045	3.169	2709	4.199	3069	4.753
91	3 1/2	93.2	3.671	6828	10.584	2117	3.281	2732	4.234	3619	5.610	4097	6.350
103	4	105.4	4.166	8794	13.631	2726	4.226	3517	5.452	4661	7.224	5276	8.179

Article 3YY —Liquidtight Flexible Nonmetallic Conduit (LFNC-B*)

Metric Designator	Trade Size	Internal Diameter		Total Area 100%		2 Wires 31%		Over 2 Wires 40%		1 Wire 53%		Total Area 60%	
		(mm)	(in.)	(mm²)	(in.²)	(mm²)	(in.²)	(mm²)	(in.²)	(mm²)	(in.²)	(mm²)	(in.²)
12	3/8	12.5	0.494	124	0.192	38	0.059	50	0.077	66	0.102	74	.115
16	1/2	16.1	0.632	203	0.314	63	0.097	81	0.125	107	0.166	122	.188
21	3/4	21.1	0.830	349	0.541	108	0.168	139	0.216	185	0.287	209	.325
27	1	26.8	1.054	563	0.872	174	0.270	225	0.349	298	0.462	338	.523
35	1 1/4	35.4	1.395	986	1.528	306	0.474	394	0.611	523	0.810	592	.917
41	1 1/2	40.3	1.588	1277	1.979	396	0.614	511	0.792	677	1.049	766	1.189
53	2	51.6	2.033	2094	3.245	649	1.006	837	1.298	1110	1.720	1256	1.947

*Corresponds to Section 3YY.2(B)

Article 3YY — Liquidtight Flexible Nonmetallic Conduit (LFNC-A*)

Metric Designator	Trade Size	Internal Diameter		Total Area 100%		2 Wires 31%		Over 2 Wires 40%		1 Wire 53%		Total Area 60%	
		(mm)	(in.)	(mm²)	(in.²)	(mm²)	(in.²)	(mm²)	(in.²)	(mm²)	(in.²)	(mm²)	(in.²)
12	3/8	12.6	0.495	124	0.192	39	0.060	50	0.077	66	0.102	74	.115
16	1/2	16.0	0.630	201	0.312	63	0.097	81	0.125	106	0.165	121	.187
21	3/4	21.0	0.825	345	0.535	107	0.166	138	0.214	183	0.283	207	.321
27	1	26.5	1.043	551	0.854	171	0.265	220	0.341	292	0.452	331	.512
35	1 1/4	35.1	1.383	968	1.501	300	0.465	387	0.600	514	0.796	581	.901
41	1 1/2	40.7	1.603	1301	2.017	403	0.625	521	0.807	690	1.069	781	1.210
53	2	52.4	2.063	2155	3.341	668	1.036	862	1.336	1143	1.771	1293	2.005

*Corresponds to Section 3YY.2(A)

Article 3XX — Liquidtight Flexible Metal Conduit (LFMC)

Metric Designator	Trade Size	Internal Diameter		Total Area 100%		2 Wires 31%		Over 2 Wires 40%		1 Wire 53%		Total Area 60%	
		(mm)	(in.)	(mm²)	(in.²)	(mm²)	(in.²)	(mm²)	(in.²)	(mm²)	(in.²)	(mm²)	(in.²)
12	3/8	12.5	0.494	124	0.192	38	0.059	50	0.077	66	0.102	74	.115
16	1/2	16.1	0.632	203	0.314	63	0.097	81	0.125	107	0.166	122	.182
21	3/4	21.1	0.830	349	0.541	108	0.168	139	0.216	185	0.287	209	.325
27	1	26.8	1.054	563	0.872	174	0.270	225	0.349	298	0.462	338	.523
35	1 1/4	35.4	1.395	986	1.528	306	0.474	394	0.611	523	0.810	592	.917
41	1 1/2	40.3	1.588	1277	1.979	396	0.614	511	0.792	677	1.049	766	1.187
53	2	51.6	2.033	2094	3.245	649	1.006	837	1.298	1110	1.720	1256	1.947
63	2 1/2	63.3	2.493	3148	4.879	976	1.513	1259	1.952	1668	2.586	1889	2.927
78	3	78.4	3.085	4823	7.475	1495	2.317	1929	2.990	2556	3.962	2894	4.485
91	3 1/2	89.4	3.520	6278	9.731	1946	3.017	2512	3.893	3328	5.158	3767	5.839
103	4	102.1	4.020	8188	12.692	2539	3.935	3275	5.077	4340	6.727	4913	7.615
129	5	—	—	—	—	—	—	—	—	—	—	—	—
155	6	—	—	—	—	—	—	—	—	—	—	—	—

Article 346 — Rigid Metal Tubing (RMC)

Metric Designator	Trade Size	Internal Diameter		Total Area 100%		2 Wires 31%		Over 2 Wires 40%		1 Wire 53%		Total Area 60%	
		(mm)	(in.)	(mm²)	(in.²)	(mm²)	(in.²)	(mm²)	(in.²)	(mm²)	(in.²)	(mm²)	(in.²)
12	3/8	—	—	—	—	—	—	—	—	—	—	—	—
16	1/2	16.1	0.632	203	0.314	63	0.097	81	0.125	108	0.166	122	.188
21	3/4	21.2	0.836	354	0.549	110	0.170	142	0.220	188	0.291	212	.329
27	1	27.0	1.063	573	0.888	177	0.275	229	0.355	303	0.470	344	.533
35	1 1/4	35.4	1.394	985	1.526	305	0.473	394	0.610	522	0.809	591	.916
41	1 1/2	41.2	1.624	1336	2.071	414	0.642	535	0.829	708	1.098	802	1.243
53	2	52.9	2.083	2199	3.408	681	1.056	879	1.363	1165	1.806	1319	2.045
63	2 1/2	63.2	2.489	3139	4.866	973	1.508	1255	1.946	1664	2.579	1883	2.920
78	3	78.5	3.090	4838	7.499	1500	2.325	1935	3.000	2565	3.975	2903	4.499
91	3 1/2	90.7	3.570	6458	10.010	2002	3.103	2583	4.004	3426	5.305	3875	6.006
103	4	102.9	4.050	8312	12.883	2577	3.994	3325	5.153	4405	6.828	4987	7.730
129	5	128.9	5.073	13041	20.213	4043	6.266	5216	8.085	6912	10.713	7825	12.128
155	6	154.8	6.093	18812	29.158	5832	9.039	7525	11.663	9970	15.454	11287	17.495

Article 347 — Rigid PVC Conduit (RNC), Schedule 80

Metric Designator	Trade Size	Internal Diameter		Total Area 100%		2 Wires 31%		Over 2 Wires 40%		1 Wire 53%		Total Area 60%	
		(mm)	(in.)	(mm²)	(in.²)	(mm²)	(in.²)	(mm²)	(in.²)	(mm²)	(in.²)	(mm²)	(in.²)
12	3/8	—	—	—	—	—	—	—	—	—	—	—	—
16	1/2	13.4	0.526	140	0.217	43	0.067	56	0.087	74	0.115	84	.130
21	3/4	18.3	0.722	264	0.409	82	0.127	106	0.164	140	0.217	158	.245
27	1	23.8	0.936	444	0.688	137	0.213	177	0.275	235	0.365	266	.413
35	1 1/4	31.9	1.255	798	1.237	247	0.383	319	0.495	423	0.656	479	.742
41	1 1/2	37.5	1.476	1104	1.711	342	0.530	441	0.684	585	0.907	662	1.027
53	2	48.6	1.913	1854	2.874	575	0.891	742	1.150	743	1.523	1112	1.724
63	2 1/2	58.2	2.290	2657	4.119	824	1.277	1063	1.647	1408	2.183	1594	2.471
78	3	72.7	2.864	4156	6.442	1288	1.997	1663	2.577	2203	3.414	2494	3.865
91	3 1/2	84.5	3.326	5605	8.688	1737	2.693	2242	3.475	2971	4.605	3363	5.213
103	4	96.2	3.786	7263	11.258	2252	3.490	2905	4.503	3850	5.967	4358	6.755
129	5	121.1	4.768	11519	17.855	3751	5.535	4608	7.142	6105	9.463	6911	10.713
155	6	145.0	5.709	16515	25.598	5119	7.935	6606	10.239	8753	13.567	9909	15.35

