

**ARTICLE 200 — USE AND IDENTIFICATION OF
GROUNDED CONDUCTORS**

5-13 Log #1009 NEC-P05 **Final Action: Accept**
(200.6(B))

Submitter: Noel Williams, Noel Williams Consulting
Comment on Proposal No: 5-16
Recommendation: This proposal should continue to be accepted.
Substantiation: This proposal addresses my concerns expressed in proposal 5-13, but also improves the overall readability of this section.
Panel Meeting Action: **Accept**
Number Eligible to Vote: 16
Ballot Results: Affirmative: 16

5-14 Log #1010 NEC-P05 **Final Action: Accept**
(200.6(D))

Submitter: Noel Williams, Noel Williams Consulting
Comment on Proposal No: 5-20
Recommendation: This proposal should continue to be accepted in principal as modified by Panel 5.
Substantiation: I agree with the Comment on Affirmative by Johnston.
Panel Meeting Action: **Accept**
Number Eligible to Vote: 16
Ballot Results: Affirmative: 16

5-15 Log #3408 NEC-P05 **Final Action: Reject**
(200.6(D))

Submitter: Douglas A. Lee, U.S. Consumer Product Safety Commission
Comment on Proposal No: 5-20
Recommendation: This proposal should be accepted.
Substantiation: This comment was submitted by a task group of CMP 2.
Panel Meeting Action: **Reject**
Panel Statement: CMP 2 Task Group provided no substantiation for eliminating the editorial improvements implemented by CMP 5.
Number Eligible to Vote: 16
Ballot Results: Affirmative: 16

5-19 Log #1239 NEC-P05 **Final Action: Reject**
(200.6(E) Exception No. 1)

Submitter: Charles M. Trout, Maron Electric Co. Inc.
Comment on Proposal No: 5-31
Recommendation: This proposal should be Accepted in Principle. Do not delete as the proposal suggests but rather add a second and third paragraph to the exception to read:
The name(s) of the qualified person(s) shall be kept in a permanent record at the office of the establishment in charge of the completed installation and at the office of the Authority Having Jurisdiction. Notification of any changes in the employment of the designated qualified person(s) shall be made to the office of the Authority Having Jurisdiction.
A person designated as a qualified person shall possess the skills and knowledge related to the construction and operation of the electrical equipment and installation and shall have received documented safety training on the hazards involved. Documentation of their qualifications shall be on file with the office of the Authority Having Jurisdiction and the office of the establishment in charge of the completed installation.
Substantiation: My apologies for inadvertently using the wrong Section number in my original proposal and thank you for processing my proposal. It was not necessarily my desire to have the wording in the exception deleted if the exception could be changed to include prescriptive requirements that could ensure that qualified persons are actually performing the maintenance and supervision as required by the exception.
It is difficult to understand how it is possible to relax requirements for safety in a Code that tells us in 90.1(B), "this Code contains provisions that are considered NECESSARY for safety." This section further states that "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." It appears to me that this tells us that these requirements are the MINIMUM requirements for safety and anything less will result in an installation that is NOT FREE FROM HAZARD.
Proponents of this travesty, knowing the truth in this, attempt to circumvent the obvious degradation of safety by using phraseology such as "the installation is under engineering supervision" or "a qualified person will monitor the system." What is monitoring the installation? What does engineering supervision mean?

I have submitted several proposals to delete these exceptions to requirements for safety but they were all rejected. Perhaps in the comment stage, enough persons will comment in favor of accepting these proposals or at least accepting them in a manner where some prescriptive requirements will be added to accurately describe what "engineering supervision" entails. What does "monitoring" the installation mean, what type of record keeping is necessary to assure compliance, what is a "monitor" or what is a "qualified person?" How is documentation of the qualifications and presence of a "qualified person" accomplished by the Authority Having Jurisdiction?

Without these prescriptive requirements, these exceptions to the requirements for safety appear to be "just another subterfuge to avoid compliance with the safety requirements of the National Electrical Code without regard to putting persons and equipment at risk."

Panel Meeting Action: **Reject**
Panel Statement: The proposed adjustment to this proposal does not add clarity to the exception and would likely result in inconsistent enforcement. "Qualified persons" referred to in the exception should not be limited by being named specifically. It is the responsibility of the owner to maintain compliance with the provisions of this exception in a manner acceptable to the authority having jurisdiction. It is not the responsibility of the authority having jurisdiction to keep track of the names of qualified persons for the purposes of utilizing the provisions of the exception.

Number Eligible to Vote: 16
Ballot Results: Affirmative: 15 Negative: 1
Explanation of Negative:
TOOMER: Accepting this comment would ensure that the provision in this section is being enforced.

5-16 Log #2136 NEC-P05 **Final Action: Accept**
(200.6(F) (New))

Submitter: Frederic P. Hartwell, Hartwell Electrical Services, Inc.
Comment on Proposal No: 5-23
Recommendation: Continue to reject the proposal.
Substantiation: The hazard cited in the substantiation is already a prohibited practice in the NEC. See 210.4(A).
Panel Meeting Action: **Accept**
Number Eligible to Vote: 16
Ballot Results: Affirmative: 16

5-17 Log #3309 NEC-P05 **Final Action: Reject**
(200.7(C))

Submitter: Charles Mello, Electro-Test, Inc.
Comment on Proposal No: 5-26
Recommendation: Revise the text of 200.7(C) to the following:
200.7(C) Circuits of 50 Volts or More. The use of a conductor with insulation that is white or gray or that has three continuous white stripes for an ungrounded other than a grounded conductor, single pole, 3-way or 4-way switch loops or travelers for in circuits of 50 volts or more shall be permitted only as in (1) through (3).
(1) If the conductor is part of a cable assembly or flexible cord and where the insulation is permanently reidentified to indicate its use as an ungrounded conductor, by painting, or other effective means at its termination, and at each location where the conductor is visible and accessible. The reidentification shall encircle the conductor and shall be a label or a color other than white, gray, or green.
(2) ~~Where a cable assembly with reidentified white or gray conductors is used contains an insulated conductor for single-pole, 3-way or 4-way switch loops, the reidentified conductor shall not be used as the switched conductor to the switched outlet, and the conductor with white or gray insulation or a marking of three continuous white stripes is used for the supply to the switch but not as a return conductor from the switch to the switched outlet. In these applications, the conductor with white or gray insulation or with three continuous white stripes shall be permanently reidentified to indicate its use by painting or other effective means at its terminations and at each location where the conductor is visible and accessible.~~
(3) Where in a flexible cord, having one conductor reidentified from by a white or gray outer finish or three continuous white stripes or by any other means permitted by 400.22 in accordance with 200.7(C)(1), which is used for connecting an appliance or equipment permitted by 400.7. This shall apply to flexible cords connected to outlets whether or not the outlet is supplied by a circuit that has a grounded conductor.

FPN: The color gray may have been used in the past as an ungrounded conductor. Care should be taken when working on existing systems.
Substantiation: The revised text reorganizes this section into clear requirements and adds the term "travelers" that resolves a missing link which was addressed in a series of proposals and the ballot comment provided by Dan Hammel. The first part establishes in one place the list of applications where a white, gray or otherwise identified conductor can be used as other than a grounded conductor. The 3 requirements address the methods of reidentification, the prohibition to use the reidentified conductor as the switch leg to the

switched outlet, where confusion on proper termination could exist, and the added requirements for flexible cords to correlate with 400.22.

Panel Meeting Action: Reject

Panel Statement: The panel concludes that the proposed revision does not add clarity.

Number Eligible to Vote: 16

Ballot Results: Affirmative: 15 Negative: 1

Explanation of Negative:

HAMMEL: The revised text in this comment would improve the understanding of 200.7(C). The term “travelers” is commonly used and understood by electricians. The term “re-identified conductor” should be used because it is both accurate and descriptive.

5-18 Log #1396 NEC-P05
(200.7(C)(2))

Final Action: Reject

Submitter: Heath Hull Ithaca, MI

Comment on Proposal No: 5-30

Recommendation: Change panel action from reject to accept in principle and modify paragraph (2) by adding after the word “used” in the first sentence as an ungrounded conductor, it and deleting the remainder of the first sentence. Also, delete the beginning of the second sentence up through the word stripes. The first and second sentence will be combined into one sentence as follows:

(2) Where a cable assembly contains an insulated conductor for single-pole, 3-way or 4-way switch loops and the conductor with white or gray insulation or a marking of three continuous white stripes is used as an ungrounded conductor, it for the supply to the switch but not as a return conductor from the switch to the switched outlet. In these applications, the conductor with white or gray insulation or with three continuous white strips shall be permanently reidentified to indicate its use by painting or other effective means as its terminations and at each location where the conductor is visible and accessible.

Substantiation: If a white or gray insulated wire is reidentified as an ungrounded conductor, it makes no difference whether it is used as the supply to the switch or the return to the luminaire or receptacle. The requirement that the white wire in a switch loop be the supply to the switch was only necessary before reidentification was a requirement. The old rule did allow the reidentified white wire to be the return wire to the luminaire or receptacle. Polarity is no longer necessary. This modification of paragraph (2) will bring this section in conformity with E3307.3 Exception of the 2000 and 2003 International Residential Code.

Panel Meeting Action: Reject

Panel Statement: The panel reaffirms its original position on Proposal 5-30 and maintains that the current requirements help to ensure proper polarity where connecting luminaires, receptacles, and other equipment.

Number Eligible to Vote: 16

Ballot Results: Affirmative: 16

5-20 Log #1240 NEC-P05
(200.9 Exception)

Final Action: Reject

Submitter: Charles M. Trout, Maron Electric Co. Inc.

Comment on Proposal No: 5-32

Recommendation: This proposal should be Accepted in Principle. Do not delete as the proposal suggests but rather add a second and third paragraph to the exception to read:

The name(s) of the qualified person(s) shall be kept in a permanent record at the office of the establishment in charge of the completed installation and at the office of the Authority Having Jurisdiction. Notification of any changes in the employment of the designated qualified person(s) shall be made to the office of the Authority Having Jurisdiction.

A person designated as a qualified person shall possess the skills and knowledge related to the construction and operation of the electrical equipment and installation and shall have received documented safety training on the hazards involved. Documentation of their qualifications shall be on file with the office of the Authority Having Jurisdiction and the office of the establishment in charge of the completed installation.

Substantiation: It was not necessarily my desire to have the wording in the exception deleted, if the exception could be changed to include prescriptive requirements that could ensure that qualified persons are actually performing the maintenance and supervision as required by the exception.

It is difficult to understand how it is possible to relax requirements for safety in a Code that tells us in 90.1(B), “this Code contains provisions that are considered NECESSARY for safety.” This section further states that “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.” It appears to me that this tells us that these requirements are the MINIMUM requirements for safety and anything less will result in an installation that is NOT FREE FROM HAZARD.

Proponents of this travesty, knowing the truth in this, attempt to circumvent the obvious degradation of safety by using phraseology such as “the installation is under engineering supervision” or “a qualified person will monitor the

system.” What is monitoring the installation? What does engineering supervision mean?

I have submitted several proposals to delete these exceptions to requirements for safety but they were all rejected. Perhaps in the comment stage, enough persons will comment in favor of accepting these proposals or at least accepting them in a manner where some prescriptive requirements will be added to accurately describe what “engineering supervision” entails. What does “monitoring” the installation mean, what type of record keeping is necessary to assure compliance, what is a “monitor” or what is a “qualified person?” How is documentation of the qualifications and presence of a “qualified person” accomplished by the Authority Having Jurisdiction?

Without these prescriptive requirements, these exceptions to the requirements for safety appear to be “just another subterfuge to avoid compliance with the safety requirements of the National Electrical Code without regard to putting persons and equipment at risk.”

Panel Meeting Action: Reject

Panel Statement: The proposed adjustment to this proposal does not add clarity to the exception and would likely result in inconsistent enforcement. “Qualified persons” referred to in the exception should not be limited by being named specifically. It is the responsibility of the owner to maintain compliance with the provisions of this exception in a manner acceptable to the authority having jurisdiction. It is not the responsibility of the authority having jurisdiction to keep track of the names of qualified persons for the purposes of utilizing the provisions of the exception.

Number Eligible to Vote: 16

Ballot Results: Affirmative: 15 Negative: 1

Explanation of Negative:

TOOMER: Accepting this comment would ensure that the provision in this section is being enforced.

5-21 Log #2542 NEC-P05
(200.10(B)(2) FPN, 200.10(E), 250, FPN)

Final Action: Reject

Submitter: Vince Baclawski, National Electrical Manufacturers Association (NEMA)

Comment on Proposal No: 5-1

Recommendation: Continue to reject this proposal.

Substantiation: The stated purpose of this proposal is to correct the “misuse” and “misunderstanding” related to the terms grounding and bonding. These terms have a long history of use in the electrical industry and are well understood by those familiar with the concepts of grounding and bonding. There is no evidence provided that the misunderstanding and misuse is widespread or that the misunderstanding of these terms has resulted in unsafe installations. If there is any misunderstanding or misuse of these terms, a more appropriate solution may be an improved educational effort instead of an extensive revision of the NEC.

If this proposal is adopted, there will be a high cost for implementation of the proposed revisions to the NEC. Manufacturers will be required to revise product markings, product labeling, product instructions, product literature and catalogs. There is also the concern of incorrect installations due to the change in terminology. Confusion will be created by labels and markings on equipment in the existing infrastructure being different than the new products modified to comply with the new terminology.

The submitter has shown no safety hazard and no benefit. There is no substantiation as to what safety improvements will result, how shock accidents or fires will be prevented or reduced, how installations will improve or what will be done differently and better.

Panel Meeting Action: Reject

Panel Statement: The panel has determined that the concepts in Proposal 5-1 require further study. See the panel action and statement on Comment 5-1.

Number Eligible to Vote: 16

Ballot Results: Affirmative: 16

Comment on Affirmative:

BOKSINER: See my comment on affirmative on Comment 5-1.

ARTICLE 210 — BRANCH CIRCUITS

2-4 Log #1957 NEC-P02 **Final Action: Reject**
(210.4)

Submitter: Michael I. Callanan, IBEW

Comment on Proposal No: 2-9

Recommendation: The proposal should be accepted.

Substantiation: I urge the panel to revisit the substantiation offered by the submitter and reconsider their position on this important safety issue. I believe the submitter has provided much more than substantiation of a general nature. I believe he has raised important safety issues that there is an opportunity to correct. What Mr. Wellman has proposed is not a new concept. The requirement to simultaneously disconnect all ungrounded conductors of multiwire branch circuits is already required by this code in 527.4(E). This requirement is contained in Article 527 for temporary installations. As recently as the 1999 NEC, the scope of Article 305 (now 527) stated that “the provisions of this article

apply to temporary electrical power and lighting wiring methods that may be of a class less than would be required for a permanent installation." Note that the concept of "a class less" was recognized for temporary installations. It is reasonable to expect requirements for a permanent installation to be at least equal to what is required in Article 527 for temporary installations. This Comment represents the official position of the International Brotherhood of Electrical Workers Codes and Standards Committee.

Panel Meeting Action: Reject

Panel Statement: The panel agrees that the requirements allowing multiwire branch circuits permanent installations are conceptually clear. Proposal 2-9 asked that multiwire branch circuits be prohibited. The panel has extended the disconnect requirements for devices on the same yoke to all locations by the panel action on Proposal 2-12. The submitter has not presented any additional substantiation to warrant acceptance of the original proposal.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 12 Negative: 1

Explanation of Negative:

KING: The submitter of this comment has alerted Panel 2 to a hazard that currently exists in the field when qualified persons are required to work on multi-wire branch circuits. It is not always possible to identify a grounded conductor in the field as being part of a multi-wire branch circuit. There is an increased risk of electric shock or electrocution to qualified persons who unknowingly come in contact with these systems. The recommended change would eliminate the hazard and should have been given further consideration by Panel 2.

2-5 Log #1958 NEC-P02
(210.4)

Final Action: Reject

Submitter: Michael I. Callanan, IBEW

Comment on Proposal No: 2-11

Recommendation: The proposal should be accepted.

Substantiation: The submitter of this proposal has recognized and brought to our attention a hazard that is a serious safety concern. Clearly, this problem is already recognized in the electrical community and is addressed in 527.4(E). Mr. Liggett has proposed enforceable and usable text that will go a long way towards realizing the purpose of this code. This comment represents the official position of the International Brotherhood of Electrical Workers Codes and Standards Committee.

Panel Meeting Action: Reject

Panel Statement: The submitter has not provided any additional substantiation that multiwire branch circuits should be restricted or prohibited. It has not been established that a safety problem exists for qualified service and maintenance personnel who are trained to work with and properly troubleshoot multiwire branch circuits.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 12 Negative: 1

Explanation of Negative:

KING: See my explanation of negative vote on Comment 2-4.

2-6 Log #1960 NEC-P02
(210.4)

Final Action: Reject

Submitter: Michael I. Callanan, IBEW

Comment on Proposal No: 2-23

Recommendation: The proposal should be accepted.

Substantiation: The panel has not provided substantiation for not accepting this proposal. The present 210.4(D) has simply been moved to 210.5(C) in the proposed draft of the 2005 NEC. Moving the requirement is not substantiation to not accept the proposal. The submitter presents excellent substantiation and enforceable and usable proposed text. The language proposed by the submitter should be accepted, regardless of where the requirement moves to. This Comment represents the official position of the International Brotherhood of Electrical Workers Codes and Standards Committee.

Panel Meeting Action: Reject

Panel Statement: The proposal was accepted in principle through the creation of new 210.5(C) in Proposal 2-30. The panel accepted the concept of requiring identification, but not the specified color code. The panel does not agree with the commenter that Proposal 2-23 provides enforceable text since the material is contained in an FPN. In addition, the recommended FPN is not necessarily the only means of identification using a color code.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 12 Negative: 1

Explanation of Negative:

KING: The submitter of this comment has reaffirmed the intent of the original proposal, which is to recognize an existing industry practice that will increase safety through the implementation of a standardized means of conductor identification for these two voltage systems. It is not the intent of this proposed FPN to exclude other means of conductor identification that is permitted in the main text as is suggested in the panel statement. Addition of this FPN would, however, inform the code user of an already widely accepted conductor

identification practice which, if adhered to, would be beneficial to all qualified persons required to work on these systems.

2-7 Log #2176 NEC-P02
(210.4)

Final Action: Reject

Submitter: Danny Liggett Richmond, TX

Comment on Proposal No: 2-11

Recommendation: This proposal should have been accepted.

Substantiation: Common neutrals are dangerous. They are a trap to even the most qualified of electricians. They kill qualified people every year. Recently an IBEW representative mentioned this is one of the great dangers that their membership faces every day. This comment comes from the very people the panel says that should have no problem working on these systems. If the panel fails to eliminate this dangerous condition then they have failed to live up to the very purpose the NEC exists.

Panel Meeting Action: Reject

Panel Statement: See panel statement on Comment 2-5.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 12 Negative: 1

Explanation of Negative:

KING: See my explanation of negative vote on Comment 2-4.

2-8 Log #2202 NEC-P02
(210.4)

Final Action: Accept

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

Comment on Proposal No: 2-9

Recommendation: Continue to reject the proposal.

Substantiation: Multiwire branch circuits use scarce resources more efficiently, and they essentially have been permitted since branch circuits were first invented. This proposal appears to be one of an unfortunate number of proposals designed to make wiring safe for untrained persons, something that will never be achieved.

Panel Meeting Action: Accept

Number Eligible to Vote: 13

Ballot Results: Affirmative: 12 Negative: 1

Explanation of Negative:

KING: I disagree with the submitter of this comment that only untrained persons would benefit from the changes recommended in Proposal 2-9. The submitter offers no proof to support this claim. It has been well documented in numerous proposals submitted to Panel 2 that trained persons are at a greater risk of electric shock or electrocution when working on these systems.

See my explanation of negative vote on Comment 2-4.

2-9 Log #174 NEC-P02
(210.4(A))

Final Action: Reject

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education

Comment on Proposal No: 2-14

Recommendation: Accept but after "panelboard" add "or similar distribution equipment".

Substantiation: The 2-12 "Accept in principle" location includes "two devices on a yoke," which I learned confuses many people in the field, including consultants. There are two problems, where experienced people believe, "Nah, it doesn't actually mean what the words technically say." First, Article 100 says a circuit begins at the overcurrent device and ends at the end of the wires. This means a multiwire circuit is the same circuit all the way. However, some experienced people say that it doesn't need to be treated as one, with neutral splicing/pigtailing, past the point where both hot conductors are present. Second, some people read "feeding multiple devices sharing a yoke" as meaning the rule refers only to where multiple hot wires of a multiwire circuit are connected to the same yoke, as with a split-wired receptacle, even though literally, a circuit feeding any duplex receptacle, for example, qualifies. Taking the literally precise meaning of that language, consider this. A multiwire circuit is fed by CB 4 and CB 6. CB 4 feeds single receptacles alpha, beta, etc., CB 6 other single receptacles, uno, does, etc., further downstream along the neutral, with no shared yoke anywhere. Sparky wants to work on beta, identifies and kills CB 4, and tests for voltage as a good Sparky should. He then starts separating the wires, even undoing splices. Now, someone turns on a load fed from CB 6, say at receptacle quatro, feeding return current into the splices Sparky is undoing. Ouch! Require tying the handles (or going multipole) and protect our lad.

Panel Meeting Action: Reject

Panel Statement: The submitter has not presented substantiation to support a requirement that all multiwire branch circuits have a simultaneous disconnecting means. See panel statement on Comment 2-4.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 12 Negative: 1

Explanation of Negative:

KING: I agree with the submitter of this comment that requiring simultaneous disconnection of all multiwire branch circuits would prevent many electric shocks. The submitter's substantiation presents to Panel 2 current field practices that place electricians at risk of electric shock or electrocution every time they are required to service equipment supplied by multiwire branch circuits. Panel 2 has recognized the hazards associated with these circuits in their action taken on Proposal 2-12, but fails to see the need to extend this protection to all circuits of this type.