Article 347 — Rigid PVC Conduit (RNC), Schedule 40, and HDPE Conduit

Metric Designator	Trade Size	Internal Diameter		Total Area 100%		2 Wires 31%		Over 2 Wires 40%		1 Wire 53%		Total Area 60%	
		(mm)	(in.)	(mm²)	(in.²)	(mm²)	(in.²)	(mm²)	(in.²)	(mm²)	(in.²)	(mm²)	(in.²)
12	3/8	—	—	—	—	—	—	—	—	—	—	—	—
16	1/2	15.3	0.602	184	0.285	57	0.088	74	0.114	97	0.151	110	.171
21	3/4	20.4	0.804	328	0.508	101	0.157	131	0.203	174	0.269	197	.305
27	1	26.1	1.029	537	0.832	166	0.258	215	0.333	285	0.441	322	.499
35	1 1/4	34.5	1.360	937	1.453	290	0.450	375	0.581	497	0.770	562	.872
41	1 1/2	40.4	1.590	1281	1.986	397	0.616	512	0.794	679	1.052	769	1.192
53	2	52.0	2.047	2123	3.291	658	1.020	849	1.316	1125	1.744	1274	1.975
63	2 1/2	62.1	2.445	3029	4.695	939	1.455	1212	1.878	1605	2.488	1817	2.817
78	3	77.3	3.042	4689	7.268	1454	2.253	1875	2.907	2485	3.852	2813	4.361
91	3 1/2	89.4	3.521	6282	9.737	1947	3.018	2513	3.895	3330	5.161	3769	5.842
103	4	101.5	3.998	8099	12.554	2511	3.892	3240	5.022	4293	6.654	4859	7.532
129	5	127.4	5.016	12749	19.761	3952	6.126	5099	7.904	6757	10.473	7649	11.851
155	6	153.2	6.031	18430	28.567	5714	8.856	7372	11.427	9768	15.141	11058	17.140

Article 347 — Type A, Rigid

Metric Designator	Trade Size	Internal Diameter (mm)	Internal Diameter (in.)	Total Area 100% (mm^2)	Total Area 100% ($in.^2$)	2 Wires 31% (mm^2)	2 Wires 31% ($in.^2$)	Over 2 Wires 40% (mm^2)	Over 2 Wires 40% ($in.^2$)	1 Wire 53% (mm^2)	1 Wire 53% ($in.^2$)	Total Area 60% (mm^2)	Total Area 60% ($in.^2$)
16	1/2	17.8	0.700	248	0.385	77	0.119	99	0.154	132	0.204	149	.231
21	3/4	23.1	0.910	419	0.650	130	0.202	168	0.260	223	0.345	251	.390
27	1	29.8	1.175	699	1.084	217	0.336	280	0.434	371	0.575	419	.650
35	1 1/4	38.1	1.500	1140	1.767	354	0.548	456	0.707	605	0.937	684	1.060
41	1 1/2	43.7	1.720	1499	2.324	465	0.720	599	0.929	794	1.231	899	1.394
53	2	54.7	2.155	2353	3.647	730	1.131	941	1.459	1247	1.933	1412	2.188
63	2 1/2	66.9	2.635	3518	5.453	1090	1.690	1407	2.181	1865	2.890	2111	3.272
78	3	82.0	3.230	5286	8.194	1639	2.540	2115	3.278	2802	4.343	3172	4.916
91	3 1/2	93.7	3.690	6899	10.694	2139	3.315	2760	4.278	3657	5.668	4139	6.416
103	4	106.2	4.180	8854	13.723	2745	4.254	3541	5.489	4692	7.273	5312	8.234
129	5	—	—	—	—	—	—	—	—	—	—	—	—
155	6	—	—	—	—	—	—	—	—	—	—	—	—

Article 347 — Type EB, PVC Conduit (RNC)

Metric Designator	Trade Size	Internal Diameter (mm)	Internal Diameter (in.)	Total Area 100% (mm^2)	Total Area 100% ($in.^2$)	2 Wires 31% (mm^2)	2 Wires 31% ($in.^2$)	Over 2 Wires 40% (mm^2)	Over 2 Wires 40% ($in.^2$)	1 Wire 53% (mm^2)	1 Wire 53% ($in.^2$)	Total Area 60% (mm^2)	Total Area 60% ($in.^2$)
16	1/2	—	—	—	—	—	—	—	—	—	—	—	—
21	3/4	—	—	—	—	—	—	—	—	—	—	—	—
27	1	—	—	—	—	—	—	—	—	—	—	—	—
35	1 1/4	—	—	—	—	—	—	—	—	—	—	—	—
41	1 1/2	—	—	—	—	—	—	—	—	—	—	—	—
53	2.0	56.4	2.221	2499	3.874	775	1.201	1000	1.550	1325	2.053	1499	2.324
63	2 1/2	—	—	—	—	—	—	—	—	—	—	—	—
78	3	84.6	3.330	5619	8.709	1742	2.700	2248	3.484	2978	4.616	3371	5.225
91	3 1/2	96.6	3.804	7332	11.365	2273	3.523	2933	4.546	3886	6.024	4399	6.819
103	4	108.9	4.289	9321	14.448	2890	4.479	3728	5.779	4940	7.657	5593	8.669
129	5	135.0	5.316	14319	22.195	4439	6.881	5728	8.878	7590	11.764	8591	13.317
155	6	160.9	6.336	20342	31.530	6306	9.774	8137	12.612	10781	16.711	12205	18.918

EXPLANATION OF NEGATIVE:
KENDALL: This comment should be put on "hold". See my explanation of negative vote on Comment 8-98a.
LILLY: The action on this comment should be hold with a recommendation that a task group be appointed to analyze the proposed 60 percent fill numbers to verify their correctness with the method used to determine the original numbers in Table 4. Some of the items that need to be verified include whether pi was utilized as 3.141 or 3.142, how many places to the right of the decimal place were employed, and what method, if any, was used for rounding up or down. This is new material that has not had the benefit of public review.
See my explanation of negative vote on Comment 8-98a.
COMMENT ON AFFIRMATIVE:
DAUBERGER: See my comment on affirmative vote on Comment 8-98a.
ROWE: I believe that this panel action should have been "accept" rather than "accept in principle". This material is an important addition to the NEC and inclusion of this material should not be contingent on the acceptance of panel generated Comment 8-98a.

(Log #1453)

8- 99a - (Chapter 9 Table 5): Accept
SUBMITTER: Richard E. Loyd, Perryville, AR
COMMENT ON PROPOSAL NO: 8-458
RECOMMENDATION: Continue to reject this proposal.
SUBSTANTIATION: I agree with Code-Making Panel 8 substantiation to reject this proposal. No substantiation has been provided while the committee has continued to express concern with this issue. Please reject this proposal.
PANEL ACTION: Accept.
This comment should be forwarded to CMP-8 for action.
PANEL STATEMENT: The comment does not address a proposal within the jurisdiction of CMP-6. See panel action and statement on Comment 6-83.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #1454)

6- 82 - (Chaper 9 Table 5): Accept
Note: The Technical Correlating Committee understands that the panel action is to maintain their original position on Proposal 6-212 and that item 5 of the proposal remains rejected.
SUBMITTER: Richard E. Loyd, Perryville, AR
COMMENT ON PROPOSAL NO: 6-212
RECOMMENDATION: Continue to reject this proposal.
SUBSTANTIATION: The committee has not provided substantiation that the addition of circuits to an individual conduit would not introduce additional heating and introduce a possible fire and life safety hazard. This issue has been discussed for the past three code cycles yet no studies have been presented to show that the addition will not present a problem even though Code-Making Panel 8 has continued to express concern with this issue. Please reject this proposal.
PANEL ACTION: Accept.
PANEL STATEMENT: See panel action and statement on Comment 6-83.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Ferrell

(Log #1558)

6- 83 - (Chapter 9 Table 5): Accept in Part
SUBMITTER: Ravindra H. Ganatra, Alcan Cable
COMMENT ON PROPOSAL NO: 6-212
RECOMMENDATION: This comment is prepared as requested by the Chair of Code-Making Panel (CMP) 6 and in consultation with the Chair of CMP 8 to address the Technical Correlating Committee (TCC) Comment on Proposals 6-212 and 8-458 (identical proposals reviewed by CMP 6 and CMP 8 for their respective jurisdictions).