2-10 Log #970 NEC-P02
(210.4(A))

Final Action: Reject

Submitter: Dorothy Kellogg, American Chemistry Council
Comment on Proposal No: 2-14

Recommendation: Panel should have accepted Proposal 2-14 as written.

Substantiation: Multiwire branch circuits employing shared neutrals can offer unexpected shock hazards to electricians unless all ungrounded conductors of the circuits are disconnected simultaneously. The safety concern associated with an unintentional voltage being present on multiwire branch circuits during maintenance is valid. An electrician may not know that a circuit is a multiwire branch circuit when work begins. Even if aware of a multiwire branch circuit, there is presently no direct way to identify and disconnect all ungrounded conductors of that multiwire branch circuit. The panel's action on Proposal 2-12 correctly recognized the safety issues for the limited situation of "more than one device or component on the same yoke". While the use of multiwire branch circuits may have a valid use, they should be permitted where a means is provided to disconnect simultaneously all ungrounded conductors of that circuit. Proposal 2-14 should be accepted as written.

Panel Meeting Action: Reject

Panel Statement: See panel statement on Comment 2-9.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 11 Negative: 2

Explanation of Negative:

KING: See my explanation of negative vote on Comment 2-9.

ROCHE: Multiwire branch circuits employing shared neutrals can offer unexpected shock hazards to electricians unless all ungrounded conductors of the circuits are disconnected simultaneously. An electrician may not know that a circuit is a multiwire branch circuit when work begins. Even if aware of a multiwire branch circuit, there is presently no direct way to identify and disconnect all ungrounded conductors of that multiwire branch circuit. While the use of multiwire branch circuits may have a valid use, they should be permitted where a means is provided to disconnect simultaneously all ungrounded conductors of that circuit.

2-11 Log #1959 NEC-P02
(210.4(D))

Final Action: Reject

Submitter: Michael I. Callanan, IBEW

Comment on Proposal No: 2-30

Recommendation: The proposal should be accepted.

Substantiation: The panel agreed and the identification of the ungrounded conductors in branch circuits is needed in its panel statement. I urge the panel to review the substantiation presented for this proposal. The concepts presented therein are still valid even with the action the panel took. I would again suggest acceptance of this proposed text in conjunction with the panel action on this proposal. This Comment represents the official position of the International Brotherhood of Electrical Workers Codes and Standards Committee.

Panel Meeting Action: Reject

Panel Statement: The requirement to only identify conductors by a color code is too limiting. The panel action on Proposal 2-30 accomplishes the safety objective of the submitter without relying on a color code as the only means.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 12 Negative: 1

Explanation of Negative:

KING: I disagree with the panel that the proposed means of identification is too restrictive. This means of identification is already a widely accepted practice in the field today. Colored tape, individual conductor insulation, and cables manufactured with individual conductors meeting the requirements of the proposed Table 210.5(C) are readily available today. This requirement would standardize the identification of two of the most commonly used systems.

2-12 Log #1982 NEC-P02
(210.4(D))

Final Action: Reject

Submitter: James T. Dollard, Jr., IBEW Local 98

Comment on Proposal No: 2-23

Recommendation: Continue to accept in principle by including the proposed Fine Print Note at the end of 210.5(C) as created in proposal 2-30.

Substantiation: I agree with the action of CMP-2 to delete 210.4(D) and create new 210.5(C) on proposal 2-30. However I do not believe that the action on 2-30 satisfied the action to "accept in principle" on this proposal.

This proposal is not intended to put into positive text, a formal color code for branch circuits. I agree that there are several acceptable means of identifying branch circuits. The proposed text is in the form of a Fine Print Note, which as per 90.5, is informational only and not an enforceable part of the NEC.

However this proposal does recognize the most popular identification means in the use of color coding and marking tape. This is the method of choice for the installer due to the fact that in many cases the same type cable assemblies are used for different systems in the same areas of a given occupancy. This proposal also recognizes colors that are essentially an industry standard. Providing this example in the form of a FPN is user friendly for both the installer and the enforcement agency.

Most importantly, this FPN provides the user with an example of how to identify the ungrounded conductors by system at the panelboard. This example of panelboard marking will be extremely useful to the user of this code and the choice of identification method is up to the installer.

The reason that the identification means (color coding, marking tape, tagging or other approved means) is required by the present text to be posted at the panelboard is due to the fact that there is not a standard color code, or method of identification required by the NEC. This posting at the panelboard/s is where the Installer/Maintainer will determine the color code or other method used, by an individual owner/occupant. Providing an example of panelboard posting is extremely user friendly.

This proposal to add an informative FPN in the form of an example, along with the present requirement, is safety driven, user-friendly, practical, easy to read and understand. While this FPN is an unenforceable part of the NEC, it will aid the Enforcement community and the users of this code by providing a basic example for installers to follow.

The acceptance of this proposal will have a positive impact on the users and enforcers of this code. This proposal is directed at simplifying the requirement through an example, providing for a safer electrical installation.

Panel Meeting Action: Reject

Panel Statement: The recommended FPN does not provide any additional needed information for application or enforcement of the rule. The language of the FPN implies a limit on how the color coding can be used.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 12 Negative: 1

Explanation of Negative:

KING: See my explanation of negative vote on Comment 2-6.

2-13 Log #2203 NEC-P02
(210.4(E) (New))

Final Action: Reject

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

Comment on Proposal No: 2-25

Recommendation: The proposal should be accepted in principle. Following the action on Proposal 2-12, insert the following text as a new 210.4(C):

(C) Conductors. The ungrounded and grounded conductors of each multiwire branch circuit shall be grouped using wire ties or similar means within the panelboard or other point of origination unless the circuit enters a cable or raceway unique to the circuit that makes the grouping obvious.

Substantiation: One of the problems of multiwire branch circuits is being assured that the neutral is really dead, and the only way to be sure of that is to be sure all the associated ungrounded conductors are disconnected. This comment works toward that end by forcing new installers to take care that they keep track of which white wire belongs with which colored wires and that they arrive at the same location. Although the requirement to originate in the same panelboard has been around for some time, it has been difficult to enforce, since everything connected will "work" if the rule is violated. This comment will help the inspection community enforce the new provisions in this section.

Panel Meeting Action: Reject

Panel Statement: The submitter suggests an alternative means of identifying multiwire grounded and ungrounded conductors but the submitter's recommendation is too restrictive for some equipment with respect to termination points. Additional substantiation has not been provided that a safety problem exists for qualified service and maintenance personnel. Also, see panel action and statement on Proposal 2-30.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 12 Negative: 1

Explanation of Negative:

KING: I disagree with the panel statement that this proposed new requirement for identifying multiwire branch circuits is too restrictive. Conductors could be grouped at their point of entry to a panel board, and, as much as practical, along their length to the point of termination of the first conductor in the group. This requirement would greatly assist a qualified person working on a circuit of this type a physical means of identifying all energized conductors of the circuit, thus, assuring that all energized conductors of the circuit are deenergized before beginning to work on the circuit.

Comment on Affirmative:

O'NEIL: This panel members understanding is that a qualified employee

should be capable of identifying a multiwire branch circuits and their associated neutral where conductors are not grouped. The commenter suggested a no cost solution to a safer installation. If the installation is done in a neat and workman like manner, multiwire branch circuits are identified by grouping. The hazards associated with knowing that a neutral is de-energized are not eliminated by deenergizing all associated ungrounded conductors. Circuit design must permit single phase operation of multiwire branch circuits. Qualified individuals must be able to work with multiwire branch circuit neutrals while not deenergizing of all phase conductors. Single phase operation of multiwire branch circuits is a fact of building design and the associated hazard must be worked around with additional safeguards. This is a work practice procedure issue in NFPA 70E and should not be required in the NEC. Reference 90.1(C) the NEC is not intended to be an instruction manual for untrained persons.

2-14 Log #3394 NEC-P02
(210.4(E))

Final Action: Reject

Submitter: Michael L. Last Na'alehu, HI

Comment on Proposal No: 2-25

Recommendation: Request reconsideration to add text as per proposal. This request is based upon the Statement of Problem and Substantiation for comment indicated below.

Substantiation: Panel statement on proposal 2-30 (Log 2788) acknowledges, "that the identification of the ungrounded conductors for branch circuits is needed." This by itself indicated that there is concern about the proper identification of these types of conductors, even when the conductors are available to "qualified service and maintenance personnel". The substantiation on the proposal addresses two very real safety concerns. Such hazards of which qualified service and maintenance personnel are not immune from. Qualified individuals should always be acting in a responsible and safe manner, yet the level of safety would be enhanced by the implementation of this proposal. It is understood that qualified individuals would not knowingly cause the conditions 1. and /or 2. (indicated in the statement of problem and substantiation for Proposal), if they are aware that such potential exists. This proposal would alert all parties of the existence of a multi wire branch circuit and the identification of line (phases) and the corresponding grounded conductor.

Panel Meeting Action: Reject

Panel Statement: The submitter has not substantiated that a safety problem exists for qualified service and maintenance personnel for a requirement to identify each grounded conductor relative to the associated ungrounded conductors.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 12 Negative: 1

Explanation of Negative:

KING: I disagree with the panel statement that it has not been substantiated that a safety problem exists for qualified service and maintenance personnel. On the contrary, Proposal 2-30 as stated in this comment along with other proposals submitted, have alerted Panel 2 to the fact that multiwire branch circuits do pose a hazard to qualified persons working on electrical equipment in the field. The proposal referenced by this comment offers a practical means for the qualified person to identify multiwire branch circuits so that all conductors of the circuit can be safely de-energized before beginning work on equipment supplied by these systems. Acceptance of this comment by Panel 2 would have provided for a safer working environment for all qualified persons.

2-15 Log #1011 NEC-P02
(210.5(C))

Final Action: Accept in Principle

Submitter: Noel Williams, Noel Williams Consulting

Comment on Proposal No: 2-30

Recommendation: This proposal should continue to be accepted in principal as modified by Panel 2.

Substantiation: Color coding is a good practice, but the methods and colors proposed seem to be based on the assumption that there will not be more than two three-phase systems in a given facility. This is plainly mistaken. Many facilities, especially industrial facilities have four or more three phase systems and possibly other single phase or DC power systems as well. (Not all are used for multiwire branch circuits, but all may well be used for branch circuits.) The assignment of color codes as proposed simply falls apart when two of the systems that use the same colors are present in a single facility. In my experience, it has not been uncommon to have single phase 120/240 and three phase 208Y/120 volt systems in the same facility or building, and this proposal would require that both be marked using the same colors, so they would be indistinguishable. This proposal does not recognize other frequency systems or DC systems at all, and both systems are common in certain industries (400 hz for avionics, for example, and DC for many industrial systems and communications.) Industrial users often use a color to identify a voltage system and then use tags or other means to identify phases. A mandated color code in the NEC

also creates problems for those who want to use a color code under NFPA 79. The panel has been wise to resist the repeated proposals to mandate a color code and should continue to recognize the variety of installations that exist and the resulting need for some design flexibility.

Panel Meeting Action: Accept in Principle

Panel Statement: See panel action on Comment 2-16.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 12 Negative: 1

Explanation of Negative:

KING: See my explanation of negative vote on Comment 2-6.

2-16 Log #1574 NEC-P02
(210.5(C))

Final Action: Accept

Submitter: Jim Pauley, Square D Company

Comment on Proposal No: 2-30

Recommendation: Revise the last sentence of the accepted text as shown below:

The means of identification shall be permitted to be by separate color coding, marking tape, tagging, or other approved means and shall be permanently posted at each branch-circuit panelboard or similar branch-circuit distribution equipment.

Substantiation: This revision is offered to clarify where the means of identification must be posted. As presently worded, the language is clear that the ID means must be at a branch circuit panelboard, but it is not clear that the term "branch circuit" also modifies "distribution equipment". The revision suggested should make it clear that the ID means is only required to be posted at equipment where branch circuits originate and branch-circuit ID is not required to be posted at distribution equipment that contains only feeder circuits. It should be recognized that 215.12 will require separate ID of the feeders if there are multiple feeders supplied from multiple systems.

Panel Meeting Action: Accept

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

2-17 Log #3578 NEC-P02
(210.5(C) (New))

Final Action: Reject

Submitter: Christopher R. Pharo Marlton, NJ

Comment on Proposal No: 2-30

Recommendation: Please accept the proposal in its original format.

Substantiation: This proposal will justify and standardize the identification practices already used throughout the country. The true purpose in identifying different systems with different voltages is to forewarn the electrician of maintenance personnel who may work on this circuit in the future. The proposed color scheme is essential because it is already used and established throughout the country - why not mandate a standard!

Tagging of the conductors works initially but after the first couple of years, the strings break or degrade - hence losing the conductor identification. This is why it is not an option when identifying the equipment grounding conductor and the grounded conductor. By identifying the conductor with color tape, it now becomes part of the conductor and it would not accidentally come off. The color tape would have to be consciously removed.

Panel Meeting Action: Reject

Panel Statement: See panel statement on Comment 2-11. Tagging and other methods have been in use for years and have been acceptable as an identification means under 210.4(D). In addition, there are numbering and other identification methods that apply similarly to tape but are not color coded.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 12 Negative: 1

Explanation of Negative:

KING: See my explanation of negative vote on Comment 2-6.

2-18 Log #3626 NEC-P02
(210.6)

Final Action: Reject

Submitter: John D. Green, Holophane, an Acuity Brands Company

Comment on Proposal No: 2-32

Recommendation: Delete new wording as proposed in 2-32. The wording of the 2002 NEC text of 210.6 should be retained.

Substantiation: This modification is not supported by any data that substantiates the need for a change in the current code. The proposal substantiation notes that the "practice is very common with large buildings such as factories", but there is no mention of any safety or related problems with this common usage. The justification for specifically excluding luminaires from indoor use of voltages between 277 and 600 over other types of utilization equipment is not present and appears unsupported by field experience.

Panel Meeting Action: Reject

Panel Statement: See panel statement on Comment 2-19.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

2-19 Log #3286 NEC-P02
(210.6(D)(2))**Final Action: Reject****Submitter:** Frederick L. Carpenter, Lithonia Lighting
Comment on Proposal No: 2-32**Recommendation:** Remove the text that was added by the Code-Making Panel. Revert to the text from the 2002 NEC. 210.6(D)(2) should read: "Cord-and-plug connected or permanently connected utilization equipment."
Substantiation: The proposal to limit 210.6(D)(2) to utilization equipment other than luminaires should be rejected for the following reasons:

1. The submitter indicates that "The current text is interpreted to permit a 480-volt delta-connected system to supply the ballasts of HID fixtures; and that "This practice is very common with large buildings such as factories", but supplies no data to suggest that this has created a hazard. No technical problem has been identified with the current wording that would suggest that HID luminaires should be excluded from 210.6(D)(2).

2. The proposed revision to 210.6(D)(2) suggests that luminaires pose a hazard that is not present in other utilization equipment. No technical justification has been supplied to support the conclusion that cord-and-plug connected or permanently installed luminaires present a greater hazard than other utilization equipment.

3. The text of Section 210-6(D)(2) has not changed since 1987. No data has been provided to suggest that luminaires installed in accordance with this provision for the past 16 years have been inadequate or unsafe.

4. The submitter's only substantiation is the appearance of a conflict between 210.6(D)(1) and 210.6(D)(2). When the history of this code provision is researched, the appearance of this conflict can be understood and rationalized. The provisions of paragraph 210.6(D)(1) first appeared in the NEC in 1965 as Exception No. 5 to paragraph 210-6 as shown below:

"The branch circuits supplying the ballasts for electric discharge lamps mounted in permanently installed fixtures on poles for the illumination of areas such as highways, bridges, athletic fields, parking lots, at a height not less than 22 feet, or on other structures such as tunnels at a height not less than 18 feet, shall not exceed 500 volts between conductors when installed as provided in Section 730-7(a)."

In 1975, this section (210-6(b)) of the code was modified to clarify that the areas being specified were outdoor areas with the following text:

"Voltage between Conductors - Poles, Tunnels, and Similar Structures. The voltage shall not exceed 500 volts between conductors on branch circuits supplying only the ballasts for electric-discharge lamps mounted in permanently installed fixtures as provided in Section 225-7(c) where the fixtures are mounted as follows:

(1) Not less than a height of 22 feet on poles or similar structures for the illumination of outdoor areas, such as highways, roads, bridges, athletic fields, or parking lots.

(2) Not less than a height of 18 feet on structures, such as tunnels."

In 1986, Code-Making Panel 2 submitted a proposal (proposal 2-50 published in the 1986 Annual Meeting NEC Technical Committee Report NEC-TCR-86-A) to rewrite Section 210-6. The proposed wording is shown below:

"(c) 600 Volts Between Conductors. Circuits exceeding 277 volts, nominal to ground shall not exceed 600 volts, nominal, between conductors on branch circuits supplying: (1) receptacles rated for the circuit voltage; (2) permanently connected utilization equipment; or (3) the auxiliary equipment for electric-discharge lamps mounted in permanently installed fixtures where the fixtures are mounted as follows:

1. Not less than a height of 22 feet (6.71 m) on poles or similar structures for the illumination of outdoor areas, such as highways, roads, bridges, athletic fields, or parking lots.

2. Not less than a height of 18 feet (5.49 m) on other structures, such as tunnels."

As can be seen, this rewrite did not touch the text that already existed for outdoor installations, but added provisions for allowable installations indoors and did not exclude luminaires. Through the Code-Making process, the 1986 proposal evolved into the current text when the 1987 code was published. When the existing 210.6(D) is interpreted as having separate provisions applying to outdoor installations (210.6(D)(1)) and indoor installations (210.6(D)(2)), the apparent discrepancy in the text can be understood.

While the wording of 210.6 certainly lacks clarity, attempting to solve this by excluding luminaires from 210.6(D)(2) is not justified.

Panel Meeting Action: Reject**Panel Statement:** The panel does not agree with all of the elements of the submitter's historical account of this rule. Up to and including the 1984 NEC, the only time a voltage could exceed 300 volts to ground was for the applications on poles, tunnels, and similar installations. In the 1987 NEC rewrite by CMP-2, the language was added to allow permanently connected or cord-connected utilization equipment. However, the language regarding lighting remained. Had the intent been to allow lighting under the "permanently connected or cord-connected" language, there would have been no need to keep the height limitations. The panel does not agree that CMP-2 intended to allow a luminaire to be installed indoors at any height and have the voltage exceed 277V to ground. The action of Proposal 2-32 is to remove the conflict that exists by having language specific to lighting and having language that covers all "utilization equipment".**Number Eligible to Vote:** 13
Ballot Results: Affirmative: 132-20 Log #1283 NEC-P02
(210.7(C))**Final Action: Accept****Submitter:** Yates Colby Columbia Falls, MT**Comment on Proposal No:** 2-33**Recommendation:** "Where more than one branch circuit supplies more than one...". Change "receptacle" to "device or equipment" on the same yoke...".
Substantiation: Changing the word "receptacle" to "device or equipment" will bring that section/paragraph in line with other NEC wording evidenced in 210.4(B) and, therefore, create more consistency in the code. It also gives a broader meaning to that paragraph.**Panel Meeting Action: Accept****Number Eligible to Vote:** 13**Ballot Results:** Affirmative: 132-21 Log #888 NEC-P02
(210.8)**Final Action: Accept in Principle****Submitter:** William H. King, Jr., U.S. Consumer Product Safety Commission**Comment on Proposal No:** 2-47**Recommendation:** Reconsider the part of Proposal 2-47 that covers outlets for boat hoist motors and associated equipment wiring. That is, rename sections (A) and (B) of 210.8, and add new section (C), as follows:

(A) Receptacles at Dwellings.

(B) Receptacles at Other than Dwellings

(C) Outlets for Boat Hoists. Outlets for boat hoist motors and associated equipment wiring shall have ground-fault circuit-interrupter protection for personnel.

Substantiation: The ROP panel statement in support of the panel meeting action to reject the proposal makes no mention of this part. Adequate substantiation for protecting users of electrically powered boat hoists at residential locations (typically properties having yards with docks and bulkheads) from electrocution was provided with the proposal and with similar proposals submitted in previous code cycles. Actions taken in previous code cycles supported the rational for GFCI protection for boat hoists, but the words added to the code were incomplete.**Panel Meeting Action: Accept in Principle****Panel Statement:** See panel action on Comment 2-65.**Number Eligible to Vote:** 13**Ballot Results:** Affirmative: 12 Negative: 1**Explanation of Negative:**

BECKER: See my Explanation of Negative Vote on Comment 2-65.

2-22 Log #1940 NEC-P02
(210.8)**Final Action: Reject****Submitter:** Michael I. Callanan, IBEW**Comment on Proposal No:** 2-37**Recommendation:** This proposal should be accepted.**Substantiation:** Contrary to the panel statement, it is my contention that substantiation has been made to warrant this important step to meet the purpose of this Code. This comment represents the official position of the International Brotherhood of Electrical Workers Codes and Standards Committee.**Panel Meeting Action: Reject****Panel Statement:** The submitter has not provided any additional substantiation to expand this requirement to all occupancies. In addition, the panel notes that locations used in Part A such as "garages and also accessory buildings" are too encompassing for application beyond dwelling units. Further, it has been recognized that kitchens in dwelling units present different hazards from kitchens in other occupancies, and this provision would reduce the level of protection in non-dwelling unit kitchens.**Number Eligible to Vote:** 13**Ballot Results:** Affirmative: 11 Negative: 2**Explanation of Negative:**

KING: This comment should have been accepted in principle with revised text to ensure that current requirements for GFCI protection in dwelling unit kitchens are not compromised. The need to expand GFCI protection to all occupancies is well documented.

See my explanation of negative vote on Comment 2-53.

WEBER: The panel should have Accepted the original proposal and this supporting comment. Given the long record of the installation and use of ground-fault circuit-interrupter protection for personnel, the expansion of its use is warranted. It has still not been proven to me that hazards exist in dwelling units that are not equally a hazard for similar environments that occur in both commercial and industrial installations. The documentation on the number of lives saved cannot be provided because the means of protection has

functioned properly and, therefore, an accident did not occur. The expansion of its use should be supported to enhance safety, similar to the analogy of using seat belts in cars has proven to increase safety when used. To my knowledge, they do not produce any cars without them and cost is not a factor.

2-23 Log #3113 NEC-P02
(210.8)

Final Action: Accept

Submitter: Kenneth E. Vannice, Leviton/NSI-Colortran / Rep. United States Institute for Theatre Technology

Comment on Proposal No: 2-39

Recommendation: Continue to reject adding the proposed new text.

Substantiation: We have recently checked with UL and Intertek (ETL). We can find no record of available Listed Special Purpose GFCIs (also known as Class C, D and E GFCIs) to implement the proposed requirement. Even if Listed equipment were to become available in the near future, there would be insufficient time to evaluate it for appropriate application in this situation.

Panel Meeting Action: Accept

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

2-24 Log #3616 NEC-P02
(210.8)

Final Action: Accept

Submitter: Michael D. Skinner, Alliance of Motion Picture and Television Producers (AMPTP)

Comment on Proposal No: 2-39

Recommendation: Continue to Reject Proposal.

Substantiation: The submitter did not provide sufficient documentation to warrant such a major change in wiring methods. This equipment has not been field tested for this application and it will not provide protection for a person accidentally contacting phase to phase or phase to neutral conductors. This equipment also relies on equipment grounding to provide let-go protection since they trip at 15 to 20 mA and higher. Some applications may be more hazardous if equipment nuisance trips.

Panel Meeting Action: Accept

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

2-25 Log #1389 NEC-P02
(210.8, FPN (New))

Final Action: Reject

Submitter: Kevin J. Brooks, IBEW Local #16

Comment on Proposal No: 2-8

Recommendation: Add a new FPN as follows:

“FPN: When deenergizing multi wire branch circuits, care should be considered as there may be a level of energy present in the Grounded conductor.”

Substantiation: This will be a valuable safety reminder that by opening the ungrounded conductor, there still could be a level of voltage present in a multi-wire branch circuit in the grounded conductor. There are way too many accidents due to this voltage being present. As the world wide leader in safety, the NFPA must continue its leadership in safety and quality standards. As an electrician working in the field everyday, I can tell you this Fine Print Note is needed to remind everyone of this dangerous problem we have to deal with on a daily basis.

Panel Meeting Action: Reject

Panel Statement: This comment appears to be directed to multiwire branch circuits in 210.4, which already contains a FPN directing the user to 300.13(B) for continuity of the grounded conductor. The submitter does not provide any additional substantiation that a safety problem exists for qualified service and maintenance personnel.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 12 Negative: 1

Explanation of Negative:

KING: The panel's reference to 300.13(B) FPN does not address the submitter's safety concerns. This FPN was intended to alert the code user that a shock hazard exists where all phases of a multiwire branch circuit are not de-energized. It is not always possible to identify all of the phase conductors that share a common grounded conductor as part of a multiwire branch circuit in existing panel board. I disagree with the panel that the submitter needs to provide additional substantiation indicating that a safety problem exists for qualified service and maintenance personnel. The hazards associated with trained professionals working on equipment supplied from the multiwire branch circuits are well documented.

2-26 Log #1045 NEC-P02
(210.8(A))

Final Action: Reject

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: Jack Wells, Pass & Seymour/Legrand

Comment on Proposal No: 2-47

Recommendation: The proposal should be to accept in principle and 210.8(A) should be revised to add a new section (9) to read as follows:

(9) All receptacle outlets required by 210.52 (A) and (H).

Substantiation:

The stated reasons for the rejection of this proposal are:

- the substantiation and documentation do not provide adequate information to determine if the accidents could have been prevented by GFCI protection.
- damaged appliance and portable cords appear to be a factor in causing the accident.

Based on the brief incident reports submitted with the substantiation, it can be concluded that the panel statement is a fair assessment of the information provided. However, upon careful analysis of the detailed reports it becomes evident that GFCI protection very likely would have prevented a fatality in the incidents cited.

Although damaged electrical products were involved in many of these incidents, a GFCI would have afforded effective protection. It may be argued that damaged electrical products should be taken out of service. Unfortunately, as demonstrated by the incident reports, this is not always what happens. The products described were functional, even though they were poorly repaired. Stating that GFCI protection is not necessary because the electrical equipment was damaged overlooks the point that people will continue to use damaged electrical equipment if it remains functional.

An additional concern revealed by the accident reports is that a number of the fatalities were children under the age of seven. An adult may be wary of a damaged electrical product but a child cannot be expected to exercise the same level of caution. Young children are especially vulnerable because they are unlikely to have any understanding of the danger associated with coming into contact with a live electrical component. Many of the reported incidents occurred due to the negligence of adults allowing the continued use of damaged electrical equipment but it was ultimately a child who paid the price for this negligence.

It is not always negligence that results in electrocution. Case no. 970220HCC7384 describes a 4-year-old boy who was well supervised by his parents and cautioned about the dangers of electricity. Even with these precautions, the child was electrocuted when playing near an outlet and coming into contact with a live plug and a metal heating grate.

The CPSC reports represent a litany of electrical accidents that would have been prevented by the use of a GFCI. Providing GFCI protection in dwelling unit living areas will help to prevent similar incidents from occurring in the future.

It should be noted that the provided CPSC reports do not represent all incidences of electrocutions in dwellings. Also provided are brief reports by the National Injury Information Clearing House describing 6 electrocutions which may have been prevented by the use of GFCIs installed in dwellings.

Most of the incidents described occurred in dwelling unit living areas specified in 210.52(A) and (H). The proposal has been reworded to make it clear that these are the locations that require GFCI protection.

I have provided a brief synopsis of a number of the CPSC incident reports referenced in the proposal. Also, I have provided the complete CPSC report of each incident.

CPSC Report Synopsis

Case No. 960930CCC7462

7-year-old female sustained fatal electrical shock.

Electric fan had a direct short which energized the frame. The child came into contact with the fan frame and a heating register. Incident occurred in the kitchen/living room.

Case No. 970909CWE7048

Nine-month-old female sustained fatal electric shock.

A table lamp had the lamp socket partially pulled out of the base exposing bare conductors. The lamp was plugged in but had no light bulb. The lamp was located on the floor. The child was in a walker and grabbed the lamp socket while reaching for a doll that was on the floor. The incident occurred in the living room.

Case No. 981110HCC20555

5-month-old male was electrocuted.

The child was playing on the floor and came into contact with exposed wiring on a digital alarm clock. The cord on the clock was damaged and had exposed copper wire. The incident apparently occurred in a living room or a similar area where a number of people were gathered watching television.

Case No. 970423CCC1157

5-year-old female died of electrocution.

A nail was used to hold the guard in place on a portable fan. The nail contacted a live conductor, energizing the fan frame. The fan was mounted in a metal frame window causing the metal frame of the house and the metal door frame to become energized. The child came into contact with the metal door frame. The incident occurred in the living room.

Case No. 970220HCC7384

4-year-old boy electrocuted.

The child was playing on the floor when he came into contact with a live plug blade and a heating grate. The incident occurred in the family room.

Case No. 960523CCC6231

76-year-old male died of electrocution.

While working on an aquarium, the man came into contact with a broken aquarium heater. The incident apparently occurred in the living area of an apartment.

Case No. 980827HCC2807

2-year-old female died of electrocution.

Live wires protruding from a wall outlet came into contact with a metal kitchen table, which in turn contacted a metal chair. The child came into contact with the chair and a heating grate. The incident occurred in the kitchen.

Case No. 990408HCC2395

9-month-old female electrocuted.

The cord of a pedestal fan was damaged and had been taped. The tape came loose and exposed a bare wire. The child was crawling on the floor and came into contact with the bare wire. The incident occurred in the kitchen.

Case No. 990609CCC3365

2-month-old boy electrocuted.

A heating pad that had been repaired with electrical tape was placed in a basinet with the child. The incident occurred in the bedroom.

Case No. 990316HCC2328

39-year-old female electrocuted.

The lamp socket of an antique lamp contacted the lamp frame. The woman apparently came into contact with the lamp frame when attempting to turn the lamp off. The incident occurred in the bedroom.

Case No. 981110HCC0083

1-year-old male died of electrocution.

The child bit into the cord of the amplifier. The amplifier cord had been repaired with tape. The incident occurred in the living room.

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

Panel Meeting Action: Accept

Number Eligible to Vote: 13

Ballot Results: Affirmative: 5 Negative: 8

Explanation of Negative:

BECKER: The substantiation does not support the expansion of this requirement.

DOBSON: The panel had recognized that a threshold for applications of GFCIs should include the presence of moisture. This change is a clear departure from this position and blankets a requirement that has yet to be clearly demonstrated as necessary.

There was ample information provided through the CPSC reports, which supposedly substantiated the need to require GFCIs in most receptacle locations. However when taking a closer look at this data there are three discrepancies that cannot be ignored:

- In many of cases, standard circuit breaker technology will detect the shorts and open the circuit providing equivalent protection.
- In the cases cited, there was no indication of the age of the electrical system, the age of the electrical appliances or how old were the age of cord sets, all of which are extremely important. We need to recognize the significant advances that have been made in the safety of our electrical systems and products. Fatalities have been on a major decline and the examples provided are most probably in antiquated systems, not new systems or equipment.
- Many of the examples provided are in areas of the residence that are now already required to be served by GFCIs indicating that those incidences occurred in areas of residences that were not compliant with current GFCI requirements and therefore should not be used to substantiate the need to expand the requirements.

Such extreme increases in the requirement should not be made with such questionable data. We therefore urge the committee to reject these comments and this blanket application of GFCIs.

O'NEIL: The panel has accepted this proposal without full consideration of the substantiation. Many of the accidents detailed in the submitter's substantiation would not have been eliminated through GFCI protection. GFCI protection does not protect an individual contact from contact between ungrounded and neutral conductors rather it protects from contact between ungrounded conductor contact and ground. Nuisance tripping of AFCIs is a concern where multiple connected appliances with acceptable leakage cumulatively add up to nuisance tripping.

The Standard for Information Technology Equipment, IEC/UL 60950-1, allows higher leakage currents than other Standards, and it is possible for a properly functioning home computer setup incorporating a PC, monitor, printer and other auxiliary equipment to have a cumulative leakage current high enough to trip a GFCI.

PORTER: UL supports the expansion of GFCI protection as a general principle. However, the use of properly operating personal computer equipment in family rooms, living rooms, libraries, dens, bedrooms, recreation rooms and other similar areas covered by 210.52(A) may result in cumulative leakage current levels that may trip the GFCI. The leakage current from any single piece of home computer equipment is typically well below the 3.5 ma level permitted by IEC/UL 60950-1. Nonetheless, several piece of computer equipment (e.g., a PC, monitor, printer, fax machine, external drive, wireless router,

paper shredder, etc.) may be connected to a multi-outlet relocatable power strip and this power strip in turn connected to a single receptacle outlet. Since the leakage current is an additive for the power strip through the single grounding conductor, it is possible that the combined leakage current could exceed the trip setting of a GFCI. Further study should be done on this issue to determine the likelihood of this occurring before requiring GFCI in these locations. UL does, however, continue to support requiring GFCIs for boat hoists as recommended in Comment 2-65.

ROCHÉ: With the proposed major expansion of the requirements for GFCI protection for receptacle outlets in dwelling units, new types of loads will be routinely supplied by GFCI equipment. Reports from UL that widely used loads such as PCs and their auxiliary equipment might cause tripping of GFCIs are a major example of potential incompatibilities. Further evaluation and resolution of these potential nuisance-tripping issues should be completed before the proposed expansion is implemented.

SIDHOM: As indicated in Susan Porter's, of UL, e-mail, the effect of computer loads on tripping GFCI is not known. For that reason, the expansion of using GFCI for nonlinear loads should be postponed for further studies by recognized labs.

TOMAN: My vote is negative on the panel action. This submitter has not provided adequate substantiation or documentation which would conclusively support a determination that the accidents would have been prevented by GFCI protection and would justify such a broad expansion of this requirement to every hallway, family room, dining room, living room, parlor, library, den, sunroom, bedroom, recreation room, or similar room or area of dwelling units. The design standard for GFCI locations is to place GFCIs where there is water or moisture, in accordance with Underwriters Laboratories GFCI location criteria. Also, UL notes that nuisance tripping of GFCIs located in areas where properly functioning home computer setups are installed may occur.

After closely reviewing the eleven accidents cited, it should be noted that one case involved a short circuit which could have been de-energized by a standard thermal magnetic circuit breaker, five cases involving damaged appliances or equipment, three cases which occurred in kitchens and are already required to be GFCI protected, and two cases that provided too little information in order to decisively determine in the eleven cases cited if a GFCI would have prevented the accidents. The substantiation is vague and lacks specific technical information or data. Also, parental negligence or an absence of parental supervision appears to be a significant factor.

Although GFCI protection is not required for all 125 volt, 15- and 20-ampere receptacles in the home, it is permitted and can be a design consideration. Justification to support such a major expansion to this requirement has not been provided.

WILKINSON: I am voting negative on this panel action. The submitter has not provided sufficient substantiation to support such an all encompassing expansion of GFCI requirements in dwelling units and UL has noted a possibility of nuisance tripping of some computers connected to GFCI protected circuits.

Comment on Affirmative:

KING: The submitter's substantiation is compelling. The CPSC case studies included in the substantiation are evidence that expansion of GFCI devices as recommended in Proposal 2-47 is warranted.

WEBER: I wish to applaud the panel on the acceptance of the comment's recommendation and the addition of a new section (9). Only the future can display the lives saved and increased safety provided for by the panel action. We have a long track record of the value of this means of protection and its expansion is certainly reasonable. Thank you all.

2-27 Log #1281 NEC-P02
(210.8(A))

Final Action: Reject

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: Aaron B. Chase, Leviton Mfg. Co. Inc.

Comment on Proposal No: 2-47

Recommendation: Reject Panel Action. The Panel should Accept the original Proposal.

Substantiation: The submitter clearly provided adequate substantiation whereby lives could have been saved by having GFCI protection. GFCIs are a proven technology and the Panel is responsible to employ technology wherever it can increase safety from electric shock or fire. Furthermore, the Panel statement for rejecting this Proposal is not adequate. The statement that "many of these accidents in Table 2 of the report occurred in areas of the dwelling units when GFCI protection is currently required." Even if true, did the Panel do a study to see if there was GFCI protection at these physical locations. A large number of dwellings were built prior to GFCI protection being required by the NEC. Hence, it is not known whether GFCI protection was present. Ms. Porter correctly cites data submitted to support the expanded use of these life saving devices. The Panel should reconsider the Action taken here based on the CPSC data just as it correctly did in 2-70. The Panel needs to be consistent and support this technology to protect life.

Panel Meeting Action: Accept in Principle

Panel Statement: See panel action on Comment 2-26.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 5 Negative: 8

Explanation of Negative:

BECKER: See my explanation of negative vote on comment 2-26.
 DOBSON: See my explanation of Negative Vote on Comment 2-26.
 O'NEIL: See my explanation of negative vote on Comment 2-26.
 PORTER: See my explanation of negative vote on Comment 2-26.
 ROCHE: See my Explanation of Negative Vote on Comment 2-26.
 SIDHOM: See my explanation of negative vote on Comment 2-26.
 TOMAN: See my Explanation of Negative Vote on Comment 2-26.
 WILKINSON: See my Explanation of Negative Vote on Comment 2-26.

Comment on Affirmative:

KING: See my explanation of affirmative vote on Comment 2-26.

2-28 Log #1391 NEC-P02
 (210.8(A))

Final Action: Reject

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: Kevin J. Brooks, IBEW Local #16

Comment on Proposal No: 2-47

Recommendation: Accept Mr. King's proposal in full as submitted. Revised 210-8(A), as submitted by him and published in the 2004 ROP, page number 221, 2-47 Log 2445 NEC-P02.

Substantiation: With the development of GFCIs, the cost of each device has dropped to a cost that we have moral value to require them on all general use, 15 and 20 ampere branch circuits in a dwelling. I fully agree with Mr. King's data and genuine concern of fatalities. One of the deaths was in my home-town. We have to ask ourselves what should be the cost of a human life, on a problem that can be solved by the NFPA in the code book. If you would take a survey...most homeowners would be happy to have the protection afforded by GFCIs in a new home at the cost they are now, per device. This is especially true if they have children living in that dwelling. The NFPA must always be on the front of safety. There is a fork in the road on this issue, are we going to go forward in saving lives, or are we going to place a human life over the cost of GFCIs in new dwelling construction. If we choose the bad fork in the road, I do not want to explain how we could have required GFCIs in new dwelling construction with very little cost and we did not, allowing a preventable death to a loved one.

Panel Meeting Action: Accept in Principle

Panel Statement: See panel action on Comment 2-26.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 5 Negative: 8

Explanation of Negative:

BECKER: See my explanation of negative vote on comment 2-26.
 DOBSON: See my explanation of Negative Vote on Comment 2-26.
 O'NEIL: See my explanation of negative vote on Comment 2-26.
 PORTER: See my explanation of negative vote on Comment 2-26.
 ROCHE: See my Explanation of Negative Vote on Comment 2-26.
 SIDHOM: See my explanation of negative vote on Comment 2-26.
 TOMAN: See my Explanation of Negative Vote on Comment 2-26.
 WILKINSON: See my Explanation of Negative Vote on Comment 2-26.

Comment on Affirmative:

KING: See my explanation of affirmative vote on Comment 2-26.

2-29 Log #1399 NEC-P02
 (210.8(A))

Final Action: Reject

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: William H. King, Jr., U.S. Consumer Product Safety Commission

Comment on Proposal No: 2-47

Recommendation: Reconsider the part of Proposal 2-47 identified as 210.8(A)(1).

Substantiation: The substantiation provided to the panel with the proposal included a sample of the numerous electrocutions of occupants of homes. In a review of the detailed investigation reports for the cases cited, the conclusion is that these incidents were the result of ground-fault shocks to innocent victims that would likely have been prevented by the protection afforded by ground-fault circuit interrupters (GFCIs). While in a few cases the current path through the victim's body was indeterminate based on the details recorded, the electrocutions were not likely the result of line-to-line shocks. All of the specific cases cited in the proposal substantiation were investigated by CPSC field staff and occurred at locations where GFCI protection is not currently required.

Since the ROP meeting when the panel acted on this proposal, an economic cost/benefit study has been completed by CPSC staff economists that indicates that the benefits of providing additional GFCI protection in homes compares favorably with the added cost of their installation. I have provided NFPA with a copy of this study.

The panel statement that damaged appliances and portable cords appear to be significant factors that led to the electrocutions cited is accurate. Protecting personnel from these hazardous conditions is the major reason for providing the GFCI protection.

It was noted in the panel statement that providing GFCI protection for all 125-volt, 15- and 20-ampere receptacles in a home is permitted and can be a design consideration. The CPSC analysis included with this comment indicates that 75-88 deaths per year may be averted by expanding the required coverage for GFCI protection to receptacles in a residence not presently required to have GFCI protection.

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

Panel Meeting Action: Accept in Principle

Panel Statement: See panel action on Comment 2-26.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 5 Negative: 8

Explanation of Negative:

BECKER: See my explanation of negative vote on comment 2-26.
 DOBSON: See my explanation of Negative Vote on Comment 2-26.
 O'NEIL: See my explanation of negative vote on Comment 2-26.
 PORTER: See my explanation of negative vote on Comment 2-26.
 ROCHE: See my Explanation of Negative Vote on Comment 2-26.
 SIDHOM: See my explanation of negative vote on Comment 2-26.
 TOMAN: See my Explanation of Negative Vote on Comment 2-26.
 WILKINSON: See my Explanation of Negative Vote on Comment 2-26.

Comment on Affirmative:

KING: See my explanation of affirmative vote on Comment 2-26.

2-30 Log #2875 NEC-P02
 (210.8(A))

Final Action: Reject

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: Aaron Williams Lansing, MI

Comment on Proposal No: 2-47

Recommendation: The panel should accept this proposal.

Substantiation: As referenced in the proposal, there is enough substantiation for this change.

Panel Meeting Action: Accept in Principle

Panel Statement: See panel action on Comment 2-26.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 5 Negative: 8

Explanation of Negative:

BECKER: See my explanation of negative vote on comment 2-26.
 DOBSON: See my explanation of Negative Vote on Comment 2-26.
 O'NEIL: See my explanation of negative vote on Comment 2-26.
 PORTER: See my explanation of negative vote on Comment 2-26.
 ROCHE: See my Explanation of Negative Vote on Comment 2-26.
 SIDHOM: See my explanation of negative vote on Comment 2-26.
 TOMAN: See my Explanation of Negative Vote on Comment 2-26.
 WILKINSON: See my Explanation of Negative Vote on Comment 2-26.

Comment on Affirmative:

KING: See my explanation of affirmative vote on Comment 2-26.

2-31 Log #2978 NEC-P02
 (210.8(A))

Final Action: Reject

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: Steve Campolo, Leviton Manufacturing Co., Inc.

Comment on Proposal No: 2-47

Recommendation: Accept original proposal.

Substantiation: The CPSC incident reports (981110HCC3049, 970423CCC1157, 980826HCC2807, 96092CCC7462, and 970220HCC7384) are much more than needed to support the original proposal. The panel points out that expanded GFCI usage is permitted, but this rejection reason is inconsistent with mandating combination AFCI's which are also permitted and in the same light, not needing of a mandate.