Recommendation 1: CMP 6 recognizes and agrees with TCC observation that CMP 6 has accepted another proposal (6-202) that deletes Type AF referenced in these two proposals.

Recommendation 2: It is recommended that CMP 8 accept Item 5 of the proposal and reverse its decision.
SUBSTANTIATION: No substantiation is required for Recommendation 1.

Substantiation for Recommendation 2:

CMP 8 Statement provides this reasoning for their action: "By reducing the required insulation thickness for these wire types without changing the designation, there exists a possibility that installers may unknowingly permit the greater wire fill numbers using wire with the heavier insulation thickness. This would result in exceeding the permitted wire fills for the raceway per Chapter 9, Table 1."

In reality, this possibility would not materialize because:

1) The wire with the heavier insulation thickness would result in greater wire fill numbers is academic. This means the existing stock of the wire types THHW and THW in sizes 14-10 AWG and 8 AWG for which the insulation thickness has been reduced by the action taken on Proposal 6-47 for 1999 NEC by CMP 6 is used in an installation with proposed new fill requirement. CMP 6 took this action to harmonize requirements in the NEC with NOM 001 (Mexican Electrical Code). Typically, in the US Type THWN has replaced THW and THHW.

2) It should be noted that this change does not reduce the insulation thickness for the entire range of wire sizes for the types mentioned above. Such change may require additional markings to differentiate the same wire type when multiple insulation thicknesses are recognized for that wire type. However, neither CMP 6 or the NEC process are ready to recognize such performance requirements in the Code at the present time as evident by the actions taken for 1996 and 1999 code cycles. CMP 8 should remain assured that this proposal is not undermining those actions.

3) The suggested possibility may materialize when an existing installation is being reworked. As such, the installer needs to verify the compliance with the Code requirements when modifying an existing installation. Thus, greater wire fill (provided the rework was being carried out using an old stock of aforementioned wire types and sizes) would not materialize.

4) The suggested possibility is not feasible with new installations since the installer would comply with the requirements in the Code. Should the installer happens to use aforementioned wire types and sizes from old stock, then wire fill requirements would be computed using the actual dimensions of the wire since the Code is already reflecting new dimensions based on the action taken by CMP 6 on proposal 6-47 for 1999 NEC.
PANEL ACTION: Accept in Part.
The panel accepts recommendation 1.
The panel rejects recommendation 2.
Forward this comment to CMP-8 for information.
PANEL STATEMENT: The changes in Table 5 of Chapter 9 and in Annex C do not need to be correlated with the changes in Table 310-13 for Type THW and THHW in sizes 14 thru 10 AWG. The present dimensions of Table 5 of Chapter 9 and conduit fill data in Annex C are conservative and will not compromise safety. The recommendation to change these requirements can be addressed in future editions of the Code.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Ferrell

(Log #1558a)

8- 100 - (Chapter 9 Table 5): Accept in Principle in Part
SUBMITTER: Ravindra H. Ganatra, Alcan Cable
COMMENT ON PROPOSAL NO: 8-458
RECOMMENDATION: This comment is prepared as requested by the Chair of Code-Making Panel (CMP) 6 and in consultation with the Chair of CMP 8 to address the Technical Correlating Committee (TCC) Comment on Proposals 6-212 and 8-458 (identical proposals reviewed by CMP 6 and CMP 8 for their respective jurisdictions).

Recommendation 1: CMP 6 recognizes and agrees with TCC observation that CMP 6 has accepted another proposal (6-202) that deletes Type AF referenced in these two proposals.

Recommendation 2: It is recommended that CMP 8 accept Item 5 of the proposal and reverse its decision.
SUBSTANTIATION: No substantiation is required for Recommendation 1.

Substantiation for Recommendation 2:

CMP 8 Statement provides this reasoning for their action: "By reducing the required insulation thickness for these wire types without changing the designation, there exists a possibility that installers may unknowingly permit the greater wire fill numbers using wire with the heavier insulation thickness. This would result in exceeding the permitted wire fills for the raceway per Chapter 9, Table 1."

In reality, this possibility would not materialize because:

1) The wire with the heavier insulation thickness would result in greater wire fill numbers is academic. This means the existing stock of the wire types THHW and THW in sizes 14-10 AWG and 8 AWG for which the insulation thickness has been reduced by the action taken on Proposal 6-47 for 1999 NEC by CMP 6 is used in an installation with proposed new fill requirement. CMP 6 took this action to harmonize requirements in the NEC with NOM 001 (Mexican Electrical Code). Typically, in the US Type THWN has replaced THW and THHW.

2) It should be noted that this change does not reduce the insulation thickness for the entire range of wire sizes for the types mentioned above. Such change may require additional markings to differentiate the same wire type when multiple insulation thicknesses are recognized for that wire type. However, neither CMP 6 or the NEC process are ready to recognize such performance requirements in the Code at the present time as evident by the actions taken for 1996 and 1999 code cycles. CMP 8 should remain assured that this proposal is not undermining those actions.

3) The suggested possibility may materialize when an existing installation is being reworked. As such, the installer needs to verify the compliance with the Code requirements when modifying an existing installation. Thus, greater wire fill (provided the rework was being carried out using an old stock of aforementioned wire types and sizes) would not materialize.

4) The suggested possibility is not feasible with new installations since the installer would comply with the requirements in the Code. Should the installer happens to use aforementioned wire types and sizes from old stock, then wire fill requirements would be computed using the actual dimensions of the wire since the Code is already reflecting new dimensions based on the action taken by CMP 6 on proposal 6-47 for 1999 NEC.
PANEL ACTION: Accept in Principle in Part.
PANEL STATEMENT: The panel accepts in principle the recommendation to delete Type AF conductors in those tables and articles under the jurisdiction of CMP-8. See panel action and statement on Comment 8-97.

The panel rejects recommendation 2 in the comment. The panel statement given by Code-Making Panel 8 on Proposal 8-458 clearly states why Proposal 8-458 should continue to be rejected and item 5 of Proposal 6-212 should be rejected. For ease of the reader the part of that statement germane to this substantiation is reproduced here.

"The panel cannot accept the recommendation to revise the tables in Appendix C to increase the wire fills. By reducing the required insulation thickness for these wire types without changing the designation, there exists a possibility that installers may unknowingly permit the greater wire fill numbers using wire with the heavier insulation thickness. This would result in exceeding the permitted wire fills for the raceway per Chapter 9, Table 1. The panel refers this action to Code-Making Panel 6 for information."
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #2336)

6- 84 - (Chapter 9, Table 5): Accept in Part
SUBMITTER: Wayne A. Lilly, Bridgewater, VA
COMMENT ON PROPOSAL NO: 6-212 and 8-458
RECOMMENDATION: Proposal 8-458 should continue to be rejected and item 5 of Proposal 6-212 should be rejected.
SUBSTANTIATION: A task Group consisting of Wayne A. Lilly, Richard Loyd, and Kenneth L. Jannot developed this comment.

The Panel Statement given by Code-Making Panel 8 on Proposal 8-458 clearly states why Proposal 8-458 should continue to be rejected and item 5 of Proposal 6-212 should be rejected. For ease of the reader the part of that statement germane to this substantiation is reproduced here.