Panel Meeting Action: Accept in Principle

Panel Statement: See panel action on Comment 2-26.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 5 Negative: 8

Explanation of Negative:

BECKER: See my explanation of negative vote on comment 2-26.
 DOBSON: See my explanation of Negative Vote on Comment 2-26.
 O'NEIL: See my explanation of negative vote on Comment 2-26.
 PORTER: See my explanation of negative vote on Comment 2-26.
 ROCHE: See my Explanation of Negative Vote on Comment 2-26.
 SIDHOM: See my explanation of negative vote on Comment 2-26.
 TOMAN: See my Explanation of Negative Vote on Comment 2-26.
 WILKINSON: See my Explanation of Negative Vote on Comment 2-26.

Comment on Affirmative:

KING: See my explanation of affirmative vote on Comment 2-26.

2-32 Log #3256 NEC-P02
 (210.8(A))

Final Action: Reject

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: Michael I. Callanan, IBEW

Comment on Proposal No: 2-47

Recommendation: This proposal should be accepted.

Substantiation: The panel statement reads in part as follows: "Damaged appliance and portable cords appear to be significant factors. Many of these accidents in Table 2 of the report occurred in areas of dwelling units where GFCI protection is currently required." The submitter has presented ample

documented cases where electrocutions resulted from the use of common electrical appliances in the home. Contrary to the panel statement many of the cases were in areas where GFCI protection is not already required. Panel 2 has failed to recognize the following Consumer Product Safety Commission case numbers in the substantiation, case no. 001108HCC0080, case no. 990316HCC2328, case no. 991014CC3105, case no. 981110HCC0083, case no. 98026HCC2807, case no. 990609CCC3635, case no. 981110HCC3049, case no. 981110HCC2055, case no. 980219CCC3606, case no. 980202CCC3570, case no. 9709009CWE7048, case no. 960523CCC6231, case no. 970423CCC1157, case no. 96093CCC7462, and case no. 970220HCC7384 all of which involve electrocutions in areas where GFCI protection is not currently required. Panel 2 also needs to clarify in their statement, "Damaged appliance and portable cords appear to be significant factors." Is the panel implying that GFCI protection is not intended to protect persons from the hazards of an electrical shock resulting from their interface with faulty electrical appliances? The use of properly functioning electrical appliances is expected to be free from the hazards of electrical shock. It is when these appliances are in some way damaged and or human negligence in the use of electrical appliances is involved that a shock hazard is present. GFCI protection has a proven track record of saving lives. Expanding the use of GFCI protection as this submitter has requested will undoubtedly save many more lives. In light of the documentation presented to Panel 2, further consideration should be given to this proposal. This Comment represents the official position of the International Brotherhood of Electrical Workers Codes and Standards Committee.

Panel Meeting Action: Accept in Principle

Panel Statement: See panel action on Comment 2-26.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 5 Negative: 8

Explanation of Negative:

BECKER: See my explanation of negative vote on comment 2-26.
 DOBSON: See my explanation of Negative Vote on Comment 2-26.
 O'NEIL: See my explanation of negative vote on Comment 2-26.
 PORTER: See my explanation of negative vote on Comment 2-26.
 ROCHÉ: See my Explanation of Negative Vote on Comment 2-26.
 SIDHOM: See my explanation of negative vote on Comment 2-26.
 TOMAN: See my Explanation of Negative Vote on Comment 2-26.
 WILKINSON: See my Explanation of Negative Vote on Comment 2-26.

Comment on Affirmative:

KING: See my explanation of affirmative vote on Comment 2-26.

2-33 Log #3464 NEC-P02 **Final Action: Reject**
 (210.8(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: Jack Floyd, Downie, Turner & Burness

Comment on Proposal No: 2-47

Recommendation: CMP-2 should accept this proposal.

Substantiation: If the average number of branch circuits in a home is 10 and half are already protected by GFCIs, the cost of protecting the remaining five circuits should be under \$50.00 per house. Even if an additional 10 branch circuits required GFCI protection the cost would be under \$100.

While this proposal is fully justified based on electrocution incident data submitted with the proposal, CMP-2 is also asked to consider the side benefit of a reduction in fires resulting from line-to-ground arcing faults. While fire incident data does not allow line-to-ground fault initiated fires to be broken out and quantified, a portion of electrical fires clearly originate in this manner. Indeed, today's AFCI circuit breakers all detect and interrupt such arcing faults at 30 mA or so. GFCIs would detect and interrupt such arcing at 5 mA and at one third the cost of an AFCI. For the same \$50 to \$100 cost of preventing the clearly documented electrocutions, an improved level of fire protection would be afforded at no additional cost and with a product with a proven performance record.

Panel Meeting Action: Accept in Principle

Panel Statement: See panel action on Comment 2-26.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 5 Negative: 8

Explanation of Negative:

BECKER: See my explanation of negative vote on comment 2-26.
 DOBSON: See my explanation of Negative Vote on Comment 2-26.
 O'NEIL: See my explanation of negative vote on Comment 2-26.
 PORTER: See my explanation of negative vote on Comment 2-26.
 ROCHÉ: See my Explanation of Negative Vote on Comment 2-26.
 SIDHOM: See my explanation of negative vote on Comment 2-26.
 TOMAN: See my Explanation of Negative Vote on Comment 2-26.
 WILKINSON: See my Explanation of Negative Vote on Comment 2-26.

Comment on Affirmative:

KING: See my explanation of affirmative vote on Comment 2-26.

2-34 Log #3257 NEC-P02 **Final Action: Reject**
 (210.8(A) and (B))

Submitter: Michael I. Callanan, IBEW

Comment on Proposal No: 2-44

Recommendation: This proposal should be accepted.

Substantiation: Contrary to the panel statement, I believe the proposer has referenced sufficient substantiation to warrant this change. This Comment represents the official position of the International Brotherhood of Electrical Workers Codes and Standards Committee.

Panel Meeting Action: Reject

Panel Statement: See panel statement on Comment 2-22.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 12 Negative: 1

Explanation of Negative:

WEBER: See my explanation of negative on Comment 2-22. Sufficient substantiation has been provided and the practical safeguarding should not be disregarded because of potential cost factors or the supposed potential poor performance since that has not been noted in the field as a problem in recent years.

2-35 Log #3604 NEC-P02 **Final Action: Reject**
 (210.8(A) and (B))

Submitter: Lanny G. McMahon Phoenix, AZ

Comment on Proposal No: 2-44

Recommendation: Accept this proposal as submitted.

Substantiation: I respectfully disagree with Panel 2 that sufficient substantiation was not submitted to accept this Proposal. There were several pages of substantiation submitted during the 2002 code cycle supporting this change (See ROC 2-13, Log 1058). During the 2002 process, Panel 2 rejected the Proposal for the same reason, so it did not make much sense to resubmit the documentation. The rejection of the Proposal, however, was challenged on the floor at the NFPA Annual Meeting. At that time, the Proposal received overwhelming support from the membership. What additional substantiation is needed? Is it necessary to show fatalities before we can provide "practical safeguarding for persons"? Ground-fault circuit-interrupter protection is a proven technology, and the requirements for personnel protection should apply consistently. Obviously, electricity does not single out specific occupancies - the hazards are the same. Accepting this proposal will afford the same level of personnel protection in all occupancies. It will also move the code in the direction of consistency and usability. Again, the time is right for this change! I encourage the Panel to accept this Proposal.

Panel Meeting Action: Reject

Panel Statement: See panel statement on Comment 2-22.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 12 Negative: 1

Explanation of Negative:

WEBER: See my explanation of negative vote on Comments 2-22 and 2-34.

2-36 Log #172 NEC-P02 **Final Action: Reject**
 (210-8(A), Exceptions 1, 2, and 3)

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: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education

Comment on Proposal No: 2-47

Recommendation: Accept, but without the first three exceptions.

Substantiation: This will not eliminate all electrocutions, but no one can deny that it will make people so much safer, subsuming even some of the safety purposes ascribed to AFCIs. The exceptions I propose leaving out are unnecessary for the avoidance of nuisance trips in modern equipment, with low leakage current of 1/2 to 3/4 ampere.

Panel Meeting Action: Accept in Principle

Panel Statement: See panel action on Comment 2-26.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 5 Negative: 8

Explanation of Negative:

BECKER: See my explanation of negative vote on comment 2-26.
 DOBSON: See my explanation of Negative Vote on Comment 2-26.
 O'NEIL: See my explanation of negative vote on Comment 2-26.
 PORTER: See my explanation of negative vote on Comment 2-26.
 ROCHÉ: See my Explanation of Negative Vote on Comment 2-26.
 SIDHOM: See my explanation of negative vote on Comment 2-26.
 TOMAN: See my Explanation of Negative Vote on Comment 2-26.
 WILKINSON: See my Explanation of Negative Vote on Comment 2-26.

2-37 Log #2408 NEC-P02
(210.8(A)(5) Exception No. 3)

Final Action: Reject

Submitter: Leif O. Pihl, IBEW LU 292

Comment on Proposal No: 2-58

Recommendation: Insert words “duplex”, and drop the new 2nd sentence from the proposal.

It should then read as follows:

Exception No. 3: A duplex receptacle supplying only a permanently installed fire alarm or burglar alarm system shall not be required to have ground-fault circuit-interrupter protection.

Substantiation: I disagree with the Panels statement that the existing language already addresses the concerns raised in the original proposal. This modification will make it clear that installation of a duplex receptacle is an appropriate use.

Panel Meeting Action: Reject

Panel Statement: The present language already permits such an application. The installation can be accomplished by removing the tabs on a duplex receptacle to disable the unused portion. The submitter’s recommendation would permit a duplex receptacle to be installed without GFCI protection on the unused portion. This is exactly the situation the panel intends to avoid.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

2-38 Log #2349 NEC-P02
(210.8(A)(7))

Final Action: Accept in Principle

Submitter: James M. Imlah, City of Hillsboro

Comment on Proposal No: 2-42

Recommendation: Revise text to read as follows:

210.8(A)(7) ~~Wet-bar~~ Sinks - where the receptacles are installed to serve the countertop surfaces and are located within 1.8 m (6 ft) of the outside edge of the ~~wet-bar~~ sink.

Panel Statement from ROP:

“The submitter has not substantiated a requirement for the addition of GFCI protection at laundry sinks. The substantiation provided is of a general nature and lacks any specific supporting data that warrants expansion of the requirement to cover laundry sinks that are installed in locations that are not already covered by the requirements of 210.8(A).”

Substantiation: Presently, the IAEE (International Association of Electrical Inspectors) nor the NFPA to my knowledge have a mechanism for compiling that data in a detail acceptable to the panel. We, as inspectors, during on-site evaluations of electrical installations or in training programs with electricians, contractors, designers and even other inspectors have to attempt to justify and explain why a laundry sink or tub is any less a hazard for an electrocution as compared to kitchen sinks, bathroom sinks or lavatories, and wet bar sinks. We all know that a car is unsafe to drive without brakes, so should we be able to acknowledge that an electrical safety hazard exists at laundry sinks or tubs under a similar analogy. Given the opportunity to encounter the same damp and wet location and grounded surfaces scenarios, and the proven safety record of GFCI protection required for the other locations, it is prudent to support the inclusion of this new requirement as well from purely a safety aspect. The time has come to protect all sink location receptacles used within dwelling units with GFCI protection when a receptacle is installed within 1.8 or 6 ft of the outside edge of any sink location.

The Oregon Chapter of IAEE would like reconsideration and present the following additional information:

1. There are many grounded fixed appliances in close proximity (within 6 ft) of the laundry sink such as washers, dryers and water heaters. In addition, irons, hair dryers and similar items with ungrounded polarized and non-polarized cord caps are commonly used in this area, presenting the same shock hazard found in other areas where the NEC currently requires GFCI protection.

2. Given the evolution of the GFCI requirements in dwelling units, there has been no technical substantiation provided to exclude this last sink location where electrical appliances are utilized in areas where water and other grounded surfaces are also present.

Panel Meeting Action: Accept in Principle

Revise the text in 210.8(A)(7) to read as follows:

“(7) Laundry, Utility, and Wet Bar Sinks. Where the receptacles are installed within 1.8 m (6 ft) of the outside edge of the sink.”

Panel Statement: The panel has revised the title to include sinks other than those in kitchen and bathroom locations because they are covered by other provisions. The panel deleted the reference to countertop surfaces because not all laundry sinks are installed in a countertop.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

2-39 Log #3252 NEC-P02
(210.8(A)(7))

Final Action: Accept in Principle

Submitter: Michael I. Callanan, IBEW

Comment on Proposal No: 2-62

Recommendation: This proposal should be accepted.

Substantiation: The submitter seeks to expand the requirement for GFCI protection for receptacles that serve counter top spaces and are located in close proximity of any sink. The panel statement to reject this proposal reads as follows: “The submitter has not substantiated a requirement for the addition of GFCI protection at all sinks.” The installation of receptacles to serve countertop spaces is intended to supply portable cord and plug connected appliances. When these receptacles are located within six feet of any sink the risk of an electrical shock or electrocution is greatly increased. The technical substantiation to support this change already exists on file with the NFPA. See my comment on Proposal 2-61. This comment represents the official position of the International Brotherhood of Electrical Workers codes and Standards Committee.

Panel Meeting Action: Accept in Principle

Panel Statement: See panel action and statement on Comment 2-38.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

2-40 Log #3254 NEC-P02
(210.8(A)(7))

Final Action: Accept in Principle

Submitter: Michael I. Callanan, IBEW

Comment on Proposal No: 2-61

Recommendation: This panel should have accepted this proposal.

Substantiation: GFCI protection has documented proof that it saves lives. GFCI protection is required to be installed in dwellings as per 210.8 in Bathrooms, Garages and accessory buildings, Outdoors, Unfinished Basements, Kitchens, Wet bar sinks, and Boatouses. If the laundry tub were installed in a garage it would be GFCI protected. If the laundry tub were installed outdoors it would be GFCI protected. If the laundry tub were installed in an unfinished basement with no appliances it would be GFCI protected. If the laundry tub were installed in a boathouse it would be GFCI protected. If a laundry tub were installed in a counter top it could be considered a wet bar. But stand it alone in a laundry room and it does not require GFCI protection. If the laundry tub were installed in a garage with a washer and dryer it would not be GFCI protected. The application and use has not changed, only the location. It will be used in all locations the same way and should be protected the same way in all locations.

We agree with the negative comment of Mr. Weber expressed in Proposal 2-42. When it is elf-evident that the electrical shock hazards presented in specific types of applications, such as wet bar sinks and laundry tubs in this case, are the same, the burden of proof should not be on producing specific “supporting data” i.e. electrocutions. In meeting the purpose of the code, proactive action to expand the provision to those similar installations seems warranted.

This comment represents the official position of the International Brotherhood of Electrical Workers Codes & Standards Committee.

Panel Meeting Action: Accept in Principle

Panel Statement: See panel action and statement on Comment 2-38.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

2-41 Log #3255 NEC-P02
(210.8(A)(7))

Final Action: Accept in Principle

Submitter: Michael I. Callanan, IBEW

Comment on Proposal No: 2-61

Recommendation: This proposal should be accepted.

Substantiation: The panel statement to reject this proposal as referenced to Proposal 2-42 reads as follows: “The submitter has not substantiated the requirement for the addition of GFCI protection at laundry sinks.” The technical substantiation to support this change is already available at the NFPA Headquarters. A person’s interaction with electrical appliances and water greatly increases that person’s risk of electrical shock or electrocution. The amount of current that flows through the human body is inversely proportional to the body’s resistance. The lower the resistance the larger the amount of current that flows through the body. When a person’s skin becomes wet due to moisture from the surrounding environment or contact with water from a source such as a laundry sink his/her body resistance is reduced significantly. Studies have shown up to a ninety nine percent reduction in body resistance is possible when the skin’s surface is wet. This lowered resistance will permit dangerous levels of current to flow through the body. Receptacles installed to serve countertop spaces in laundry areas are intended for the use of electrical appliances associated with doing laundry. Electrical appliances such as irons require the addition of water for their normal operation thus exposing a person using this type of appliance to the potential hazard of an electrical shock or

electrocution. Employing GFCI protection will limit the amount of current that flows outside of the circuits intended path to a safe level (4-6 milliamps) thus protecting persons from the dangerous levels of current that may exist in this type of environment. In light of these facts, Panel 2 should reconsider its position on this proposal. This comment represents the official position of the International Brotherhood of Electrical Workers Codes and Standards Committee.

Panel Meeting Action: Accept in Principle

Panel Statement: See panel action and statement on Comment 2-38.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

2-42 Log #171 NEC-P02
(210.8(A)(9))

Final Action: Reject

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education

Comment on Proposal No: 2-50

Recommendation: Accept in principle, but append "within 2 meters (6 ft) of accessible grounded metal larger than screw heads."

Substantiation: The submitter's concern is valid, but need not apply to, for example, a pull-chain porcelain with an integral receptacle, where there is no accessible metal box, or, more to the point, where the duct or other equipment such as killed those electricians is absent.

Panel Meeting Action: Reject

Panel Statement: The submitter did not provide any substantiation to support acceptance of the proposal to provide GFCI requirements to attic spaces.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 12 Negative: 1

Explanation of Negative:

KING: I agree with the submitter of this Comment that persons utilizing receptacles in attic spaces for the purpose of servicing installed equipment are exposed to a greater risk of electric shock when in contact with metal surfaces associated with the equipment. Confined space together with lower body resistance due to perspiration would greatly increase an individual's risk of electric shock or electrocution. The proposal referenced by this comment sites two electrocutions that resulted from electricians contacting the hot wire of an unprotected circuit. The addition of GFCI protection for receptacles serving attic spaces would save many lives and should be required.

2-43 Log #173 NEC-P02
(210.8(A)(9))

Final Action: Accept in Principle

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education

Comment on Proposal No: 2-42

Recommendation: Accept as proposed.

Substantiation: Two words: steam irons.

Consider how many cooks leave a coffee maker plugged in as they fill it at the tap, but don't leave a steam iron plugged in as they fill it at the tap? The same problem exists at both locations, and a laundry sink may be more likely than a kitchen sink to sit on a concrete floor, and furthermore, one that is wet while people stand on it.

Panel Meeting Action: Accept in Principle

Panel Statement: See panel action and statement on Comment 2-38.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

2-44 Log #3251 NEC-P02
(210.8(A)(9) (New))

Final Action: Accept in Principle

Submitter: Michael I. Callanan, IBEW

Comment on Proposal No: 2-63

Recommendation: This proposal should be accepted.

Substantiation: The submitter of this proposal provides panel 2 with a unique and practical application of laundry tubs that typically would involve a person's interaction with both water and cord and plug connected electrical appliances such as a hair dryer. The dangers associated with the use of electricity and water is well documented. See my comment on Proposal 2-61. Receptacles installed to serve counter top spaces are intended for the connection of cord and plug connected electrical appliances. Where these receptacles are installed within six feet of a laundry tub GFCI protected devices should be employed. This comment represents the official position of the International Brotherhood of Electrical Workers Codes and Standards Committee.

Panel Meeting Action: Accept in Principle

Panel Statement: See panel action and statement on Comment 2-38.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

2-45 Log #3253 NEC-P02
(210.8(A)(9))

Final Action: Accept in Principle

Submitter: Michael I. Callanan, IBEW

Comment on Proposal No: 2-63

Recommendation: This panel should have accepted this proposal.

Substantiation: GFCI protection has documented proof that it saves lives. GFCI protection is required to be installed in dwellings as per 210.8 in Bathrooms, Garages and accessory buildings. Outdoors, unfinished basements, kitchens, wet bar sinks, and boathouses. If a sink were installed in a garage it would be GFCI protected. If a sink were installed outdoors it would be GFCI protected. If a sink were installed in an unfinished basement with no appliances it would be GFCI protected. If a sink were installed in a boathouse it would be GFCI protected. If a sink were installed in a counter top it could be considered a wet bar. But stand it alone in a laundry room and it does not require GFCI protection. If a sink were installed in a garage with a washer and dryer it would not be GFCI protected. The application and use has not changed, only the location. It will be used in all locations the same way and should be protected the same way in all locations.

We agree with the negative comment of Mr. Weber expressed in Proposal 2-42. When it is self-evident that the electrical shock hazards presented in specific types of installations, in this case around laundry rooms, are the same, the burden of proof should not be on producing specific "supporting data" i.e. electrocutions. In meeting the purpose of the code, proactive action to expand the provision to those similar installations seems warranted.

This comment represent the official position of the International Brotherhood of electrical Workers Codes and Standards committee.

Panel Meeting Action: Accept in Principle

Panel Statement: See panel action and statement on Comment 2-38.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

2-46 Log #3259 NEC-P02
(210.8(A)(9))

Final Action: Accept in Principle

Submitter: Michael I. Callanan, IBEW

Comment on Proposal No: 2-42

Recommendation: The Panel should reconsider this proposal and accept it.

Substantiation: We fully agree and support the position of Mr. Weber with regard to the determination of "data" necessary to substantiate these types of GFCI expansion proposals.

According to the United States Consumer Products small appliances account for 24 percent of all electrocutions (source United States Consumer Products Commission). Couple this fact along with data compiled by State Farm Insurance that washing machine hose failures cause about \$170 million in damage to homes in the United States each year (source State Farm Insurance, the likelihood for electrocution in the laundry room increase. Construction styles have changed over the years to where now it is common place to have counter tops, laundry sinks, washer and dryers in close proximity to each other. It is very common during home inspections to find extension cords, fans, radios, televisions, stereos, irons, tool chargers as well as many other appliances and electrical equipment on the counter top in laundry rooms. All of the appliances that cause 24 percent of all electrocutions often are located in an area subject to moisture and hose failures apt to cause substantial flooding. The same hazards exist near laundry sinks as on any kitchen counter. In checking with safety bulletins put out by every insurance company and Public Service Company the hazards of electrical shock in laundry rooms are highlighted.