"The panel cannot accept the recommendation to revise the tables in Appendix C to increase the wire fills. By reducing the required insulation thickness for these wire types without changing the designation, there exists a possibility that installers may unknowingly permit the greater wire fill numbers using wire with the heavier insulation thickness. This would result in exceeding the permitted wire fills for the raceway per Chapter 9, Table 1. The panel refers this action to Code-Making Panel 6 for information."
PANEL ACTION: Accept in Part.
Panel accepts the recommendation pertaining to Proposal 6-212. Panel cannot act on the recommendation related to Proposal 8-458.
PANEL STATEMENT: See panel action and statement on Comment 6-83.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Ferrell

(Log #2336a)

8- 101 - (Chapter 9, Table 5): Accept
SUBMITTER: Wayne A. Lilly, Bridgewater, VA
COMMENT ON PROPOSAL NO: 6-212 and 8-458
RECOMMENDATION: Proposal 8-458 should continue to be rejected and item 5 of Proposal 6-212 should be rejected.
SUBSTANTIATION: A task Group consisting of Wayne A. Lilly, Richard Loyd, and Kenneth L. Jannot developed this comment.

The Panel Statement given by Code-Making Panel 8 on Proposal 8-458 clearly states why Proposal 8-458 should continue to be rejected and item 5 of Proposal 6-212 should be rejected. For ease of the reader the part of that statement germane to this substantiation is reproduced here.

"The panel cannot accept the recommendation to revise the tables in Appendix C to increase the wire fills. By reducing the required insulation thickness for these wire types without changing the designation, there exists a possibility that installers may unknowingly permit the greater wire fill numbers using wire with the heavier insulation thickness. This would result in exceeding the permitted wire fills for the raceway per Chapter 9, Table 1. The panel refers this action to Code-Making Panel 6 for information."
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14

(Log #466)

16- 405 - (Chapter 9, Table 12 (b)): Accept
SUBMITTER: Technical Correlating Committee on Signaling Systems for the Protection of Life and Property
COMMENT ON PROPOSAL NO: 16-372
RECOMMENDATION: The Technical Correlating Committee on the National Fire Alarm Code recommends that Code Panel 16 continue to reject this proposal.
SUBSTANTIATION: If an existing installation of a fire detection system that has the electrical characteristics described by this portion of Table 12(b) was moved from one location to another location within the same building, the reinstallation of the system might be considered as a new installation. If the permissive requirements of Table 12(b) are eliminated, the authority having jurisdiction might not be able to accept such a reinstallation. A similar problem might exist if an extension were made to an existing installation using spare parts on hand at a facility.
PANEL ACTION: Accept.
PANEL STATEMENT: The panel continues its position to reject Proposal 16-372.

However the panel does not agree with the substantiation provided by the submitter. The National Electrical Code provides requirements for the installation of systems in new construction or modifications to existing construction. As codes change, old requirements may not be retained or they may be replaced by newer "up to date" requirements based upon changes in technology or safety to life.

While the panel continues to reject Proposal 16-372, the continued rejection is independent of the substantiation with which we do not agree.

The submitter's substantiation suggests that if equipment is relocated within the same building it should not be considered new, and therefore the submitter implies that a new "Record of Completion," drawings of record, and all testing requirements of Chapter 7 are not required. Furthermore, implying that additional equipment can be added to an existing fire alarm system without these same requirements, simply because spare parts were on hand, may not be prudent. Spare parts are maintained on hand for maintenance and repair of the existing system, not for expanding the system. At the least, the substantiation implies that the Authority Having Jurisdiction won't know about the addition or relocated use of these detectors and therefore may not inspect them for compliance with local codes.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21

ANNEX A

(Log #1225)

1- 179 - (Annex A): Reject
SUBMITTER: Dann Strube, Lanesville, IN
COMMENT ON PROPOSAL NO: 1-315
RECOMMENDATION: The proposal should have been rejected.
SUBSTANTIATION: This is a companion to my comment on Proposal 1-95.

A list of related UL standards is of no real use for several reasons.

1. The list is not a full list of all UL standards used to evaluate products.
2. Many other standards are used in code enforcement, i.e., NEMA, IEC, ANSI, etc.
3. With no cross-reference from Annex A to specific code sections, the list in Annex A is no less than wasted paper filling the code with useless pages.
4. To satisfy the intent of Annex A we must include the UL White Book, UL Catalog, ANSI catalog and who knows what else.
5. The users of the NEC should be expected to understand that Section 110-3(b) requires or at least implies that compliance with other standards and instruction is required.

PANEL ACTION: Reject.
PANEL STATEMENT: Standards that form the basis for product listing to the requirements of the National Electrical Code represent a distinct and identifiable group of standards. The panel believes that listing these for reference in Annex A improves the usability of the Code. The panel agrees with the submitter's statement that some other types of industry standards and publications are also related to Code enforcement, but disagrees that these include catalogs.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #1251)

1- 180 - (Annex A): Reject
SUBMITTER: Dann Strube, Lanesville, IN
COMMENT ON PROPOSAL NO: 1-80
RECOMMENDATION: Change new Article 80 to Annex XX.

Title new Annex XX Examples of Administrative and Enforcement Methods.

Add a Fine Print Note to Section 90-04 as follows:

FPN: See Annex XX for examples of administrative and enforcement methods.

Renumber the material as needed.
SUBSTANTIATION: Since this material is not part of the enforceable code, it should be in an annex. If a jurisdiction wants to adopt the material it can be adopted from an annex as well as it can from Article 80.

Located in an annex, the new material will cause less confusion than in its present location.

I am aware that the Manual of Style (MOS) Section 2.3.4.3 states that the word "shall" shall not be used in an annex. However, Annex A of the MOS is full of "shall" words. In this case, the section containing the "shall" word is used as an example. If the

new annex is an example, it seems as if it would comply with the intent and style of the MOS.

I do not object to the material and feel that it has real merit. I am not comfortable with its location.

PANEL ACTION: Reject.

PANEL STATEMENT: See panel action on Comment 1-6. The panel intends to retain Article 80 in the front of the NEC and therefore, the FPN following Section 90-4 is unnecessary.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13

VOTE ON PANEL ACTION:

AFFIRMATIVE: 13

(Log #1389)

1- 181 - (Annex A): Reject

SUBMITTER: Kari Barrett, American Chemistry Council

COMMENT ON PROPOSAL NO: 1-315

RECOMMENDATION: The panel should reject the proposal.

SUBSTANTIATION: The proposal is not a complete list of product safety standards and does not address how the list will be controlled as to who will determine future additions to the list.

PANEL ACTION: Reject.

PANEL STATEMENT: No information was submitted to identify those standards described as being omitted from the list. The list will be amended through the NFPA Code-making process. See Comments 1-179 and 1-182 and the associated panel actions.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

NEGATIVE: 1

EXPLANATION OF NEGATIVE:

PRICHARD: The list of product safety standards is not a complete list of product safety standards, but only for those that are utilized for product listing where that listing is required by the code.

(Log #1764)

1- 182 - (Annex A): Accept

SUBMITTER: Jim Pauley, Square D Company

COMMENT ON PROPOSAL NO: 1-315

RECOMMENDATION: Continue to accept the proposal with the following modifications:

1) Accept the revisions to the introductory paragraph as shown in Mr. Stauffer's affirmative comment on vote.

2) In accordance with Mr. Fiske's affirmative comment, add the following standards to the list:

- Nonincendive Electrical Equipment for Use in Class I and II, Division 2 and Class III, Divisions 1 and 2 Hazardous (Classified) Locations —— ISA S12.12

- Electrical Apparatus for Use in Class I, Zone 1 Hazardous (Classified) Locations Type of Protection - Encapsulation "m" ——— ISA S12.23.01

- Electrical Apparatus for Use in Class I, Zones 0 & 1 Hazardous (Classified) Locations: General Requirements ——— ISA 12.0.01

- Electrical Apparatus for Use in Class I, Zone 1 Hazardous (Classified) Locations Type of Protection - Increased Safety "e" ——— ISA S12.16.01

- Electrical Apparatus for Use in Class I, Zone 1 Hazardous (Classified) Locations Type of Protection - Flameproof "d" ———— ISA S12.22.01

- Electrical Apparatus for Use in Class I, Zone 1 Hazardous (Classified) Locations: Type of Protection - Powder Filling "q" ——— ISA S12.25.01

- Electrical Apparatus for Use in Class I, Zone 1 Hazardous (Classified) Locations Type of Protection - Oil-Immersion "O" ——— ISA S12.26.01

SUBSTANTIATION: Acceptance of this proposals remains critical to the integrity of the US Electrical Safety System. Although this is only an informative annex, the information contained in the Annex begins to build the necessary bridge to understanding the interactions between the parts of the system. I continue to see applications where this annex will help address questions that occur relative to the proper use of products in accordance with the NEC.

The recommended revisions are:

1) Editorial in nature via Mr. Stauffer's revisions to the introductor paragraph.

2) Seven additional standards have been added in accordance with Mr. Fiske's recommendation in his affirmative comment. The other standards from his affirmative comment are not recommended at this time because the products covered by those standards are not directly required to be listed by the present NEC rules. The formation of this annex will actually occur over a number of Code cycles. Since this is the first cycle where the annex will be introduced, the objective (as indicated in the original substantiation) was to introduce standards where the NEC had a requirement that the covered products be listed. Mr. Fiske is correct that there are other product standards that can be moved from FPN's to the Annex, but that was not the intent during this first cycle. That task of moving those standards is best undertaken by the Usability Task Group where appropriate proposals can be made to delete the FPN's and move the reference to the Annex. Also, some of the standards in Mr. Fiske are not 1st level product standards. They are standards (such as UL 1581) that are used as a portion of the evaluation, but the primary product standard (such as UL 44 or UL 83) would reference that standard. Again, the initial intent is to keep the list focused on the standard used to provide a listing for the product.

The IEC standard references have not been added because those standards are not used as stand alone documents for the certification and the proper deviations must be included. The ISA or UL standards that are included on the list have the appropriate deviations to the IEC 60079 series of document and are the primary references.

The ANSI designations were not deemed to be necessary for this list. That designation typically relies on a specific date/edition of the standard and that level of specificity was not intended for this list. The designations could certainly be added as he notes, but since the list is informative in nature, it does not increase the usefulness of the list.

PANEL ACTION: Accept.

PANEL STATEMENT: The panel does not necessarily concur with all of the substantiation.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13

VOTE ON PANEL ACTION:

AFFIRMATIVE: 13

(Log #2356)

1- 183 - (Annex A): Accept

SUBMITTER: Alan Manche, Square D Co.

COMMENT ON PROPOSAL NO: 1-315

RECOMMENDATION: The panel should continue to accept this proposal and needs to add the following UL standard to the list.

Transient Voltage Surge Suppressors UL 1449

SUBSTANTIATION: Panel 5 has accepted proposal 5-316 to include a new article on transient voltage surge suppressors. The new article 285 includes a listing requirement and the installation requirements in 285 are tied directly to the product listing requirements in UL 1449.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13

VOTE ON PANEL ACTION:

AFFIRMATIVE: 13

ANNEX B

(Log #66)

8- 102 - (Table B-310-1): Accept

SUBMITTER: Technical Correlating Committee National Electrical Code

COMMENT ON PROPOSAL NO: 6-5

RECOMMENDATION: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panels 8 and 12 for correlation. This action will be considered by Panels 8 and 12 as a Public Comment.

SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.

PANEL ACTION: Accept.

PANEL STATEMENT: The panel confirms that Type RH is not referenced in any of the material under the jurisdiction of CMP-8.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:

AFFIRMATIVE: 14

(Log #66a)

12- 65 - (Table B-310-1): Accept

SUBMITTER: Technical Correlating Committee National Electrical Code

COMMENT ON PROPOSAL NO: 6-5

RECOMMENDATION: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panels 8 and 12 for correlation. This action will be considered by Panels 8 and 12 as a Public Comment.

SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
PANEL STATEMENT: The panel accepts the direction of the Technical Correlating Committee. The panel action on Comment 12-7 has accomplished this correlation.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 9
NOT RETURNED: 2 Kelley, Laney

(Log #67)

6- 85 - (Table B-310-1): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
COMMENT ON PROPOSAL NO: 6-6
RECOMMENDATION: It was the action of the Technical Correlating Committee that this Proposal be reconsidered and correlated with the action on Proposal 6-5. The Technical Correlating Committee directs the Panel to correct the text in 310-15(b) to include the table. The Technical Correlating Committee directs that the Panel clarify the Panel Action of this Proposal relative to Table 310-16. This action will be considered by the Panel as a Public Comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept.
PANEL STATEMENT: See panel action on Comment 6-36.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Ferrell

(Log #952)

6- 86 - (Table B-310-5): Reject
SUBMITTER: John E. Conley, Stratford, CT
COMMENT ON PROPOSAL NO: 6-232
RECOMMENDATION: Accept the proposal.
SUBSTANTIATION: These comments apply, individually, and collectively, to the following proposed actions published in the ROP for the 2002 NEC.
1-101 (100-Ampacity)
6-92 (310-15(c))
6-120 (310-60(d))
6-126 (Table 310-67)
6-127 (Table 310-68)
6-128 (Table 310-69)
6-129 (Table 310-70)
6-130 (Table 310-71)
6-131 (Table 310-72)
6-132 (Table 310-73)
6-133 (Table 310-74)
6-134 (Table 310-75)
6-135 (Table 310-76)
6-136 (Table 310-77)
6-137 (Table 310-78)
6-138 (Table 310-79)
6-139 (Table 310-80)
6-140 (Table 310-81)
6-141 (Table 310-82)
6-142 (Table 310-83)
6-143 (Table 310-84)
6-144 (Table 310-85)
6-145 (Table 310-86)
6-223 (B-310-15(b)(1))
6-226 (Table B-310-1)
6-228 (B-310-15(b)(2))
6-231 (Table B-310-3)
6-232 (Table B-310-5)
6-233 (Table B-310-6)
6-234 (Table B-310-7)
6-235 (Table B-310-8)
6-236 (Table B-310-9)
6-237 (Table B-310-10)
All of these proposals should be accepted.
Individual panel comments seem to fall into three major categories: (1) 'Scientific ampacity' does not appear in the NEC; (2) The present definition is entirely satisfactory; (3) All NEC ampacities are scientific
My comments:
(1) These proposals were inspired by the panel's rejection, three years ago, for this very reason. Proposal 1-101 deals with the definition; the others deal with introducing the term into the text where appropriate.
(2) The present definition is great; very carefully crafted. It is not wrong, but it is inadequate. It applies only for those ampacities based strictly on thermal considerations, such as those in the tables listed above. Other ampacities are based on a multiplicity of factors (see section 310-15(b) FPN) beyond the scope of the existing definition. An objective observer would certainly conclude that the present definition is not entirely satisfactory.
(3) This is a very interesting observation. It can be reasonably stated that everything in the Code is scientific, but that obscures the point that a tremendous amount of judgment often modifies pure science. That is as it should be. In this case, what I have called scientific ampacities are pure science. They are calculated using only recognized scientific principles; nothing judgmental. They spring from the field of technology and computers. Other ampacities come from the field of wisdom, and cannot be calculated scientifically.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Comment 6-43.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Ferrell

(Log #953)

6- 87 - (Table B-310-6): Reject
SUBMITTER: John E. Conley, Stratford, CT
COMMENT ON PROPOSAL NO: 6-233
RECOMMENDATION: Accept the proposal.
SUBSTANTIATION: These comments apply, individually, and collectively, to the following proposed actions published in the ROP for the 2002 NEC.
1-101 (100-Ampacity)
6-92 (310-15(c))
6-120 (310-60(d))
6-126 (Table 310-67)
6-127 (Table 310-68)
6-128 (Table 310-69)
6-129 (Table 310-70)
6-130 (Table 310-71)
6-131 (Table 310-72)
6-132 (Table 310-73)
6-133 (Table 310-74)
6-134 (Table 310-75)
6-135 (Table 310-76)
6-136 (Table 310-77)
6-137 (Table 310-78)
6-138 (Table 310-79)
6-139 (Table 310-80)
6-140 (Table 310-81)
6-141 (Table 310-82)
6-142 (Table 310-83)
6-143 (Table 310-84)
6-144 (Table 310-85)
6-145 (Table 310-86)
6-223 (B-310-15(b)(1))
6-226 (Table B-310-1)
6-228 (B-310-15(b)(2))
6-231 (Table B-310-3)
6-232 (Table B-310-5)
6-233 (Table B-310-6)
6-234 (Table B-310-7)
6-235 (Table B-310-8)
6-236 (Table B-310-9)
6-237 (Table B-310-10)
All of these proposals should be accepted.
Individual panel comments seem to fall into three major categories: (1) 'Scientific ampacity' does not appear in the NEC; (2) The present definition is entirely satisfactory; (3) All NEC ampacities are scientific
My comments:
(1) These proposals were inspired by the panel's rejection, three years ago, for this very reason. Proposal 1-101 deals with the definition; the others deal with introducing the term into the text where appropriate.
(2) The present definition is great; very carefully crafted. It is not wrong, but it is inadequate. It applies only for those ampacities

based strictly on thermal considerations, such as those in the tables listed above. Other ampacities are based on a multiplicity of factors (see section 310-15(b) FPN) beyond the scope of the existing definition. An objective observer would certainly conclude that the present definition is not entirely satisfactory.