Conclusions: Electrical hazards represent a serious, widespread danger in and near laundry rooms. Practically all members of the household are exposed to electrical energy during the performance of their daily duties. The purpose of the National Electrical Code is the practical safeguarding of persons and property from hazards arising from the use of electricity. The NEC serves as the basis for electrical building codes across the United States and has the responsibility to address this hazard.

This comment represents the official position of the International Brotherhood of Electrical Workers codes and Standards Committee.

Panel Meeting Action: Accept in Principle

Panel Statement: See panel action and statement on Comment 2-38.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

2-47 Log #531 NEC-P02
(210.8(B))

Final Action: Reject

Submitter: Albert R. Pressler, J.A.R.Engineering,Inc.

Comment on Proposal No: 2-76

Recommendation: We recommend that the wording in 210.8(B), Other than Dwelling Units, be modified to read as indicated in Paragraph (A) Exception No. 1 of 210.8:

"Receptacles that are not readily accessible."

The present exception listed should become Exception No. 2.

Substantiation: The problem, for example, could occur when a non-dwelling area such as a site with a kitchen or an eating establishment with smaller appliances such as a plug in refrigerator and receptacles not easily accessed could be very easily tripped out. As such, these could go for hours without being noticed as lacking power during off work hours. This could result in food spoilage and create a possible health problem if food slightly turned is served due to this failure.

Panel Meeting Action: Reject

Panel Statement: The panel reaffirms its panel statement in Proposal 2-76. Inaccessibility of the device does not eliminate the hazard.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

2-48 Log #1074 NEC-P02
(210.8(B))

Final Action: Reject

Submitter: Neil F. LaBrake, Jr., Niagara Mohawk, a National Grid Company / Rep. Edison Electric Institute

Comment on Proposal No: 2-70

Recommendation: Revise CMP-2's action to add a second sentence as follows:

(4) Outdoors in public spaces, for the purposes of this section a public space is defined as any space that is for use by or is accessible to the public. Receptacles supplying items that are incompatible with ground-fault circuit-interrupter devices shall not be required to have ground-fault circuit-interrupter protection.

Substantiation: The new text proposed by the Panel is not compatible for some equipment such as vending machines. Receptacles supplying this type of equipment are typically not accessible to the public. Refer to similar requirements in 525.23.

Panel Meeting Action: Reject

Panel Statement: GFCI protection for vending machines is covered by 422.16(B)(4). In addition, no substantiation has been provided referencing compatibility of other equipment.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 12 Negative: 1

Explanation of Negative:

O'NEIL: The panel has created a conflict with other parts of the code (specifically 525.23(B)) Appliance Receptacles. Receptacles supplying items, such as cooking and refrigeration equipment, that are incompatible with ground-fault circuit-interrupter devices shall not be required to have ground-fault circuit-interrupter protection. Current product standards allow multiple connected appliances to exceed minimum trip levels of GFCI protection safely and an exception must be allowed to accommodate listed devices which by design exceed minimum trip levels in order to avoid nuisance tripping. Product standard which exceeds minimum trip levels of GFCI protection should and do mandate additional safeguards to ensure personnel protection. GFCI incompatibility is a fact of product design and listing and therefore across the board requirement in public spaces is unenforceable code language.

Reference multiple product standards which must be revised prior to code not allowing exception to GFCI requirement with additional safeguards.

2-49 Log #1332 NEC-P02
(210.8(B))

Final Action: Reject

Submitter: Richard A. Holub Middletown, DE

Comment on Proposal No: 2-74

Recommendation: The CMP should have accepted the proposal as submitted. 210.8(B) Other Than Dwelling Units. All 125-volt, single-phase, 15- and 20-ampere receptacles installed in the locations specified in (1), (2), (3), and (4) shall have ground-fault circuit-interrupter protection for personnel:

- (1) Bathrooms
- (2) Rooftops
- (3) Kitchens
- (4) Other outdoor receptacles

Substantiation: I have reviewed the panel's action on Proposal 2-70 (Log #2446) and the action specifically states: "The panel revision recognizes that the rule does not apply to those industrial and other locations where the general public does not have access." The statement does not address the concerns raised in the initial proposal. Repeated below:

A review of the 2002 Serious Incidents to date at a large chemical company revealed that three of the electrical incidents involved 120V outdoor receptacles. In the most recent case, a mechanic was using a classified area receptacle for outside maintenance. Standard practice is to plug in a "pigtail" cord and then plug a GFCI into the "pigtail" transition. The mechanic involved then plugged in an extension cord and finally the tool that he was using (this site uses GFCI protection as part of their OSHA required assured-grounding program). A loose ground wire internal to the plug of the "pigtail" cord came in contact with the hot conductor and energized the case of the tool that he was using. In this instance, the mechanic was using a "sawzall". Had the circuit breaker not tripped, and had the mechanic not been wearing gloves at the time of the incident, the mechanic would almost certainly have been injured. The

annual inspection of the "pigtail" was current and there was no visible sign of a problem with the "pigtail" from the outside. The GFCI did not trip as the fault was upstream of the GFCI.

The second case found involved an operator plugging in a 120V cord to supply the heating circuit on a trailer he was unloading. The delivery occurred in the rain. The wet conditions, defective equipment, and wet gloves the operator was wearing all contributed to the shock the operator received.

The final case found involved a contractor who was shocked while attempting to plug in a GFCI with the appropriate adapter to a classified outdoor receptacle in a tank farm.

The above documented safety incidents are real, and are pulled from the Serious Incidents published within an extremely safety conscious company. If these incidents are happening here, they are definitely happening throughout the industry. In all of these incidents, the person could have been killed. All of these incidents could have been prevented if the outdoor receptacles were GFCI protected.

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

Panel Meeting Action: Reject

Panel Statement: The panel notes that the incidents described do not clearly substantiate or provide adequate support to warrant GFCI protection to all outdoor receptacles.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 12 Negative: 1

Explanation of Negative:

KING: The accident reports submitted in this comment are compelling and warrant consideration from Panel 2 to extend GFCI protection to all 125 volt, single-phase, 15- and 20- ampere receptacles to all outdoor locations.

2-50 Log #1390 NEC-P02
(210.8(B))

Final Action: Reject

Submitter: Kevin J. Brooks, IBEW Local #16

Comment on Proposal No: 2-70

Recommendation: This proposal should be accepted as submitted. 210-8(B) [revised].

Substantiation: I did not realize that there were two kinds of electricity on general use receptacles. One type seems to be for dwellings, and the other for nondwellings. The code now requires that some general use receptacles in dwellings be GFCI protected, as they should be. But on the other hand, a mystery type of protection, of which I am unaware of somehow protects the average person in a public setting. The average person will most likely spend over 8 hours of work in a setting away from their dwelling a day. Given that this is a lot of time, can it be explained how these workers are being protected from shock without GFCI protection. This is not a money issue, it is a basic human safety issue. The cost of a GFCI is very inexpensive when you take into account, that a person who does receive shock will be injured, and when you involve all of the lawyers who will be involved. Again, this is a simple issue, do we want the best protection we can get, especially when it is inexpensive, or do we want to risk injury, death and a mountain of legal problems that will evolve from a shock? I, myself will be on the record that this proposal should be accepted. There is a clear decision on this proposal. Safety vs. a very low cost, and what the entire Code Book stands for. TO PROTECT HUMAN LIFE AND LOSS!!!!!!!

Panel Meeting Action: Reject

Panel Statement: The submitter has not provided sufficient additional substantiation to support requiring GFCI protection for the locations specified in Proposal 2-70. The panel reaffirms its panel statement on Proposal 2-70. The submitter may also want to review Proposal 17-6, which addresses a number of the incidents shown in the substantiation.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 12 Negative: 1

Explanation of Negative:

KING: See my explanation of negative vote on Comment 2-53.

2-51 Log #1937 NEC-P02
(210.8(B))

Final Action: Reject

Submitter: Michael I. Callanan, IBEW

Comment on Proposal No: 2-64

Recommendation: This proposal should be deleted.

Substantiation: As the submitter pointed out, the hazard is the same regardless of occupancy. This comment represents the official position of the International Brotherhood of Electrical Workers Codes and Standards Committee.

Panel Meeting Action: Reject

Panel Statement: It is not clear what the submitter is asking. Proposal 2-64 was accepted in principle and could not be deleted.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

2-52 Log #2977 NEC-P02 **Final Action: Reject**
(210.8(B))

Submitter: Steve Campolo, Leviton Manufacturing Co., Inc.
Comment on Proposal No: 2-70
Recommendation: Agree with panel action to accept original proposal.
Substantiation: While I agree with the panel action, it is inconsistent with the action on 2-47. The CPSC data is clear in 2-70 and 2-47, yet the panel action is different. Why?
Panel Meeting Action: **Reject**
Panel Statement: The submitter's comment is not clear. The panel action on Proposal 2-70 was not to accept the original proposal but to accept in principle in part. The data provided in Proposal 2-47 pertained to dwelling units only and not to other than dwelling units. See panel statement on Proposal 2-50.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 12 Negative: 1
Explanation of Negative:
 KING: See my explanation of negative vote on Comment 2-53.

2-53 Log #3250 NEC-P02 **Final Action: Reject**
(210.8(B))

Submitter: Michael I. Callanan, IBEW
Comment on Proposal No: 2-70
Recommendation: This proposal should be accepted.
Substantiation: The submitter has provided panel 2 with sufficient data to support this change. In his substantiation, the submitter cites several case studies where electrocutions occurred as a result of persons coming in contact with damaged or altered electrical equipment in public places. An equal number of cases involving electrocutions that occurred both indoors and outdoors were presented. Panel 2 failed to recognize the following cases, CPSC Case No. 970922CCC2427, Case No. 98073CCC1613 and Case No. 881202CCC1072 all of which involved electrocutions that occurred indoors. The result is a panel action that limits expanding requirements for GFCI protection in public places to outdoor locations only. Given the documentation presented, panel 2 should reconsider its position on this proposal. Extending the requirements for GFCI protection as recommended in this proposal could potentially save many more lives. The Consumer Product Safety Commission technical staff estimates an additional 75-88 deaths could be prevented annually if GFCI protection were expanded to other circuits. GFCI devices are reliable meeting new stringent UL 943 standards and with the introduction of fail safe technology the new generation of devices will be even more effective in saving lives. They are economical with the average cost of receptacle devices being less than ten dollars each. Panel 2 should reconsider its position on this proposal. The need to expand the requirement for GFCI protection to all areas that are accessible to the public is well documented in this proposal and should be supported. This comment represents the official position of the International Brotherhood of Electrical Workers Codes and Standards Committee.
Panel Meeting Action: **Reject**
Panel Statement: See panel statement on Proposal 2-50.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 12 Negative: 1
Explanation of Negative:
 KING: I agree with the submitter of this comment that sufficient data was presented to support expanding the requirements for GFCI protection as indicated in the original proposal. The references made to specific CPSC case studies in the proposal were valid and should have been given further consideration by Panel 2.

2-54 Log #3294 NEC-P02 **Final Action: Reject**
(210.8(B))

Submitter: Dennis Robbins, GFS, Incorporated
Comment on Proposal No: 2-76
Recommendation: Add new paragraph as follows:
 (B) Industrial and Commercial Installations.
Electrical installations where voltages are 120 vac, 240 vac, 480 vac and ampere ratings of receptacles that exceed 20 amperes up to 400 amperes, single phase or three phase circuits, and where personnel are exposed to potential electrical shock shall be protected with special purpose Ground-Fault Circuit Interrupter for personnel.
Substantiation: New technology now being provided by multiple manufacturers, has evolved and provides listed Ground-Fault Circuit Interrupter devices to protect personnel and equipment at 240 vac, 480 vac, up to 600 vac, single and three phase, 20 amperes to 400 amperes.
 There are many industrial and commercial applications where personnel are exposed to shock hazards 230 volts and above. Such as welding machines,

power saws, steam cleaners, milling machines, food processing equipment.
 Personnel are exposed to electrical shock hazards where equipment may be connected to power through 240 vac, 480 vac, three and single phase power at higher amperes cord receptacles in hostile environments. Such as food processing facilities, shipyards, construction job sites, mining, etc.
Panel Meeting Action: **Reject**
Panel Statement: The submitter's comment is not related to the proposal. The submitter has not substantiated the change.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

2-55 Log #3490 NEC-P02 **Final Action: Reject**
(210.8(B))

Submitter: Frank Pologruto North Cape May, NJ
Comment on Proposal No: 2-76
Recommendation: I support this proposal.
Substantiation: Many offices have snack areas for their employees, that have vending machines, microwave ovens and small refrigerators, as well as coffee makers. These snack areas should have GFCI protection for personnel in other than dwelling units.
Panel Meeting Action: **Reject**
Panel Statement: The submitter's comment is in conflict with the substantiation. Proposal 2-76 was requesting an exemption from GFCI, and the commentator's substantiation would indicate a desire to expand GFCI.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

2-56 Log #112 NEC-P02 **Final Action: Reject**
(210.8(B) Exception (New))

Submitter: Thomas A. Ernst, Engineering Technologies, Inc.
Comment on Proposal No: 2-76
Recommendation: Add text to read as follows:
 Exception: In commercial kitchens, receptacles that are not readily accessible and are for refrigeration equipment, receptacles dedicated for convection ovens, slicers, or pedestal mixers.
Substantiation: • Protect food products from spoilage due to nuisance trips.
 • Protect people from burns from resetting receptacle. A lot of cooking equipment under the hood is on a shunt-trip breaker due to fire extinguishing systems and they don't make shunt-trip/GFCI combination devices.
 • Protect people who forget to shutoff mixers or slicers from harm when resetting device.
Panel Meeting Action: **Reject**
Panel Statement: See panel statement on Comment 2-47.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

2-57 Log #169 NEC-P02 **Final Action: Reject**
(210.8(B)(3))

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education
Comment on Proposal No: 2-85
Recommendation: Delete the following text:
 "...and cooking".
Substantiation: "Cooking" is included in the concept, "food preparation."
 There's a problem if we want to find language that says a sink and a coffee maker don't make a room a kitchen, and don't want to say that a room where foodstuffs are washed, chopped, blended, juiced, etc., but not actually heated, and utensils washed, is not a kitchen. Unfortunately, saying both "food preparation" and "cooking" doesn't help.
 I would define a commercial kitchen, as opposed to the break room that concerns the submitter, by the fact that a break room is equipped for individuals to serve themselves, rather than for the few to prepare food for the many as in a commercial kitchen, but it appears that is not the Code-Making Panel's direction. Certainly it would be hard to specify in objective language.
Panel Meeting Action: **Reject**
Panel Statement: See panel action on Comment 2-59. The panel does not agree that cooking and food preparation are covered in the same concept.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 13

2-58 Log #757 NEC-P02 **Final Action: Accept in Part**
(210.8(B)(3))

Submitter: Michael J. Johnston Plano, TX
Comment on Proposal No: 2-85
Recommendation: Continue to accept in principle the concept that introduces a definition for the word "kitchen." Revise the proposed text to revise 210.8(B)(3) as follows:

(3) Commercial and Institutional Kitchens - For the purposes of this section kitchen is an area with a sink, food refrigeration, and storage and permanent facilities for food preparation and cooking.

Substantiation: I support the action of the panel to introduce a definition of the word "kitchen" to help promote more consistent application and enforcement of rules associated with areas that are considered "kitchens." I do not feel that it is appropriate to define this term within the rule and limit its application to only 210.8(B)(3). The definition should be developed and inserted in 210.2 or Article 100, or both to have consistent application where the term is used throughout the NEC.

Panel Meeting Action: Accept in Part

Revise the proposed text to revise 210.8(B)(3) as follows:

"(3) Commercial and Institutional Kitchens. For the purposes of this section kitchen is an area with a sink and permanent facilities for food preparation and cooking."

Panel Statement: The panel accepts the deletion of the comma between preparation and cooking. The panel does not agree that adding the words "refrigeration and storage" adds clarity to the definition.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

2-59 Log #1013 NEC-P02
(210.8(B)(3))

Final Action: Accept

Submitter: Noel Williams, Noel Williams Consulting

Comment on Proposal No: 2-85

Recommendation: This proposal should continue to be accepted in principal as modified by Panel 2, but the comma before "cooking" should be removed.

Substantiation: The punctuation is confusing. The comma seems to imply something, but it's not clear what. If the intent is as stated by the panel, "permanent facilities" should apply to "food preparation and cooking."

Panel Meeting Action: Accept

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

2-60 Log #214 NEC-P02
(210.8(B)(3) Exception No. 1, No. 2, and No. 3)

Final Action: Reject

Submitter: Michael Rogalski, Sear-Brown

Comment on Proposal No: 2-76

Recommendation: Add new text to read as follows:

Exception No. 1: Receptacles that are not readily accessible.

Exception No. 2: Receptacles dedicated to an appliance that, in normal use, is not easily moved from one place to another and that is cord-and-plug connected in accordance with 400.7(A)(6), (A)(7), or (A)(8).

Exception No. 3: Receptacles serving permanently connected fire alarm, security, PA or telephone systems shall not require GFI protection.

Substantiation: Many receptacles serve refrigerator and freezer and are located behind them that personnel cannot access. It would be difficult to reset trip setting if appliance cannot be moved easily. Product stored in these appliances can be lost and damaged due to lack of refrigeration if GFI trips overnight, therefore, costing the owner money to replace.

In many cases telephone, PA and security systems are located in a portion of kitchens in small restaurants. These are permanent systems not plugged and unplugged by personnel and would be detrimental to building safety if these systems were without power.

Panel Meeting Action: Reject

Panel Statement: See panel statement on Comment 2-47. Circuit design techniques can place the GFCI reset mechanism at a location other than behind the supplied equipment. Properly functioning equipment listed in proposed Exception No. 3 will be compatible with GFCI protection.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

2-61 Log #3392 NEC-P02
(210.8(B)(3) Exception No. 2)

Final Action: Reject

Submitter: David A. Kerr, Jr., Tri-State Inspection Agency, Inc.

Comment on Proposal No: 2-96

Recommendation: Reconsider this proposal and many pages of similar proposals.

Substantiation: The NEC is supposed to be written using an open consensus process. CMP 2 has brushed off many pages of proposals with a very few words of explanation. Maybe it's time for some new people to be elected to CMP 2.

Panel Meeting Action: Reject

Panel Statement: The commentor's substantiation is not relevant to the proposal.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

2-62 Log #170 NEC-P02
(210.8(B)(4))

Final Action: Reject

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education

Comment on Proposal No: 2-70

Recommendation: Accept in principal in part with added wording and revised punctuation, as follows:

(4) Outdoors and other potentially wet locations in public spaces. For for...

Substantiation: Accept in principle in part to at least protect the public where there is heightened risk of shock or electrocution. (Also, avoid a run-on sentence.)

Panel Meeting Action: Reject

Panel Statement: The language suggested by the submitter is not enforceable.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

2-63 Log #2204 NEC-P02
(210.8(B)(4) (New))

Final Action: Reject

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

Comment on Proposal No: 2-70

Recommendation: Revise as follows: (4) Outdoors in spaces intended for use by the public or for which public assess is expected to be routine.

Substantiation: The proposal substantiation does not support such a broad expansion of the requirements. With one exception, every electrocution involved a vending machine. CMP 17 has accepted a CPSC proposal to require integral GFCI protection in new and remanufactured vending machines, (or double insulation) and protection for outlets for others (Proposal 17-6). This means that for a single substantiated incident that would be otherwise unaddressed in this code cycle, CMP 2 proposes an extraordinary expansion of requirements. In the previous cycle, there was detailed substantiation documenting extensive loss experience in commercial kitchens that could only be addressed in this section, in contrast to this proposal.

Nevertheless, some expansion of coverage may be warranted, but not at the expense of commercial functionality. Some years ago, Massachusetts imposed a similar requirement as has been proposed here. That state rule came flying back out of the Massachusetts Electrical Code in disgrace after the first cold snap, when diesel trucks all over the state couldn't start because the electric dipsticks routinely nuisance tripped the GFCI receptacles. Whether those would have been covered under the public access rule is subject to debate, and is what this comment addresses.

Public access may be defined in some jurisdictions as every place not fenced, in others as any place not prohibited by a trespass sign, and still others as any place not within the lot lines of private as opposed to public property. Good code is in part code that will be reasonably understood and applied in a uniform manner. This will not, and the language needs to better signal the intent. This comment addresses the spaces where the real loss exposure seems to lie, as covered in the substantiation. It is also more simply worded.

Panel Meeting Action: Reject

Panel Statement: The language suggested by the submitter is not enforceable and does not address the issue raised in the substantiation.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

2-64 Log #2409 NEC-P02
(210.8(B)(4) (New))

Final Action: Accept

Submitter: Leif O. Pihl, IBEW LU 292

Comment on Proposal No: 2-104

Recommendation: I thank the committee for the significant improvement in safety that their revised text will create. Please do not back away from the strength of the language you have proposed. While I would like to see the outdoor use of GFCI's increased, and hope that you will further strengthen the text (such as that proposed in 2-104), I can live with the language as currently modified.

Substantiation: What makes the life of a gardener or landscaper for a company's exterior worth less than the life of a member of the general public? Limiting the requirement for outdoor GFCIs to only those areas that are "accessible to the public" just does not go far enough. Some people will view the CMP to be saying that some peoples lives are worth more than other people's lives. Although the language the CMP has created will improve safety, you will not be creating as much of a safe condition at you had the potential to do.

Panel Meeting Action: Accept

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

2-65 Log #1575 NEC-P02
(210.8(C))**Final Action: Accept****Submitter:** Jim Pauley, Square D Company**Comment on Proposal No:** 2-47**Recommendation:** Add a new 210.8(C) to read as follows:

(C) **Boat Hoists.** Ground-fault circuit-interrupter protection for personnel shall be provided for outlets that supply boat hoists installed in dwelling unit locations and supplied by 125-volt, 15- and 20-ampere branch circuits.