(3) This is a very interesting observation. It can be reasonably stated that everything in the Code is scientific, but that obscures the point that a tremendous amount of judgment often modifies pure science. That is as it should be. In this case, what I have called scientific ampacities are pure science. They are calculated using only recognized scientific principles; nothing judgmental. They spring from the field of technology and computers. Other ampacities come from the field of wisdom, and cannot be calculated scientifically.

PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Comment 6-43.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Ferrell

(Log #954)

6- 88 - (Table B-310-7): Reject
SUBMITTER: John E. Conley, Stratford, CT
COMMENT ON PROPOSAL NO: 6-234
RECOMMENDATION: Accept the proposal.
SUBSTANTIATION: These comments apply, individually, and collectively, to the following proposed actions published in the ROP for the 2002 NEC.

1-101 (100-Ampacity)
6-92 (310-15(c))
6-120 (310-60(d))
6-126 (Table 310-67)
6-127 (Table 310-68)
6-128 (Table 310-69)
6-129 (Table 310-70)
6-130 (Table 310-71)
6-131 (Table 310-72)
6-132 (Table 310-73)
6-133 (Table 310-74)
6-134 (Table 310-75)
6-135 (Table 310-76)
6-136 (Table 310-77)
6-137 (Table 310-78)
6-138 (Table 310-79)
6-139 (Table 310-80)
6-140 (Table 310-81)
6-141 (Table 310-82)
6-142 (Table 310-83)
6-143 (Table 310-84)
6-144 (Table 310-85)
6-145 (Table 310-86)
6-223 (B-310-15(b)(1))
6-226 (Table B-310-1)
6-228 (B-310-15(b)(2))
6-231 (Table B-310-3)
6-232 (Table B-310-5)
6-233 (Table B-310-6)
6-234 (Table B-310-7)
6-235 (Table B-310-8)
6-236 (Table B-310-9)
6-237 (Table B-310-10)

All of these proposals should be accepted.

Individual panel comments seem to fall into three major categories: (1) 'Scientific ampacity' does not appear in the NEC; (2) The present definition is entirely satisfactory; (3) All NEC ampacities are scientific

My comments:

(1) These proposals were inspired by the panel's rejection, three years ago, for this very reason. Proposal 1-101 deals with the definition; the others deal with introducing the term into the text where appropriate.

(2) The present definition is great; very carefully crafted. It is not wrong, but it is inadequate. It applies only for those ampacities based strictly on thermal considerations, such as those in the tables listed above. Other ampacities are based on a multiplicity of factors (see section 310-15(b) FPN) beyond the scope of the existing definition. An objective observer would certainly conclude that the present definition is not entirely satisfactory.

(3) This is a very interesting observation. It can be reasonably stated that everything in the Code is scientific, but that obscures the point that a tremendous amount of judgment often modifies pure science. That is as it should be. In this case, what I have called scientific ampacities are pure science. They are calculated using only recognized scientific principles; nothing judgmental. They spring from the field of technology and computers. Other ampacities come from the field of wisdom, and cannot be calculated scientifically.

PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Comment 6-43.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Ferrell

(Log #955)

6- 89 - (Table B-310-8): Reject
SUBMITTER: John E. Conley, Stratford, CT
COMMENT ON PROPOSAL NO: 6-235
RECOMMENDATION: Accept the proposal.
SUBSTANTIATION: These comments apply, individually, and collectively, to the following proposed actions published in the ROP for the 2002 NEC.

1-101 (100-Ampacity)
6-92 (310-15(c))
6-120 (310-60(d))
6-126 (Table 310-67)
6-127 (Table 310-68)
6-128 (Table 310-69)
6-129 (Table 310-70)
6-130 (Table 310-71)
6-131 (Table 310-72)
6-132 (Table 310-73)
6-133 (Table 310-74)
6-134 (Table 310-75)
6-135 (Table 310-76)
6-136 (Table 310-77)
6-137 (Table 310-78)
6-138 (Table 310-79)
6-139 (Table 310-80)
6-140 (Table 310-81)
6-141 (Table 310-82)
6-142 (Table 310-83)
6-143 (Table 310-84)
6-144 (Table 310-85)
6-145 (Table 310-86)
6-223 (B-310-15(b)(1))
6-226 (Table B-310-1)
6-228 (B-310-15(b)(2))
6-231 (Table B-310-3)
6-232 (Table B-310-5)
6-233 (Table B-310-6)
6-234 (Table B-310-7)
6-235 (Table B-310-8)
6-236 (Table B-310-9)
6-237 (Table B-310-10)

All of these proposals should be accepted.

Individual panel comments seem to fall into three major categories: (1) 'Scientific ampacity' does not appear in the NEC; (2) The present definition is entirely satisfactory; (3) All NEC ampacities are scientific

My comments:

(1) These proposals were inspired by the panel's rejection, three years ago, for this very reason. Proposal 1-101 deals with the definition; the others deal with introducing the term into the text where appropriate.

(2) The present definition is great; very carefully crafted. It is not wrong, but it is inadequate. It applies only for those ampacities based strictly on thermal considerations, such as those in the tables listed above. Other ampacities are based on a multiplicity of factors (see section 310-15(b) FPN) beyond the scope of the existing definition. An objective observer would certainly conclude that the present definition is not entirely satisfactory.

(3) This is a very interesting observation. It can be reasonably stated that everything in the Code is scientific, but that obscures the point that a tremendous amount of judgment often modifies pure science. That is as it should be. In this case, what I have called scientific ampacities are pure science. They are calculated using only recognized scientific principles; nothing judgmental. They spring from the field of technology and computers. Other ampacities come from the field of wisdom, and cannot be calculated scientifically.

PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Comment 6-43.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Ferrell

(Log #956)

6- 90 - (Table B-310-9): Reject
SUBMITTER: John E. Conley, Stratford, CT
COMMENT ON PROPOSAL NO: 6-236
RECOMMENDATION: Accept the proposal.
SUBSTANTIATION: These comments apply, individually, and collectively, to the following proposed actions published in the ROP for the 2002 NEC.
1-101 (100-Ampacity)
6-92 (310-15(c))
6-120 (310-60(d))
6-126 (Table 310-67)
6-127 (Table 310-68)
6-128 (Table 310-69)
6-129 (Table 310-70)
6-130 (Table 310-71)
6-131 (Table 310-72)
6-132 (Table 310-73)
6-133 (Table 310-74)
6-134 (Table 310-75)
6-135 (Table 310-76)
6-136 (Table 310-77)
6-137 (Table 310-78)
6-138 (Table 310-79)
6-139 (Table 310-80)
6-140 (Table 310-81)
6-141 (Table 310-82)
6-142 (Table 310-83)
6-143 (Table 310-84)
6-144 (Table 310-85)
6-145 (Table 310-86)
6-223 (B-310-15(b)(1))
6-226 (Table B-310-1)
6-228 (B-310-15(b)(2))
6-231 (Table B-310-3)
6-232 (Table B-310-5)
6-233 (Table B-310-6)
6-234 (Table B-310-7)
6-235 (Table B-310-8)
6-236 (Table B-310-9)
6-237 (Table B-310-10)
All of these proposals should be accepted.
Individual panel comments seem to fall into three major categories: (1) 'Scientific ampacity' does not appear in the NEC; (2) The present definition is entirely satisfactory; (3) All NEC ampacities are scientific
My comments:
(1) These proposals were inspired by the panel's rejection, three years ago, for this very reason. Proposal 1-101 deals with the definition; the others deal with introducing the term into the text where appropriate.
(2) The present definition is great; very carefully crafted. It is not wrong, but it is inadequate. It applies only for those ampacities based strictly on thermal considerations, such as those in the tables listed above. Other ampacities are based on a multiplicity of factors (see section 310-15(b) FPN) beyond the scope of the existing definition. An objective observer would certainly conclude that the present definition is not entirely satisfactory.
(3) This is a very interesting observation. It can be reasonably stated that everything in the Code is scientific, but that obscures the point that a tremendous amount of judgment often modifies pure science. That is as it should be. In this case, what I have called scientific ampacities are pure science. They are calculated using only recognized scientific principles; nothing judgmental. They spring from the field of technology and computers. Other ampacities come from the field of wisdom, and cannot be calculated scientifically.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Comment 6-43.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Ferrell