Substantiation: This comment takes the item (A)(2) of the submitters proposal and creates a separate section to accomplish the intended protection. During the processing of the 1996 NEC, the CPSC made a proposal to have boat hoists covered by the GFCI requirements. As stated at that time (Proposal 2-82), there had been at least three electrocutions over a three year period from boat hoists.

CMP 2 believed that they had addressed the issue by sending the proposal to CMP 19 because residential boathouse/dock applications were, at that time, covered by Article 555. Since that time, CMP 19 revised the scope of Article 555 to exclude residential applications. So the issue is back in the scope of CMP 2.

The CPSC submitted Proposal 2-47 this cycle to address a number of issues, but included is the boat hoist issue as outlined in their substantiation. The recommended language added by this comment will address the boat hoist issue and the language is placed in a new section because it applies to “outlets” that supply a boat hoist and not just a “receptacle outlet”. This will ensure the protection regardless of whether the unit is cord- and plug-connected or hard wired.

Panel Meeting Action: Accept**Number Eligible to Vote:** 13**Ballot Results:** Affirmative: 12 Negative: 1**Explanation of Negative:**

BECKER: The substantiation does not provide adequate definition of the accidents to determine that GFCI protection should be required. These products are designed to be safe without additional protection.

2-66 Log #1241 NEC-P02
(210.9 Exception No. 2)**Final Action: Reject****Submitter:** Charles M. Trout, Maron Electric Co. Inc.**Comment on Proposal No:** 2-106

Recommendation: This proposal should be Accepted in Principle. Do not delete as the proposal suggests but rather add a second and third paragraph to the exception to read:

The name(s) of the qualified person(s) shall be kept in a permanent record at the office of the establishment in charge of the completed installation and at the office of the Authority Having Jurisdiction. Notification of any changes in the employment of the designated qualified person(s) shall be made to the office of the Authority Having Jurisdiction.

A person designated as a qualified person shall possess the skills and knowledge related to the construction and operation of the electrical equipment and installation and shall have received documented safety training on the hazards involved. Documentation of their qualifications shall be on file with the office of the Authority Having Jurisdiction and the office of the establishment in charge of the completed installation.

Substantiation: It was not necessarily my desire to have the wording in the exception deleted, if the exception could be changed to include prescriptive requirements that could ensure that qualified persons are actually performing the maintenance and supervision as required by the exception. Based on the Panel Statement that “the authority having jurisdiction has the responsibility to evaluate whether persons responsible for the supervision and maintenance are qualified before permitting such installations,” it would appear that the National Electrical Code could be reduced to one performance oriented statement that “all electrical installations shall be done properly” and the Authority Having Jurisdiction could handle it from there. However, that’s not the case, the National Electrical Code is a prescriptive code and it is the technical committees’ responsibility to ensure that prescriptive requirements are present for the Authority Having Jurisdiction to use.

It is difficult to understand how it is possible to relax requirements for safety in a Code that tells us in 90.1(B), “this Code contains provisions that are considered NECESSARY for safety.” This section further states that “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.” It appears to me that this tells us that these requirements are the MINIMUM requirements for safety and anything less will result in an installation that is NOT FREE FROM HAZARD.

Proponents of this travesty, knowing the truth in this, attempt to circumvent the obvious degradation of safety by using phraseology such as “the installation is under engineering supervision” or “a qualified person will monitor the system.” What is monitoring the installation? What does engineering supervision mean?

I have submitted several proposals to delete these exceptions to requirements for safety but they were all rejected. Perhaps in the comment stage, enough persons will comment in favor of accepting these proposals or at least accepting them in a manner where some prescriptive requirements will be added to accurately describe what “engineering supervision” entails. What does “monitoring” the installation mean, what type of record keeping is necessary to assure compliance, what is a “monitor” or what is a “qualified person?” How is documentation of the qualifications and presence of a “qualified person” accomplished by the Authority Having Jurisdiction?

Without these prescriptive requirements, these exceptions to the requirements for safety appear to be “just another subterfuge to avoid compliance with the safety requirements of the National Electrical Code without regard to putting persons and equipment at risk.”

Panel Meeting Action: Reject

Panel Statement: It is not practical for the AHJ to keep a list of all qualified personnel. The decision on how to enforce the exception has to be made by each AHJ based on their local needs.

Number Eligible to Vote: 13**Ballot Results:** Affirmative: 132-67 Log #3643 NEC-P02
(210.9 Exception No. 2)**Final Action: Reject****Submitter:** W. Creighton Schwan Hayward, CA**Comment on Proposal No:** 2-106

Recommendation: Reconsider, and accept proposal to delete 210-9 Exc. No. 2.

Substantiation: The existing wording weakens the Code, and places an unacceptable burden on the AHJ. To expect the AHJ to judge that all of the maintenance personnel on a property meet the definition of “Qualified Person” in Article 100 is an onerous charge, and even if it could be done, considering the frequency of personnel changes in the usual industrial occupancy, it is an impossible task for the AHJ to continuously monitor the qualifications of the maintenance personnel.

Panel Meeting Action: Reject**Panel Statement:** See panel statement on Comment 2-66.**Number Eligible to Vote:** 13**Ballot Results:** Affirmative: 12 Negative: 1**Explanation of Negative:**

KING: I agree with the submitter that the existing wording of Exception No. 2 does weaken the requirement of 210.9. I agree with the panel that it is not practical for the Authority Having Jurisdiction to keep a list of all qualified personnel. I disagree with the second sentence of the panel statement on Comment 2-66. Text that is not practical or impossible for the Authority Having Jurisdiction to enforce should not be permitted.

2-68 Log #3514 NEC-P02
(210.9(A)(3))**Final Action: Accept in Principle****Submitter:** Henry A. Jenkins, Wake County, Inspections Development**Comment on Proposal No:** 2-184

Recommendation: I support the action of the committee.

Substantiation: None.**Panel Meeting Action: Accept in Principle**

Panel Statement: See panel action on Comment 2-118. The panel understands that the comment was intended to address 210.19(A)(3) instead of 210.9(A)(3).

Number Eligible to Vote: 13**Ballot Results:** Affirmative: 132-69 Log #87 NEC-P02
(210.11(B))**Final Action: Reject****Submitter:** Dan Leaf Rancho Santa Margarita, CA**Comment on Proposal No:** 2-109

Recommendation: Accept proposal.

Substantiation: Present requirements do not apply to loads calculated on other than a va/sq/ft basis nor branch circuits serving a single outlet. Branch circuits and overcurrent devices are not literally required for loads which are not “connected” such as required receptacle outlets for laundry, small appliances, bathrooms, outdoors, garage, basement, etc.

Panel Meeting Action: Reject

Panel Statement: The requirements of 210.11(B) are intended to apply when the load is calculated on a VA per square foot basis.

Number Eligible to Vote: 13**Ballot Results:** Affirmative: 13

2-70 Log #18 NEC-P02
(210.12) **Final Action: Reject**

Submitter: Stanley J. Folz, Folz Electric, Inc.
Comment on Proposal No: 2-127
Recommendation: The panel should reconsider and accept this proposal.
Substantiation: I agree with Mr. Dobson. Furthermore, it has been the intention of this Code and others to minimize the interaction of devices and equipment that could affect the performance of fire safety equipment. The panel statement refers to required backup batteries. The panel should remember that batteries do not last forever and under some cases are not replaced when they should be. The smoke detector has saved countless lives. Why cripple it.
Panel Meeting Action: Reject
Panel Statement: See panel statement on Comment 2-107.
Number Eligible to Vote: 13
Ballot Results: Affirmative: 10 Negative: 3
Explanation of Negative:

BECKER: Even though the reliability of the AFCI appears to be very good, it is not reasonable to require protection of the smoke detector circuit.

DOBSON: See my explanation of negative vote on Comment 2-107.

O'NEIL: Putting AFCI protection on Life Safety devices creates the greater risk of disabling life saving devices at time proper operation of the life-safety device is most required.

2-71 Log #73 NEC-P02
(210.12) **Final Action: Reject**

Submitter: Andrew Schirmacher, Andrews Electric Inc.
Comment on Proposal No: 2-133

Recommendation: Add text to read as follows:

All branch circuits that supply 125 volt, single-phase, 30 ampere receptacles shall be protected by a listed arc-fault circuit interrupter to provide protection for the entire branch circuit.

Substantiation: I have found that most people do not turn off the circuit breaker or RV load when installing the plug into the receptacle. Thus, the receptacle and plug become compromised, resulting in melted receptacles and plugs. The potential for personal injury and property damage can be reduced with my proposal.

Panel Meeting Action: Reject

Panel Statement: The submitter's recommendation should be made to Article 551 in the next cycle. The recommended revision to 210.12 would not address recreational vehicles.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

2-72 Log #413 NEC-P02
(210.12) **Final Action: Reject**

Submitter: T. David Mills, Bechtel Savannah River, Inc.
Comment on Proposal No: 2-116

Recommendation: Delete the section as originally proposed.

Substantiation: Undemonstrated performance of devices and lack of proof that proper operation is possible. I concur with negative comments provided by Mr. Becker and Mr. Dobson.

Panel Meeting Action: Reject

Panel Statement: See panel action and panel statement on Comment 2-87.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 12 Negative: 1

Explanation of Negative:

DOBSON: See my explanation of negative vote on Comment 2-87.

2-73 Log #414 NEC-P02
(210.12) **Final Action: Reject**

Submitter: T. David Mills, Bechtel Savannah River, Inc.
Comment on Proposal No: 2-117

Recommendation: Delete the section as originally proposed.

Substantiation: Undemonstrated performance of devices and lack of proof that proper operation is possible. I concur with negative comments provided by Mr. Becker and Mr. Dobson for Proposal 2-116.

Panel Meeting Action: Reject

Panel Statement: See panel action and panel statement on Comment 2-87.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 12 Negative: 1

Explanation of Negative:

DOBSON: See my explanation of negative vote on Comment 2-87.

2-74 Log #415 NEC-P02
(210.12) **Final Action: Reject**

Submitter: T. David Mills, Bechtel Savannah River, Inc.

Comment on Proposal No: 2-119

Recommendation: Delete the section as originally proposed.

Substantiation: Undemonstrated performance of devices and lack of proof that proper operation is possible. I concur with negative comments provided by Mr. Becker and Mr. Dobson for Proposal 2-116.

Panel Meeting Action: Reject

Panel Statement: See panel action and panel statement on Comment 2-87.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 12 Negative: 1

Explanation of Negative:

DOBSON: See my explanation of negative vote on Comment 2-87.

2-75 Log #416 NEC-P02
(210.12) **Final Action: Reject**

Submitter: T. David Mills, Bechtel Savannah River, Inc.

Comment on Proposal No: 2-122

Recommendation: Delete the section as originally proposed.

Substantiation: Undemonstrated performance of devices and lack of proof that proper operation is possible. I concur with negative comments provided by Mr. Becker and Mr. Dobson for Proposal 2-116 and the submitter's substantiation for 2-122.

Panel Meeting Action: Reject

Panel Statement: See panel action and panel statement on Comment 2-87.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 12 Negative: 1

Explanation of Negative:

DOBSON: See my explanation of negative vote on Comment 2-87.

2-76 Log #417 NEC-P02
(210.12) **Final Action: Reject**

Submitter: T. David Mills, Bechtel Savannah River, Inc.

Comment on Proposal No: 2-126

Recommendation: Delete the section as originally proposed.

Substantiation: Undemonstrated performance of devices and lack of proof that proper operation is possible. I concur with negative comments provided by Mr. Becker and Mr. Dobson for Proposal 2-116 and the submitter's substantiation for 2-126.

Panel Meeting Action: Reject

Panel Statement: See panel action and panel statement on Comment 2-87.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 12 Negative: 1

Explanation of Negative:

DOBSON: See my explanation of negative vote on Comment 2-87.

2-77 Log #418 NEC-P02
(210.12) **Final Action: Reject**

Submitter: T. David Mills, Bechtel Savannah River, Inc.

Comment on Proposal No: 2-128

Recommendation: Delete the section as originally proposed.

Substantiation: Undemonstrated performance of devices and lack of proof that proper operation is possible. I concur with negative comments provided by Mr. Becker and Mr. Dobson for Proposal 2-116 and the submitter's substantiation for 2-128.

Panel Meeting Action: Reject

Panel Statement: See panel action and panel statement on Comment 2-87.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 12 Negative: 1

Explanation of Negative:

DOBSON: See my explanation of negative vote on Comment 2-87.

2-78 Log #419 NEC-P02
(210.12) **Final Action: Reject**

Submitter: T. David Mills, Bechtel Savannah River, Inc.

Comment on Proposal No: 2-131

Recommendation: Delete the section as originally proposed.

Substantiation: Undemonstrated performance of devices and lack of proof that proper operation is possible. I concur with negative comments provided by Mr. Becker and Mr. Dobson for Proposal 2-116 and the submitter's substantiation for 2-131.

Panel Meeting Action: Reject**Panel Statement:** See panel action and panel statement on Comment 2-87.**Number Eligible to Vote:** 13**Ballot Results:** Affirmative: 12 Negative: 1**Explanation of Negative:**

DOBSON: See my explanation of negative vote on Comment 2-87.

2-79 Log #420 NEC-P02
(210.12)**Final Action: Reject****Submitter:** T. David Mills, Bechtel Savannah River, Inc.**Comment on Proposal No:** 2-137**Recommendation:** Delete the section as originally proposed.**Substantiation:** Undemonstrated performance of devices and lack of proof that proper operation is possible. I concur with negative comments provided by Mr. Becker and Mr. Dobson for Proposal 2-116 and the submitter's substantiation for 2-137.**Panel Meeting Action: Reject****Panel Statement:** See panel action and panel statement on Comment 2-87.**Number Eligible to Vote:** 13**Ballot Results:** Affirmative: 12 Negative: 1**Explanation of Negative:**

DOBSON: See my explanation of negative vote on Comment 2-87.

2-80 Log #887 NEC-P02
(210.12)**Final Action: Reject****Submitter:** William H. King, Jr., U.S. Consumer Product Safety Commission
Comment on Proposal No: 2-134a**Recommendation:** Revise the proposal submitted by CMP 2 by deleting the words "combination type" from part (B) of the proposed wording of 210.12.**Substantiation:** Although "combination type" AFCIs may represent a more advanced technology, the proposed revision of 210.12 minus the words "combination type" would permit "combination type" AFCIs when they become available, but not require them at this time. Deleting the words "combination type" would also permit the continued use of the type of AFCIs that have been commercially available for over seven years.

Branch/feeder AFCIs, and not "combination type" AFCIs, have been the commercially available type from several manufacturers for over seven years. Substantiation for the branch/feeder AFCIs is documented in the ROPs and ROCs for both the 1999 and 2002 editions of the NEC. On the other hand, "combination type" AFCIs are in their infancy without the benefit of adequate documented research, without being commercially available from several manufacturers, and without the benefit of field trial experience. For these reasons, CMP 2 should withhold specifying the "combination type" or any other type of AFCI in 210.12 for the 2005 NEC.

Panel Meeting Action: Reject**Panel Statement:** See panel action on Comment 2-87a.**Number Eligible to Vote:** 13**Ballot Results:** Affirmative: 12 Negative: 1**Explanation of Negative:**

O'NEIL: I disagree with the panel as this comment offers new material and should be held for review during the next code cycle. See my explanation of negative vote on Comment 2-87a.

Comment on Affirmative:

ROCHÉ: The panel statement refers to panel action on Comment CC200. I believe it should have referred to Comment 2-87a, which is Log CC200. Similar corrections should be made in the panel actions on Comments 2-85, 2-86, 2-93, 2-96, and 2-105.

2-81 Log #1334 NEC-P02
(210.12)**Final Action: Reject****Submitter:** Joseph A. Ross, Ross Seminars**Comment on Proposal No:** 2-127**Recommendation:** This proposal should be accepted. See Companion Comments to Proposals No. 2-134a and 3-236.**Substantiation:** This comment addresses the Panel Statement:

(1) The statement specifies that "There has been no data submitted...why...smoke alarms...in bedrooms should be deleted from the AFCI requirement."

Response: The proof of the pudding is that it's the CMP's responsibility to provide data and justify their insistence of "why life saving smoke detectors located in dwelling unit bedrooms are mandated to be connected to sensitive AFCI circuits"? Not opinions, but facts based on actual testing and evaluation, i.e., by a qualified electrical testing laboratory.

(2) The Statement "...battery backup...is required...in case of power failure (maybe by the tripping of an AFCI, I might add).

Response: Let's remember why smoke detectors are required to be connected

to 120V circuits. When only battery was required (1) the battery was missing or (2) the battery was dead (and deaths occurred). The 120V connection is a much more reliable method and the battery backup is better than nothing, and in many cases, it is nothing as the battery is either missing or dead. Don't compromise this 120V circuit!

(3) The Statement "AFCIs...shutting off the circuit when unintended arcing occurs."

Response: A fire of other than electrical origin may cause the sensitive AFCI to operate and thereby goes the life saving smoke detector alarm. A 120V circuit (without AFCI) may hang in there for a few more precious seconds and save the lives of sleeping victims.**Panel Meeting Action: Reject****Panel Statement:** See panel statement on Comment 2-107.**Number Eligible to Vote:** 13**Ballot Results:** Affirmative: 12 Negative: 1**Explanation of Negative:**

DOBSON: See my explanation of negative vote on Comment 2-107.

2-82 Log #1400 NEC-P02
(210.12)**Final Action: Reject****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:** William H. King, Jr., U.S. Consumer Product Safety Commission
Comment on Proposal No: 2-124**Recommendation:** Reconsider Proposal 2-124 with the following changes:

Change "service equipment at a dwelling" to "panelboard that contains the overcurrent protection devices for branch circuits" and remove the specific types of arc-fault interrupters to be used. The revised, proposed new section to paragraph 210.12 reads as follows:

Lighting and Appliance Branch Circuits in Dwelling Units. When the panelboard that contains the overcurrent protection devices for branch circuits is replaced, a listed arc-fault circuit interrupter shall protect each branch circuit that existed prior to the replacement that serves 125-volt, single-phase, 15- and 20-ampere outlets for lighting and for appliances.

Substantiation: The substantiation provided to the panel with the proposal included data that shows fires in older homes can be reduced by the use of AFCI devices. Since that time, an economic cost/benefit study has been completed by economists that shows that the benefits of adding AFCI protection to existing homes outweigh the costs of their installation. A copy of this study is included with this comment.

With the addition of this cost/benefit study, the positive field experience with AFCIs since the ROP meeting as reported by manufacturers and many Authorities Having Jurisdiction, and the refinements to the proposal contained in this comment, a requirement in the NEC to address the fire problem with wiring in older dwellings can be achieved.

In response to Code Making Panel 2's statement regarding Proposal 2-124 regarding retroactive requirements in the NEC, such requirements are not without precedence. See, for example, 406.3(D) regarding receptacle replacements.

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

Panel Meeting Action: Accept in Principle

Add a new 210.12(C) to read as follows:

"(C) Lighting and Appliance Branch Circuits in Dwelling Units. When a panelboard that contains the overcurrent protection devices for branch circuits is replaced, a listed arc-fault circuit interrupter shall protect each branch circuit that existed prior to the replacement that serves 120-volt, single-phase, 15- and 20-ampere outlets for lighting and for appliances."

Panel Statement: The panel has made editorial revisions to the comment that meet the intent of the submitter.**Number Eligible to Vote:** 13**Ballot Results:** Affirmative: 7 Negative: 6**Explanation of Negative:**

BECKER: See my explanation of negative vote on comment 2-87a.

DOBSON: If approved, this proposal will far exceed its intent by requiring AFCI installation in new or renovated circuits that would not otherwise be required to have them if those same circuits were to be installed in new construction. If there were a clearly identified need for the application of current AFCI technology, it would most likely be in much older existing dwellings that would not otherwise undergo any of the other upgrade renovations to the electrical system that are required under the provisions for existing construction. While we remain opposed to mandatory requirements to AFCI in general, if there is to be a requirement for existing construction, it should clearly be limited to applications where little to no other electrical system upgrades are made.

O'NEIL: Retroactive application of the NEC requirements to existing installations is beyond the scope of the document. The NEC requirements are only for new construction and re-wiring of existing installations as defined within the authority of the AHJ by law. (Reference Section 80.9) enforceable if the governmental jurisdiction having authority has adopted Article 80 when adopting the NEC.

As currently edited through Comment 2-82 Proposal 2-124 would mandate AFCI protection in panel board replacement that exceeds the NEC installation requirements for new construction. Expansion of the AFCI protection technology should apply equally to new and old construction when further field experience is gained with the combination device and UL standard 1699 is further

developed to address all of the technical issues required for protection intended.

SIDHOM: 1. The expansion of using AFCI to include older home branch circuits should be postponed for further studies by recognized labs. The effect of 2 wire systems (some existing home wiring systems) on the function of AFCI is not clear.

2. Existing home wiring systems may require a complete change to comply with those proposals.

3. Existing NEC limits the use of AFCI to bedroom branch circuits in dwelling units. Those proposals expand this limitation to include all lighting/appliances circuits in existing homes when the panel board is replaced. Also, the branch/feeder AFCI type will be replaced by AFCI-Combination type by January 2008. It is not advisable to install a device now and be replaced by another type in 3 years.

TOMAN: My vote is negative on the panel action. With Code-Making Panel 2's mandate of combination type AFCIs, effective January 1, 2008, there is not sufficient data available to justify any expansion at this time. Although AFCI protection is not required for all 125 volt, 15- and 20-ampere branch circuits in existing homes where panelboards are replaced, it is permitted and can be a design consideration. There is no experience data available to date pertaining to combination type AFCIs, and branch feeder type AFCIs are now being phased out as of January 1, 2008. The dependability of this AFCI DEVICE IN USE IN THE PUBLIC DOMAIN MUST BE DETERMINED BY ACCURATE EXPERIENCE DATA, BEFORE ANY POTENTIAL EXPANSION OF THE USE OF THIS DEVICE CAN BE considered.