(Log #957)

6- 91 - (Table B-310-10): Reject
SUBMITTER: John E. Conley, Stratford, CT
COMMENT ON PROPOSAL NO: 6-237
RECOMMENDATION: Accept the proposal.
SUBSTANTIATION: These comments apply, individually, and collectively, to the following proposed actions published in the ROP for the 2002 NEC.
1-101 (100-Ampacity)
6-92 (310-15(c))
6-120 (310-60(d))
6-126 (Table 310-67)
6-127 (Table 310-68)
6-128 (Table 310-69)
6-129 (Table 310-70)
6-130 (Table 310-71)
6-131 (Table 310-72)
6-132 (Table 310-73)
6-133 (Table 310-74)
6-134 (Table 310-75)
6-135 (Table 310-76)
6-136 (Table 310-77)
6-137 (Table 310-78)
6-138 (Table 310-79)
6-139 (Table 310-80)
6-140 (Table 310-81)
6-141 (Table 310-82)
6-142 (Table 310-83)
6-143 (Table 310-84)
6-144 (Table 310-85)
6-145 (Table 310-86)
6-223 (B-310-15(b)(1))
6-226 (Table B-310-1)
6-228 (B-310-15(b)(2))
6-231 (Table B-310-3)
6-232 (Table B-310-5)
6-233 (Table B-310-6)
6-234 (Table B-310-7)
6-235 (Table B-310-8)
6-236 (Table B-310-9)
6-237 (Table B-310-10)
All of these proposals should be accepted.
Individual panel comments seem to fall into three major categories: (1) 'Scientific ampacity' does not appear in the NEC; (2) The present definition is entirely satisfactory; (3) All NEC ampacities are scientific
My comments:
(1) These proposals were inspired by the panel's rejection, three years ago, for this very reason. Proposal 1-101 deals with the definition; the others deal with introducing the term into the text where appropriate.
(2) The present definition is great; very carefully crafted. It is not wrong, but it is inadequate. It applies only for those ampacities based strictly on thermal considerations, such as those in the tables listed above. Other ampacities are based on a multiplicity of factors (see section 310-15(b) FPN) beyond the scope of the existing definition. An objective observer would certainly conclude that the present definition is not entirely satisfactory.
(3) This is a very interesting observation. It can be reasonably stated that everything in the Code is scientific, but that obscures the point that a tremendous amount of judgment often modifies pure science. That is as it should be. In this case, what I have called scientific ampacities are pure science. They are calculated using only recognized scientific principles; nothing judgmental. They spring from the field of technology and computers. Other ampacities come from the field of wisdom, and cannot be calculated scientifically.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Comment 6-43.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Ferrell

(Log #948)

6- 92 - (Table B-310-3): Reject
SUBMITTER: John E. Conley, Stratford, CT
COMMENT ON PROPOSAL NO: 6-223
RECOMMENDATION: Accept the proposal.
SUBSTANTIATION: These comments apply, individually, and collectively, to the following proposed actions published in the ROP for the 2002 NEC.
1-101 (100-Ampacity)
6-92 (310-15(c))

6-120 (310-60(d))
6-126 (Table 310-67)
6-127 (Table 310-68)
6-128 (Table 310-69)
6-129 (Table 310-70)
6-130 (Table 310-71)
6-131 (Table 310-72)
6-132 (Table 310-73)
6-133 (Table 310-74)
6-134 (Table 310-75)
6-135 (Table 310-76)
6-136 (Table 310-77)
6-137 (Table 310-78)
6-138 (Table 310-79)
6-139 (Table 310-80)
6-140 (Table 310-81)
6-141 (Table 310-82)
6-142 (Table 310-83)
6-143 (Table 310-84)
6-144 (Table 310-85)
6-145 (Table 310-86)
6-223 (B-310-15(b)(1))
6-226 (Table B-310-1)
6-228 (B-310-15(b)(2))
6-231 (Table B-310-3)
6-232 (Table B-310-5)
6-233 (Table B-310-6)
6-234 (Table B-310-7)
6-235 (Table B-310-8)
6-236 (Table B-310-9)
6-237 (Table B-310-10)

All of these proposals should be accepted.

Individual panel comments seem to fall into three major categories: (1) 'Scientific ampacity' does not appear in the NEC; (2) The present definition is entirely satisfactory; (3) All NEC ampacities are scientific

My comments:

(1) These proposals were inspired by the panel's rejection, three years ago, for this very reason. Proposal 1-101 deals with the definition; the others deal with introducing the term into the text where appropriate.

(2) The present definition is great; very carefully crafted. It is not wrong, but it is inadequate. It applies only for those ampacities based strictly on thermal considerations, such as those in the tables listed above. Other ampacities are based on a multiplicity of factors (see section 310-15(b) FPN) beyond the scope of the existing definition. An objective observer would certainly conclude that the present definition is not entirely satisfactory.

(3) This is a very interesting observation. It can be reasonably stated that everything in the Code is scientific, but that obscures the point that a tremendous amount of judgment often modifies pure science. That is as it should be. In this case, what I have called scientific ampacities are pure science. They are calculated using only recognized scientific principles; nothing judgmental. They spring from the field of technology and computers. Other ampacities come from the field of wisdom, and cannot be calculated scientifically.

PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Comment 6-31.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Ferrell

(Log #949)

6- 93 - (Table B-310-3): Reject
SUBMITTER: John E. Conley, Stratford, CT
COMMENT ON PROPOSAL NO: 6-226
RECOMMENDATION: Accept the proposal.
SUBSTANTIATION: These comments apply, individually, and collectively, to the following proposed actions published in the ROP for the 2002 NEC.

1-101 (100-Ampacity)
6-92 (310-15(c))
6-120 (310-60(d))
6-126 (Table 310-67)
6-127 (Table 310-68)
6-128 (Table 310-69)
6-129 (Table 310-70)
6-130 (Table 310-71)
6-131 (Table 310-72)
6-132 (Table 310-73)
6-133 (Table 310-74)
6-134 (Table 310-75)
6-135 (Table 310-76)
6-136 (Table 310-77)
6-137 (Table 310-78)
6-138 (Table 310-79)
6-139 (Table 310-80)
6-140 (Table 310-81)
6-141 (Table 310-82)
6-142 (Table 310-83)
6-143 (Table 310-84)
6-144 (Table 310-85)
6-145 (Table 310-86)
6-223 (B-310-15(b)(1))
6-226 (Table B-310-1)
6-228 (B-310-15(b)(2))
6-231 (Table B-310-3)
6-232 (Table B-310-5)
6-233 (Table B-310-6)
6-234 (Table B-310-7)
6-235 (Table B-310-8)
6-236 (Table B-310-9)
6-237 (Table B-310-10)

All of these proposals should be accepted.

Individual panel comments seem to fall into three major categories: (1) 'Scientific ampacity' does not appear in the NEC; (2) The present definition is entirely satisfactory; (3) All NEC ampacities are scientific

My comments:

(1) These proposals were inspired by the panel's rejection, three years ago, for this very reason. Proposal 1-101 deals with the definition; the others deal with introducing the term into the text where appropriate.

(2) The present definition is great; very carefully crafted. It is not wrong, but it is inadequate. It applies only for those ampacities based strictly on thermal considerations, such as those in the tables listed above. Other ampacities are based on a multiplicity of factors (see section 310-15(b) FPN) beyond the scope of the existing definition. An objective observer would certainly conclude that the present definition is not entirely satisfactory.

(3) This is a very interesting observation. It can be reasonably stated that everything in the Code is scientific, but that obscures the point that a tremendous amount of judgment often modifies pure science. That is as it should be. In this case, what I have called scientific ampacities are pure science. They are calculated using only recognized scientific principles; nothing judgmental. They spring from the field of technology and computers. Other ampacities come from the field of wisdom, and cannot be calculated scientifically.

PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Comment 6-43.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Ferrell

(Log #950)

6- 94 - (Table B-310-3): Reject
SUBMITTER: John E. Conley, Stratford, CT
COMMENT ON PROPOSAL NO: 6-228
RECOMMENDATION: Accept the proposal.
SUBSTANTIATION: These comments apply, individually, and collectively, to the following proposed actions published in the ROP for the 2002 NEC.

1-101 (100-Ampacity)
6-92 (310-15(c))
6-120 (310-60(d))
6-126 (Table 310-67)
6-127 (Table 310-68)
6-128 (Table 310-69)
6-129 (Table 310-70)
6-130 (Table 310-71)
6-131 (Table 310-72)
6-132 (Table 310-73)
6-133 (Table 310-74)
6-134 (Table 310-75)
6-135 (Table 310-76)
6-136 (Table 310-77)
6-137 (Table 310-78)
6-138 (Table 310-79)
6-139 (Table 310-80)
6-140 (Table 310-81)
6-141 (Table 310-82)
6-142 (Table 310-83)
6-143 (Table 310-84)
6-144 (Table 310-85)
6-145 (Table 310-86)
6-223 (B-310-15(b)(1))

6-226 (Table B-310-1)
6-228 (B-310-15(b)(2))
6-231 (Table B-310-3)
6-232 (Table B-310-5)
6-233 (Table B-310-6)
6-234 (Table B-310-7)
6-235 (Table B-310-8)
6-236 (Table B-310-9)
6-237 (Table B-310-10)

All of these proposals should be accepted.

Individual panel comments seem to fall into three major categories: (1) 'Scientific ampacity' does not appear in the NEC; (2) The present definition is entirely satisfactory; (3) All NEC ampacities are scientific

My comments:

(1) These proposals were inspired by the panel's rejection, three years ago, for this very reason. Proposal 1-101 deals with the definition; the others deal with introducing the term into the text where appropriate.

(2) The present definition is great; very carefully crafted. It is not wrong, but it is inadequate. It applies only for those ampacities based strictly on thermal considerations, such as those in the tables listed above. Other ampacities are based on a multiplicity of factors (see section 310-15(b) FPN) beyond the scope of the existing definition. An objective observer would certainly conclude that the present definition is not entirely satisfactory.

(3) This is a very interesting observation. It can be reasonably stated that everything in the Code is scientific, but that obscures the point that a tremendous amount of judgment often modifies pure science. That is as it should be. In this case, what I have called scientific ampacities are pure science. They are calculated using only recognized scientific principles; nothing judgmental. They spring from the field of technology and computers. Other ampacities come from the field of wisdom, and cannot be calculated scientifically.

PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Comment 6-43.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Ferrell

(Log #951)

6- 95 - (Table B-310-3): Reject
SUBMITTER: John E. Conley, Stratford, CT
COMMENT ON PROPOSAL NO: 6-231
RECOMMENDATION: Accept the proposal.
SUBSTANTIATION: These comments apply, individually, and collectively, to the following proposed actions published in the ROP for the 2002 NEC.

1-101 (100-Ampacity)
6-92 (310-15(c))
6-120 (310-60(d))
6-126 (Table 310-67)
6-127 (Table 310-68)
6-128 (Table 310-69)
6-129 (Table 310-70)
6-130 (Table 310-71)
6-131 (Table 310-72)
6-132 (Table 310-73)
6-133 (Table 310-74)
6-134 (Table 310-75)
6-135 (Table 310-76)
6-136 (Table 310-77)
6-137 (Table 310-78)
6-138 (Table 310-79)
6-139 (Table 310-80)
6-140 (Table 310-81)
6-141 (Table 310-82)
6-142 (Table 310-83)
6-143 (Table 310-84)
6-144 (Table 310-85)
6-145 (Table 310-86)
6-223 (B-310-15(b)(1))
6-226 (Table B-310-1)
6-228 (B-310-15(b)(2))
6-231 (Table B-310-3)
6-232 (Table B-310-5)
6-233 (Table B-310-6)
6-234 (Table B-310-7)
6-235 (Table B-310-8)
6-236 (Table B-310-9)
6-237 (Table B-310-10)

All of these proposals should be accepted.

Individual panel comments seem to fall into three major categories: (1) 'Scientific ampacity' does not appear in the NEC; (2) The present definition is entirely satisfactory; (3) All NEC ampacities are scientific

My comments:

(1) These proposals were inspired by the panel's rejection, three years ago, for this very reason. Proposal 1-101 deals with the definition; the others deal with introducing the term into the text where appropriate.

(2) The present definition is great; very carefully crafted. It is not wrong, but it is inadequate. It applies only for those ampacities based strictly on thermal considerations, such as those in the tables listed above. Other ampacities are based on a multiplicity of factors (see section 310-15(b) FPN) beyond the scope of the existing definition. An objective observer would certainly conclude that the present definition is not entirely satisfactory.

(3) This is a very interesting observation. It can be reasonably stated that everything in the Code is scientific, but that obscures the point that a tremendous amount of judgment often modifies pure science. That is as it should be. In this case, what I have called scientific ampacities are pure science. They are calculated using only recognized scientific principles; nothing judgmental. They spring from the field of technology and computers. Other ampacities come from the field of wisdom, and cannot be calculated scientifically.

PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Comment 6-43.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Ferrell

ANNEX D

(Log #1863)

2- 145 - (Appendix D, Example #D2(c)): Reject
SUBMITTER: David P. Brown, Baltimore Gas and Electric Co/EEI
COMMENT ON PROPOSAL NO: 2-315
RECOMMENDATION: This proposal should be accepted.
SUBSTANTIATION: The Panel's statement is in error. The 1999 NEC text does nothing to clarify the technical substantiation from other Code change cycles. We believe that was clearly demonstrated in our substantiation for this proposal. The issue was further clarified in Mr. Moore's negative vote comments to this proposal. There was no substantiation submitted to justify making this change in the 1999 NEC. The wording in the 2002 NEC should revert back to the wording in the 1996 NEC, which can be consistently verified using utility metered load profile data for electrically heated dwelling units.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Comment 2-141.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NEGATIVE: 1
ABSTENTION: 1
EXPLANATION OF NEGATIVE:
MOORE: I do not agree with the panel action or the panel statement. It is my opinion that the 1999 NEC text was not a clarification from previous cycles and was revised without adequate substantiation.

The current code allows diversification at 65 percent of nameplate rating for central electric space heating for 4 units or less. However, current code allows no diversification (100 percent of the nameplate ratings) for a system employing heat pump compressors with supplemental heating. Heat pump compressors are more efficient than electric space heating. Thus, a combination central space heating installation employing heat pump compressors with supplemental heat in simultaneous operation would have a lower demand than a pure central resistance heat system of the same size. Rating the total load of the combination unit at 65 percent would be in line with the allowed 65 percent rating for a system composed only of electric space heating.

It is also my opinion that the submitter provided the necessary substantiation for the proposal.
EXPLANATION OF ABSTENTION:
TOMAN: See my Explanation of Abstention on Comment 2-141.