WILKINSON: I vote negative on this panel action. With the introduction of the combination device into this code cycle, we cannot expand its use until its dependability in actual home installations has provided us with sufficient data to warrant such an expansion.

Comment on Affirmative:

ROCHÉ: I am voting affirmative on the panel action with the understanding that the panel intended for 210.12(C) to address older dwelling units, where panelboards have to be replaced due to "end of life" or obsolescence; not a relatively new panelboard which has to be replaced due to some defect. The substantiation was also directed at "older homes."

2-83 Log #1942 NEC-P02 **Final Action: Reject**
(210.12)

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: Michael I. Callanan, IBEW

Comment on Proposal No: 2-124

Recommendation: This proposal should be accepted.

Substantiation: Adequate technical substantiation has been provided by the submitter to warrant this proposed change. This comment represents the official position of the International Brotherhood of Electrical Workers Codes and Standards Committee.

Panel Meeting Action: Accept in Principle

Panel Statement: See panel action and statement on Comment 2-82.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 7 Negative: 6

Explanation of Negative:

BECKER: See my explanation of negative vote on comment 2-87a.

DOBSON: See my explanation of negative vote on Comment 2-82.

O'NEIL: See my explanation of negative vote on Comment 2-82.

SIDHOM: See my explanation of negative vote on Comment 2-82.

TOMAN: See my Explanation of Negative Vote on Comment 2-82.

WILKINSON: See my Explanation of Negative Vote on Comment 2-82.

Comment on Affirmative:

ROCHÉ: See my Explanation of Affirmative Vote on Comment 2-82.

2-84 Log #2878 NEC-P02 **Final Action: Reject**
(210.12)

Submitter: Robert P. McGann, City of Cambridge / Rep. IAEI

Comment on Proposal No: 2-127

Recommendation: This proposal should be accepted.

Substantiation: Local fire departments do not want arc fault protection on branch circuits supplying smoke detectors, this makes it very difficult on the inspector. NFPA 70 (760) NFPA 72 both do not allow ground fault detection on fire alarm systems. The arc fault has an integral part ground fault protection.

Panel Meeting Action: Reject

Panel Statement: See panel statement on Comment 2-107. The submitter's substantiation is incorrect. NFPA 72 limits GFCI personnel protection on the circuit, not "ground fault detection".

Number Eligible to Vote: 13

Ballot Results: Affirmative: 12 Negative: 1

Explanation of Negative:

DOBSON: See my explanation of negative vote on Comment 2-107.

2-85 Log #2983 NEC-P02 **Final Action: Reject**
(210.12)

Submitter: Steve Campolo, Leviton Manufacturing Co., Inc.

Comment on Proposal No: 2-134a

Recommendation: Reject original proposal, reverse panel action in ROP.

Substantiation: There is no prohibition on using listed combination AFCIs. (if they exist) This commenter warned CMP-2 (2 cycles ago) that branch circuit AFCIs had very "limited" protection for cords. Now that a listing exists but no product is available, is CMP-2 ready to be hoaxed again? Also, there is no substantiation for 210.12(B)(2). The original State Farm data did not prove arcing faults within 10 ft of the panel.

Panel Meeting Action: Reject

Panel Statement: See panel action on Comment 2-87a and panel statement on Comment 2-88.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 12 Negative: 1

Explanation of Negative:

O'NEIL: I disagree with the panel as this comment offers new material and should be held for review during the next code cycle. See my explanation of negative vote on Comment 2-87a.

2-86 Log #3078 NEC-P02 **Final Action: Reject**
(210.12)

Submitter: J.A. Wafer, Eaton Electrical

Comment on Proposal No: 2-134a

Recommendation: Delete the words "combination type" from the Code-Making Panel 2 wording for 210.12(B) to read "(B) Dwelling Unit Bedrooms. All of 120 volt, single phase, 15 and 20-ampere branch circuits supplying outlets installed in dwelling unit bedrooms shall be protected by a listed arc-fault circuit interrupter, combination type installed to provide protection of the branch circuit."

Substantiation: The words "combination type" should be deleted from this Code-Making Panel 2 proposal. By accepting the proposal in its present form the panel is mandating:

- A device that excludes presently available Branch/Feeder AFCIs of proven value
 - A device that has not been proven to provide any additional real-world protection over Branch/Feeder AFCIs
 - A device whose field reliability relative to nuisance tripping is absolutely unknown.
 - A device that is not commercially available
- Further, the words are unnecessary because:

- The devices are already permitted by current code language

With respect to exclusivity, the proposal in its present form would exclude (1) all currently available Branch/Feeder AFCIs - devices that are providing excellent fire protection. To date, these are the only AFCIs offered in the market. Branch/Feeder AFCIs provide complete protection to the installed cable (NM-B plus ground) and they also provide significant protection beyond the outlet. Per UL 1699, these devices must detect the high power, damaging across-the-line arcs in SPT-2 two wire cords that are unlikely to trip a conventional circuit breaker. These intermittent arcs in appliance and extension cords, with current magnitudes of 50A and above, can occur due to physical bridging of the wires by an object such as a chair leg, or due to insulation breakdown between conductors due to localized heating.

Further, since all commercially available Branch/Feeder AFCIs contain ground fault protection, they prevent fires by detecting faulty circuit connections (grounded neutral) and by reacting (2) to earth leakage currents associated with overheating at grounded receptacles and plugs (glowing connections). Experience with Branch/Feeder AFCIs has been excellent. There are more than 5 million Branch/Feeder AFCIs from four major manufacturers installed in the field, with a cumulative 25 billion hours of operational experience. These devices have prevented fires, have prevented the mis-wiring of circuits and, in particular, have not been subject to unwanted (nuisance) tripping.

As testament to the value of currently existing AFCIs, the Consumer Product Safety Commission (CPSC) held a full day meeting on 9/23/03 at the CPSC Headquarters aimed at examining AFCI performance to date, and soliciting ideas for better acquainting the public with the benefits of AFCI protection for electrical circuits. The subsequent Associated Press release (3) from the meeting showed the strong CPSC and National Association of State Fire Marshals (NASFM) support for AFCI technology. Of particular importance to this substantiation, the assessment was made based on experience with Branch/Feeder AFCIs.

With respect to real-world protection, the Combination AFCI has not been proven to provide any additional real-world protection over currently available Branch/Feeder AFCIs. The only difference between Branch/Feeder AFCIs and Combination AFCIs is a single test to detect low current arcs. But it must be noted that Combination AFCIs cannot possibly respond to simple single-conductor-breaks in 120-volt circuits. As with a switch, an arc is always initiated

when copper conductors break or when a wire separates from a screw at a loose connection. In a 120-volt circuit, however, this low current, low power arc typically self-extinguishes at the first AC current zero. A Combination device could not possibly trip under these circumstances because such a device would then detect normal switching arcs. The resulting nuisance tripping could not be tolerated. The Combination AFCI can only detect long duration, low current arcs, but these arcs are highly unlikely in 120-volt circuits using copper conductors. Thus the standard requires interruption within 1 second (120 half cycles of arcing) for 5-ampere arcs. But data have not been provided that relate these long-duration low-current-arc detection capabilities to real-world events. In addition, the panel has not been provided with fire statistics related to the additional wiring issues that could be addressed by the Combination AFCI.

With respect to field reliability, Combination AFCIs are not commercially available (1). This is not an issue of whether the devices will be available in 2005. The issue is the lack of performance experience in the residences of the general public, in particular relative to nuisance tripping. And lack of practical experience relative to nuisance tripping must be a major concern. Potential problems associated with field installations could cause AHJ's to eliminate the requirement at the local level.

All AFCIs monitor the circuit to detect current anomalies. However the sensitivity (5 ampere) of the Combination AFCIs makes them particularly susceptible to nuisance tripping. This is because the device must constantly distinguish uncontrolled, low current arc waveforms from the arc waveforms that are normally occurring as a result of circuit control (switches, bimetal-thermostats) and appliance operation (electric motors with arcing-brushes such as vacuum cleaners). Further, they must constantly distinguish uncontrolled, low current arc waveforms from the distorted waveforms associated with electronic power supplies (for example, lamp ballasts and computers). Also the waveform characteristics of future power supplies could well be different from present-day supplies. By contrast the Branch/Feeder AFCIs' immunity from unwanted tripping is practical because normally occurring arcing events at the 50A level (e.g. burn-out of incandescent lamps) are rare and are accounted for in the detection circuitry. Further, the chopped waveforms at this current level are only transient in nature (for example, ballast inrush). These two conditions enable the Branch/Feeder AFCI to distinguish precisely between safe and unsafe conditions. The avoidance of nuisance tripping needs to be demonstrated for Combination AFCIs based on practical experience in hundreds of thousands of residences.

The panel must also consider the fact that alternative approaches to cord protection are already being introduced into the code. For fire protection from arcing, the code mandates (440.65), for example, that single-phase cord-and-plug-connected room air conditioners shall be provided with factory-installed LCDI or AFCI protection. Thus the cords will feed specific loads and, as a consequence, the impact of nuisance tripping will be limited to that load. Here, the nuisance tripping would be more tolerable. By contrast, nuisance tripping associated with Combination AFCIs at the circuit breaker will result in power outage for the total branch circuit.

With respect to the lack of commercial availability, CMP-2 member Susan Porter of Underwriters Laboratories, states in her Explanation on 2-134a "The action of the panel is premature. Although UL has listed the first Combination AFCI, none are yet commercially available". And availability is essential relative to demonstrating, under practical circuit conditions, the superiority or otherwise, of Combination AFCIs relative to commercially available Branch/Feeder AFCIs. What is the fire protection performance, what are the economic considerations, and what are the nuisance-tripping consequences? Based on the January 2003 presentation comments to CMP-2 by the submitter of proposal 2-146 dealing with Combination AFCIs, the panel has every right to expect commercial devices by December 2003. During the January panel discussion, the submitter of proposal 2-146 intimated that all that was required to bring these devices to market would be the addition of a few lines of code.

With respect to the current code language, the existing language is non exclusionary and already permits the installation of Combination AFCIs. The Code Panel must now evaluate the risk of changing that language to mandate new, untried technology to the exclusion of Branch/Feeder AFCIs that have proven value in the field (3). CMP-2 introduced Arc Fault Circuit Interrupters into the 1999 NEC (effective 1/1/2002) with the objective of reducing the incidence of dwelling unit fires with their associated deaths, burns and property loss. In the interests of public safety, the Panel should not take any action that could cause the public to reject AFCI technology. The gradual introduction of Combination AFCIs, as presently permitted by the present Code wording, is consistent with NFPA's dedication to fire safety. The present wording permits this gradual introduction, and in particular permits appropriate field assessment.

References

1. Comment on the July/August 2003 article "Truth about AFCIs, Part 3", IAEI News, Page 78, September /October 2003.
2. UL Special Services Investigation for Cutler-Hammer entitled "Branch/Feeder Arc Fault Circuit Interrupter Incorporating Equipment Ground Fault Protection", File E45310, May 31, 2001 (Previously submitted to CMP-2 with Proposal 2-143).
3. "Safety Officials Urge Adoption of New Device to Prevent Electrical Fires" by Associated Press Writer David Ho that appeared, for example, in the 9/24/03 Web Edition of U.S.A. today and many newspapers.

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

Panel Meeting Action: Reject

Panel Statement: See panel action on Comment 2-87a.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 12 Negative: 1

Explanation of Negative:

O'NEIL: I disagree with the panel as this comment offers new material and should be held for review during the next code cycle. See my explanation of negative vote on Comment 2-87a.

2-87 Log #3390 NEC-P02
(210.12)

Final Action: Reject

Submitter: Matthew D. Dobson, National Association of Home Builders

Comment on Proposal No: 2-126

Recommendation: Delete entire section 210.12 as noted in proposal.

Substantiation: Arc Fault Circuit Interrupter Technology

We understand the complexity of this issue and respect the amount of time and consideration that has been spent debating the need for this technology. However, we continue to contend that the AFCI requirements is unnecessary and does not significantly improve the fire safety of homes built to current codes and standards.

Concerns related to the need for this requirement and function of the devices which once again have been raised in the substantiation for the six current proposals recommending the removal of this requirement (see proposals) have yet to be adequately addressed. To further substantiate those concerns we are providing additional information for review by the CMP. The information, contained in the four documents provided, further demonstrated that any requirement for these devices in new construction is unwarranted. The following is a brief summary of each:

1) CPSC Analysis-(March 2003)

provides an in-depth comprehensive analysis leading to questions about the effectiveness of AFCIs in new construction.

2) NAHB's evaluation and Re-Analysis of the CPSC Analysis (June 2003)

NAHB Housing Policy Group's evaluation applying more realistic and accepted economic factors to CPSC's analysis showing the potential benefit of AFCI's to be considerably less than the CPSC's projections.

3) NFPA Research Foundation's -Proposal for a study entitled "Residential Electrical System Aging Research Report" (August 2003)

Proposed by the NFPA Research Foundation to study aging electrical systems. The study's purpose is to attempt to provide clearer understanding on this issue and underscoring that statistics and research currently available is not clear or comprehensive and should not be used as a basis to mandate AFCI technology.

4) NAHB's House Fire Deaths Article (November 2002)

A statistically supported report of the significant improvement to residential fire safety and reduction in residential fires further emphasizing the lack of need for AFCI requirements in new construction.

Concerns about requirements for AFCIs and the current technology are only growing. Even at a recent CPSC forum in September of 2003 intended to simulate discussion on how to further promote the issue among the public, legitimate questions were raised by a number of the participants related to concerns about what quantifiable impact AFCIs will actually have beyond current circuitry protection and about the function of the devices, i.e., a UL representative indicated that the life of this product could be less than 10 years and what guidance is given consumers?

With so many uncertainties still surrounding AFCI's we urge the committee to reconsider their position and remove the current AFCI requirements from the NEC until the need and benefit of them is appropriately demonstrated with sound, unquestionable data and not by subjective assumptions.

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

Panel Meeting Action: Reject

Panel Statement: The panel disagrees with the submitter's statement that AFCI's are unnecessary. Electrical fires have been shown to occur in houses of various ages. The CPSC analysis of AFCI's does support the increased protection. The panel also notes that the CPSC has no specific interest in creating a biased report since their focus is solely on safety of the consumer. The FPRF research project is in its infancy stage and does not provide any data at this point in time. The original data that lead to the introduction of AFCI's did not claim that residential housing fires were not declining, but specifically noted (by the CPSC) that fires of electrical origin were not declining at a sufficient rate compared to other causes.

The panel also notes that it has not been acting on "subjective assumptions" as indicated by the submitter. The data have been significant, and the panel has taken care in reviewing the material and hearing expert opinion on both sides of the issue.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 11 Negative: 2

Explanation of Negative:

DOBSON: The panel has not thoroughly considered the submitted information.

1) Contrary to the panel statement "The CPSC analysis of AFCI's does support the increased protection." - Please see page four of the submitted CPSC analysis that states "the benefits of installing AFCI protection expected to last 30 to 40 years in new housing could be less than the costs." This analysis

clearly does not support AFCI technology in new construction. The panel failed to recognize this clear statement from an organization that “has no specific interest in creating a biased report”.

2) Contrary to the panel statement “Electrical Fires have been shown to occur in houses of various ages.” Please read the following excerpt document from CPSC’s “Residential Electrical Distribution Fires” which to date is the only comprehensive investigative research report on residential electrical fires - the majority of the fires in this group probably would have been prevented if the installations and modifications had conformed to the current NEC. It is important, therefore, that CPSC continue its involvement in maintaining the effectiveness of the Code at the foundation for further efforts in preventing electrical fires.

Please note this report was filed in 1987. This report clearly shows there is a direct relation between electrical fire hazards and wiring systems constructed to older, far less stringent, electrical codes. This report is from an organization that “has no specific interest in creating a biased report”.

3) The research project being proposed by the FPRF indicates that there is still a need to gain a more complete understanding of electrical fires. Much of the push for AFCI’s was under the presumption that this hazard was clearly understood. The scope of this research indicates that the electrical fires are not clearly understood, supporting the position that there is no sound data to support a conclusion that AFCI’s will have a significant impact on reducing electrical fires in new construction.

4) Finally, the panel statement “fires of electrical origins were not declining at a sufficient rate compared to other causes” is simply not supportable. For example below is a graph derived from United State Fire Administration data which shows no abnormal patterns compared to other causes.

NOTE: Supporting Material is available for review at NFPA Headquarters.

O’NEIL: Any requirement of the AFCI protection technology should apply equally to new and old construction when the panel defines the parameters of protection intended by the requirement.

UL Standard 1699 must be further developed to address all of the technical issues required for protection intended and to insure that the device operates to the level of protection required by the panel’s intent without nuisance tripping. Current product Standard UL 1699-1999 does not require that the device survive or operate on over voltage. The AFCI should act as a protective device and not permit or burn out on a dangerous over voltage condition. Current products listed under UL 1699-1999 nuisance trip on multiple appliances loading. This product standards issue need not use the NEC for its proving ground. A panel task group is recommended to evaluate the progress of the technology with the UL 1699 testing.

2-87a Log #CC200 NEC-P02
(210.12)

Final Action: Accept

Submitter: Code-Making Panel 2

Comment on Proposal No: 2-134a

Recommendation: Revise 210.12 to read:

“210.12 Arc-Fault Circuit-Interrupter Protection.

(A) Definition. An arc-fault circuit interrupter is a device intended to provide protection from the effects of arc faults by recognizing characteristics unique to arcing and by functioning to de-energize the circuit when an arc fault is detected.

(B) Dwelling Unit Bedrooms. All 120 volt, single phase, 15 and 20-ampere branch circuits supplying outlets installed in dwelling unit bedrooms shall be protected by a listed arc-fault circuit interrupter, combination type installed to provide protection of the branch circuit.

Branch/Feeder AFCI’s shall be permitted to be used to meet the requirements of 210.12(B) until January 1, 2008.

FPN: For information on types of arc-fault circuit interrupters, see UL 1699-1999, Standard for Arc-Fault Circuit Interrupters.

Exception: The location of the arc-fault circuit interrupter shall be permitted to be at other than the origination of the branch circuit in compliance with (1) and (2):

(1) The arc-fault circuit interrupter installed within 1.8 m (6 ft) of the branch circuit overcurrent device as measured along the branch circuit conductors.

(2) The circuit conductors between the branch circuit overcurrent device and the arc-fault circuit interrupter shall be installed in a metal raceway or a cable with a metallic sheath.”

Substantiation: The panel recognizes the level of safety provided by AFCI’s; however, since the combination type technology is relatively new, a transition period has been established for the industry to meet this requirement.

Panel Meeting Action: Accept

Number Eligible to Vote: 13

Ballot Results: Affirmative: 10 Negative: 3

Explanation of Negative:

BECKER: AFCI technology has not been substantiated. It has been demonstrated that low level arcing in electrical cords does not produce ignition, and burning (joule heating) is not detected by the AFCI. Fire investigation reports do not accurately distinguish between “arcing” and burning the premises wiring. It is very apparent that the original justification for this device is in error. Satisfactory data has not been furnished to document that the AFCI functions as the NEC intended. The AFCI device, as marketed, does not indicate the

trip method. CPSC, manufacturers, NEMA, or UL have not established/implemented data collection methods to document that the AFCI is doing the job that the NEC intended. The device needs to be able to distinguish among overcurrent trip, ground fault trip, and arcing fault trip.

KING: I disagree with the added text that permits the use of Branch/Feeder AFCI devices in lieu of Combination Devices until 2008. Combination devices provide a higher level of protection against arcing faults and should be required in this code cycle. The panel’s concerns about the availability of these devices would have been better addressed by accepting Comment 2-109. See my Explanation of Negative on Comment 2-109.

O’NEIL: I disagree with the panel as this comment offers new material that has not had public review and should be held for the next revision cycle in accordance with 4-4.6.2.2(a) of the Regulations Governing Committee Projects. In addition, I disagree to allow in the Code a transition period for adoption of the combination device AFCI. Any justified expansion of the AFCI protection technology should apply equally to new and old construction when further field experience is gained with the combination device and UL Standard 1699 is further developed to address all of the technical issues required for protection intended to insure that the combination type device operates within the level of protection required by the panel’s intent without nuisance tripping. Current product standard UL 1699-1999 does not require that the device survive or operate on over voltage. The AFCI should act as a protective device and not permit or burn out on a dangerous over voltage condition. Current products listed un UL 1699-1999 nuisance trip on multiple appliances loading. This product standards issue need not use the NEC for its proving ground. A panel task group is recommended to evaluate the progress of the technology with the UL 1699 testing.

Comment on Affirmative:

WEBER: I support the panel’s action to Accept, however, the enactment date going out to January 1, 2008 is, in my opinion, an excessively long timeframe to require this enhanced safety protection function. As was indicated to the panel at the ROC meeting, there are other manufacturers that have listed equipment that meets this level of protection. I agree that they may, at this time-frame, not be in full production, but given retooling and production changes; who would commit to that without a reasonable assurance that the product will be installed without it being a code requirement. I have been around a long time and have heard of the concept that the Code is a minimum requirement and owners or contractors can put in new technology features if they wish and not make it a code requirement. My response to that happening is close to nil and the cause of enhanced safety is forestalled once again. My analogy of this technology is likened to a car with a hand braking system of old and now what is being utilized with the ABS anti-lock braking systems and what lives have been saved by the innovation. I am willing to accept a half of a loaf as versus having nothing at all with the panel’s acceptance of this comment and subsequent Code change in the future, but time is like money - the less we have of it the more wisely we tend to spend it. The time for this change is now or at least as soon as the next Code is adopted and enacted.

2-88 Log #2879 NEC-P02
(210.12 Exception)

Final Action: Reject

Submitter: Robert P. McGann, City of Cambridge / Rep. IAEI

Comment on Proposal No: 2-134a

Recommendation: Delete exception.

Substantiation: Where does the six foot rule come from? I don’t see a difference in 6 ft, 8 ft, 10 ft. We will now expect to see more subpanels installed in bedrooms. Is there documentation of damaged (home-run) wire before 1st device in line. If no splices are made until first device box, is there a danger of series arcing other than at overcurrent device and 1st device?

Panel Meeting Action: Reject

Panel Statement: The AFCI for 210.12(B) is intended to protect the entire branch circuit. The exception was added to allow additional options to meet this requirement.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

2-89 Log #102 NEC-P02
(210.12 Exception No. 1)

Final Action: Reject

Submitter: Dan Leaf Rancho Santa Margarita, CA

Comment on Proposal No: 2-129

Recommendation: All 15- and 20-ampere 125 volt branch circuits installed in bedrooms of dwelling units and guest rooms of hotels and motels shall be protected by an arc-fault circuit interrupter listed to provide protection of the entire circuit.

Exception: Circuits that supply only outlets for smoke or flame detectors.

Substantiation: Are “outlets” per se rated 15 or 20 amperes? The proposal would permit outlets for life safety to be exempt and since cords are not involved would likely enhance, not decrease safety. A dwelling unit includes certain hotel and motel guest rooms (with permanent provisions for cooking) but not others. Do arc-faults not occur in guest rooms without permanent cooking facilities?

Panel Meeting Action: Reject

Panel Statement: See panel statement on Comment 2-107. The submitter has not provided data relevant to guest rooms of hotels and motels.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 12 Negative: 1

Explanation of Negative:

DOBSON: See my explanation of negative vote on Comment 2-107.

2-90 Log #103 NEC-P02 **Final Action: Reject**
(210.12(A))

Submitter: Dan Leaf Rancho Santa Margarita, CA

Comment on Proposal No: 2-231

Recommendation: Accept the proposal.

Substantiation: 424.3(B) requires branch circuit conductors and overcurrent devices rated at not less than 125 percent of the load. The reference in that section to continuous operation infers a continuous load. Present wording does not require the feeder or service conductors or overcurrent devices to be rated at 125 percent. If the 125 percent requirement is necessary for branch circuit conductors and overcurrent devices, it is necessary for feeder and service conductors and overcurrent devices.

Panel Meeting Action: Reject

Panel Statement: The submitter's substantiation does not relate to 210.12(A) or Proposal 2-231.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

2-91 Log #510 NEC-P02 **Final Action: Reject**
(210.12(B))

Submitter: Walter Smittle, National Association State Fire Marshals

Comment on Proposal No: 2-140

Recommendation: Revise to read as follows:

Dwelling Unit Bedrooms. All branch circuits that supply 125-volt, single-phase, 15- and 20-amperes receptacles outlets installed in dwelling-unit bedrooms all living areas shall be protected by an arc-fault circuit interrupter(s).

Substantiation: See substantiations for Proposal 2-140 (Log 1623) and Proposal 2-143 (Log 2364). The panel has concluded there is not sufficient data available to substantiate the reliability and effectiveness of this new device to justify the expansion. The NASFM disagree in that more than compelling data has been submitted to Code-Making Panel 2.

The Consumer Product Safety Task Force, National Association of State Fire Marshals (NASFM), published a comprehensive report on August 1, 2002 on the efficacy and reliability of arc-fault circuit interrupters. Electrical engineering experts for US Consumer Product Safety Commission, Underwriters Laboratories, Chair of NASFM Science Advisory Committee, SP Swedish National Testing and Research Institute, and many fire safety professionals reviewed and commented on statistics and data provided by numerous sources which supports the reliability and effectiveness of arc-fault circuit interrupter technology.

During the meeting of Code-Making Panel 2 in January 2003 at Hilton Head, SC, the validity of NFPA and NFIRS reports on electrical fires was questioned. NASFM subsequently contacted ten (10) State Fire Marshals and requested two reports on investigations conducted by professional staff fire investigators where a fatality or fatalities occurred in a dwelling. Copies of these investigative reports and a synopsis of the causation factors are provided. As a result of the findings by professional investigators, with years of experience and expert credentials in the State Fire Marshal's Offices, the information supports the data collected by NFPA and NFIRS. Fifty-two (52) adults and fourteen (14) children died in dwelling fires caused by electrical failures that AFCIs could have prevented as identified in these investigative reports. Other supportive information is included regarding Firefighter Wary after 2nd Blase at SE Site in southeast Washington caused by an electrical short for a new townhouse complex as well as Fire Investigation Summary of an Apartment Building Fire in Bremerton, Washington. This supportive information clearly supports the need for AFCIs.

The panel also recommended data on "beta testing" before considering expansion of AFCIs on all circuits. NASFM understands that "beta testing" occurs before manufacturers start production. These electrical safety devices are already on the market and nearly six million AFCIs sold. NASFM is not privileged to manufacturers "beta testing" data as it would be confidential. In Appendix 2 of the NASFM report, (History of AFCIs and Their Inclusion in the National Electrical Code), in March 1996, UL issued a Report of the Research on Arc-Fault Detection Circuits. Additionally, the devices have been tested as well as scrutinized by the US Consumer Product Safety Commission before AFCIs were approved for commercial use in 1999.

NASFM firmly believes there is overwhelming scientific and statistical evidence that disproves disclaimers of nuisance tripping and that adding AFCIs to new residences is a threat to affordable housing.

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

Panel Meeting Action: Reject

Panel Statement: The panel appreciates the level of protection provided by branch/feeder AFCI's. However, the panel wants to see the combination protection implemented before expansion beyond bedrooms. The submitter has provided comprehensive fire data; however, Panel 2, seeks to gain further information on the experience with the devices already in the field.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 9 Negative: 4

Explanation of Negative:

KING: This Comment should have been accepted. I concur with the panel that comprehensive fire data was provided and share the panel's appreciation for the high level of protection provided by these devices. The panel action on Comment CC200 recognizes and permits the use of combination devices while allowing for the continued use of branch/feeder devices until 2008. I disagree that more time is needed for implementation of combination devices. Combination devices are listed and commercially available. The need to expand AFCI protection in dwelling units is well documented. Studies conducted by the NASFM and the CPSC indicate that expanding the requirement for AFCI protection to all living areas this code cycle would save many lives and save millions of dollars in property loss.

PAULEY: NEMA supports the expansion of AFCI protection to other areas of the dwelling unit. The submitter submitted substantial data to support his position. Although the panel is seeking to gain additional field experience, the AFCIs already in the field have provided a great deal of information. NEMA is not sure what additional information the panel is seeking. Fire statistics will take years to show the benefit of the improved protection, and it is difficult to show cases where AFCIs are installed and prevented a fire because consumers do not report instances of "fires that didn't occur."

PORTER: The panel has been provided with data that shows that fires in kitchens, living rooms and other dwelling unit areas may be reduced by the use of AFCI devices. The existing branch feeder AFCIs have demonstrated their performance in the field. Since these devices will continue to be permitted until January 1, 2008, there is no need to postpone the expansion of AFCI into other circuits.

WEBER: After long debate and deliberation, the panel affirmed in its statement that it "appreciates the level of protection provided" by AFCI; but wants more time for input from the field. The expansion of this proven safety protection is certainly justifiable. The original proposal and supporting comment should be Accepted. Change occurs slowly and sometimes methodically, but the time lost and potential lives lost by not increasing the safety mandate is hard to explain to a person or family that has suffered a loss to life or property that could have been prevented as the substantiation has clearly indicated to me.

2-92 Log #515 NEC-P02 **Final Action: Reject**
(210.12(B))

Submitter: Richard E. Loyd Sun Lakes, AZ

Comment on Proposal No: 2-161

Recommendation: Reconsider this proposal and accept this proposal.

Substantiation: This proposal would permit the present technology to provide the safety needed in all residential occupancies while allowing the receptacle type AFCI in residential construction where metallic concealed wiring methods are used. This change is justified as the metallic systems will protect against common damage from nails and staples, and other damage that often occurs during the construction phase. The metallic system also aids to contain arcing that may occur if the conductors are damaged while providing a low impedance path for ground faults. Consideration should be given to Mr. Pauley's comments on his negative vote on Proposal 2-134a.

Panel Meeting Action: Reject

Panel Statement: Metal conduit is only one portion of the tradeoff versus location of the AFCI. The limited distance is also necessary.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

2-93 Log #775 NEC-P02 **Final Action: Accept in Principle**
(210.12(B))

Submitter: Michael J. Johnston Plano, TX

Comment on Proposal No: 2-134a

Recommendation: Continue to accept this proposal.

This revision not only provides a clarification and guidelines for the product performance it also provides an alternative in the exception for remodels and alterations to existing dwellings that allows the AFCI protection to be applied where the service equipment and/or panelboard might otherwise have to be replaced to meet the current requirements of 210.12(B)

Substantiation: This revision not only provides a clarification and guidelines for the product performance it also provides an alternative in the exception for remodels and alterations to existing dwellings that allows the AFCI protection to be applied where the service equipment and/or panelboard might otherwise have to be replaced to meet the current requirements of 210.12(B)

Panel Meeting Action: Accept in Principle**Panel Statement:** See panel action on Comment 2-87a.**Number Eligible to Vote:** 13**Ballot Results:** Affirmative: 12 Negative: 1**Explanation of Negative:**

O'NEIL: I disagree with the panel as this comment offers new material and should be held for review during the next code cycle. See my explanation of negative vote on Comment 2-87a.

2-94 Log #1323 NEC-P02
(210.12(B))**Final Action: Reject****Submitter:** John A. Wafer, Eaton Electrical**Comment on Proposal No:** 2-140**Recommendation:** The panel is requested to reconsider and Accept Proposal 2-140.

Substantiation: The Panel statement indicates that the proposal was rejected "because there is not sufficient data available to substantiate the reliability and effectiveness of this new device to justify any expansion at this time. The dependability of this AFCI device in use in the public domain has not been determined, and the panel would seek sufficient data, including beta testing, before any potential expansion of the use of this device can be considered". The new device in question is the Combination Type AFCI that was mandated exclusively by CMP-2 in Panel Proposal 1-134a. Eaton Electrical agrees that it would indeed be irresponsible to expand the mandated application of AFCIs given the Panel Proposal to mandate Combination AFCIs exclusively. However, Eaton Electrical strongly supports the expanded use of AFCIs because Eaton Electrical is in complete disagreement (1) with the Panel's action in proposal 1-134a that mandates Combination AFCIs exclusively. The Panel's action removes the existing, effective Branch/Feeder AFCIs from residential applications and replaces them with unproven Combination AFCIs. In particular, this action has a major impact on public safety because it prevents expansion of proven fire safety technology. The Panel action in proposal 2-134a was also unnecessary because the existing code language mandates protection by an arc-fault circuit interrupter listed to provide protection of the entire branch circuit. The language does not specify the type of AFCI and the protection could presently be offered by both Branch/Feeder AFCIs and Combination AFCIs.

Ms. Susan Porter of UL voted against the expanded use of AFCIs but gave a clear written explanation of her position. She did not support expansion because of the mandated Combination AFCI. But she goes further and states that the data provided showed that fires in kitchens, living rooms and other dwelling unit areas may be reduced by the use of AFCI devices. In fact, she states that the existing AFCIs have demonstrated their performance in the field and that if these devices were to continue to be permitted in the 2005 Code there would be no need to postpone the expansion of AFCI into other circuits.

Let us examine first of all the protection afforded by Branch/Feeder AFCIs. First, it is well known that Branch/Feeder AFCIs provide complete protection to the commonly used installation wire (NM-B plus ground). What apparently is less well known is that Branch/Feeder AFCIs also provide considerable protection beyond the outlets. Per UL 1699, these devices must detect the high power, damaging, across-the-line arcs in SPT-2 two wire cords that are unlikely to trip a conventional circuit breaker. These intermittent arcs in appliance and extension cords, with current magnitudes of 50A and above, can occur due to physical bridging of the wires by an object such as a chair leg, or due to insulation breakdown between conductors due to localized heating. Further, since all commercially available Branch/Feeder AFCIs contain ground fault protection (30mA), they prevent potential fires by detecting faulty circuit connections (grounded neutral) and by reacting (2) to earth leakage currents associated with overheating at grounded receptacles and plugs (glowing connections). And experience with Branch/Feeder AFCIs has been excellent. There are more than 5 million Branch/Feeder AFCIs from four major manufacturers installed in the field, with a cumulative 25 billion hours of operational experience. These devices have prevented fires, have prevented the mis-wiring of circuits and have received public acceptance because they are not subject to unwanted tripping. As testament to the value of currently existing AFCIs, the Consumer Product Safety Commission (CPSC) held a full day meeting on 9/23/03 at the CPSC Headquarters aimed at examining AFCI performance to date, and soliciting ideas for better acquainting the public with the benefits of AFCI protection for electrical circuits. The subsequent Associated Press release (3) of the meeting showed the strong NASFM and CPSC support for AFCI technology. In particular, we note that this assessment was made based on experience with Branch/Feeder AFCIs.

And what additional protection would be offered by Combination AFCIs? The Combination AFCI detects long duration, low current arcs of 5-30 amperes. Thus, in a 20 ampere circuit the standard (4) requires that a 5-amp arc must be detected and interrupted within 1 second (120 half cycles of arcing) and a 30-amp arc (150% rating) within 0.11 seconds (13 arcing cycles). But arcs of this duration with copper wire are extremely unlikely in 120 volt circuits. An arc is certainly initiated when copper conductors break, but in a 120 volt circuit this low current, low power arc typically self-extinguishes at the first AC current zero. No AFCI could possibly trip under these half-cycle circumstances because such a device would then nuisance trip on the arcs

encountered under normal switching operations. This nuisance tripping could not be tolerated. Indeed, Code-Making Panel 2 is correct to move slowly relative to the application of Combination AFCIs because there is no experience in the residences of the general public relative to nuisance tripping. And lack of practical experience relative to nuisance tripping must be a major concern. Thus, Combination AFCIs must constantly monitor the circuit to distinguish uncontrolled, low current arc waveforms from the arc waveforms that normally occur when contacts separate for circuit control (switches, bimetal-thermostats) and appliance operation (electric motors with arcing-brushes such as vacuum cleaners). Further, they must constantly distinguish uncontrolled, low current arc waveforms from the distorted waveforms associated with electronic power supplies (for example, lamp ballasts and computers).

Important questions can certainly be asked about the added value of Combination AFCIs relative to Branch/Feeder AFCIs. Are long duration, low current arcs encountered in real world circuits? Can the detection of such arcs be accomplished without nuisance tripping? And from Eaton Electrical's viewpoint, those questions should be answered in the field by permitting both types of AFCI to coexist. We, therefore, ask the Panel to accept the present proposal to expand the use of AFCIs in the full expectation that the words Combination AFCI will be withdrawn from proposal 2-134a. The fire safety benefits of Branch/Feeder AFCIs, as highlighted at the recent CPSC meeting, will then be applied to a greater number of household circuits with a consequent reduction of fire deaths, burns and property loss. At the same time, since the present code-language is non-exclusionary, Combination AFCIs can be introduced gradually. This is in contrast to the "combination only" concept where several million field-unproven devices can be expected in the field during the first year. The American public deserves the benefit of fire safety technology, and the application of that technology should not be delayed by doubts about emerging technology. The existing technology is performing a valuable function and its range of safety-application should be expanded.

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

Panel Meeting Action: Reject**Panel Statement:** See panel statement on Comment 2-91.**Number Eligible to Vote:** 13**Ballot Results:** Affirmative: 11 Negative: 2**Explanation of Negative:**

PAULEY: See my Explanation of Negative Vote on Comment 2-91.

PORTER: See my explanation of negative vote on Comment 2-91.

2-95 Log #1324 NEC-P02
(210.12(B))**Final Action: Reject****Submitter:** John A. Wafer, Eaton Electrical**Comment on Proposal No:** 2-143**Recommendation:** The panel is requested to reconsider and accept Proposal 2-143.

Substantiation: The code presently mandates Arc-Fault Circuit Interrupter protection for branch circuits supplying 15- and 20-ampere outlets in dwelling unit bedrooms. To date this protection has been provided by Branch/Feeder AFCIs located at the origin of the branch circuit. The objective of this substantiation is to support the original proposal by arguing for expansion of the dwelling unit circuits protected by Branch/Feeder AFCIs based on (A) a description of the protection currently provided, (B) fire statistics plus a comparison to GFCI protection and (C) experience to date.

With respect to (A), all of today's Branch/Feeder AFCIs combine the thermal and magnetic protection of standard circuit breakers with arc fault detection circuitry to sense high-power line-to-neutral arcing faults. All commercially available Branch/Feeder AFCIs also contain earth leakage circuitry (30 mA) that provides protection against ground faults. As a consequence, commercially available Branch/Feeder AFCIs provide complete protection to the commonly used branch circuit installation cable (NM-B plus ground), protection against all arcing faults between two conductors (parallel faults) in 2-wire cords, and protection via ground fault against all arc-to-ground of 30 mA and above at any point in the circuit. Significant protection is also provided against glowing connections (1, 2) via ground fault and parallel arc detection. Here it is noted that parallel arcs and leakage to ground are often initiated by localized "hot-spots" (non-arcing high-resistance series faults) in the circuit. These "hot spots" can be glowing connections, for example, at a loose wire nut on a receptacle, or can originate at a high resistance contact due to a conductor break with subsequent conductor-reconnection due to the elasticity of the wire insulation.

Table 1 summarizes the protective features of the Branch/Feeder AFCI relative to eleven recognized home wiring fault hazards. Seven of these are "Behind-the-Wall" faults and four are "In-the-Room" faults. Seven of them start as high resistance series faults while two start as parallel faults. Two are related to current overload. With respect to parallel faults, a UL study (3) that showed that many household circuits had available short circuit currents of only 75A to several hundred amperes. At these low available short-circuit currents, a standard circuit breaker would not respond to many across-the-line arcing faults. However, through parallel arc detection and response to ground faults, all of the hazards in Table 1 are mitigated by the currently available Branch/Feeder AFCIs.

With respect to (B), the most reliable fire statistics come from NFPA (4). These statistics indicate that more than 60,000 fires per year are associated with

electrical arcing in one- and two-family dwellings. They result in nearly 500 deaths annually and property damage of almost \$1 billion. AFCIs, if applied widely, will have a major impact on these numbers just as GFCIs, through wide application, have had a major impact on deaths by electrocution (approximately 650 in 1976; reduced to about 175 in 2000). No one would question the value of GFCIs with their proven capability of saving several hundred lives per year and with the associated peace of mind for millions of homeowners. By the same token, no one should question the value of AFCIs with their potential to save a similar number of lives annually. And, different from GFCIs, AFCIs also have the potential to reduce debilitating burn injuries and to reduce fire-related property damage.

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

Panel Meeting Action: Reject

Panel Statement: See panel statement on Comment 2-91.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 10 Negative: 3

Explanation of Negative:

KING: See my explanation of negative vote on Comment 2-91.

PAULEY: See my Explanation of Negative Vote on Comment 2-91.

PORTER: See my explanation of negative vote on Comment 2-91.

2-96 Log #1331 NEC-P02
(210.12(B))

Final Action: Reject

Submitter: Philip M. Piqueira, General Electric Co.

Comment on Proposal No: 2-134a

Recommendation: Reconsider and reject the proposal.

Substantiation: CMP-2 acted prematurely specifying that branch circuits in dwelling unit bedrooms be protected by "combination" type AFCIs to the exclusion of all other AFCI technologies.

When CMP-2 accepted the concept of AFCI technology, during the 1999 code cycle, that acceptance was based upon research data demonstrating not only the efficacy of AFCIs in minimizing fires due to low voltage arcing but was also based upon a significant degree of field testing of AFCIs. However, the proposal to mandate combination type AFCIs did not contain the level of field-testing data necessary to assure reliability. The primary differentiation between a combination type AFCI and a branch/feeder AFCI is that the combination type AFCI must detect arcs down to 5-ampere in 2-wire cords within specific time limits. Recognizing that these devices must be capable of distinguishing, on a continuing basis, the difference between damaging arcs and the safe arcs which are inherent in the transient waveforms associated with common household circuits (including the chopped waveforms of electronic power supplies), the strong possibility of nuisance tripping exists.

If this proposal is accepted, it will obsolete the present branch/outlet AFCIs which have not only been commercially available for the past six years but have been field-proven during that time. Further, the decision by CMP-2 to accept this proposal is difficult to understand when it is recognized that the present code language allows the installation of both combination and branch/outlet AFCIs and, at this juncture, there are no commercially available combination type AFCIs.

Clearly, the interests of public safety will not be served if combination type AFCI's are mandated in the code to the exclusion of all other AFCIs.

Panel Meeting Action: Reject

Panel Statement: See panel action on Comment 2-87a.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 12 Negative: 1

Explanation of Negative:

O'NEIL: I disagree with the panel as this comment offers new material and should be held for review during the next code cycle. See my explanation of negative vote on Comment 2-87a.

2-97 Log #1395 NEC-P02
(210.12(B))

Final Action: Reject

Submitter: Nathan Messing Bad Axe, MI

Comment on Proposal No: 2-135

Recommendation: Change panel action from reject to accept.

Substantiation: Data does not need to be submitted. As was stated in proposal 2-127, it is common sense. NFPA 72 does not permit fire alarm systems to be supplied from a circuit protected by a GFCI. The issue here is similar. I agree with the comment on negative vote for proposal 2-127 by Mr. Dobson and Mr. Becker. Please also consider their comments as a part of this substantiation.

Panel Meeting Action: Reject

Panel Statement: See panel statement on Comment 2-107.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 12 Negative: 1

Explanation of Negative:

DOBSON: See my explanation of negative vote on Comment 2-107.

2-98 Log #1398 NEC-P02
(210.12(B))

Final Action: Reject

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: William H. King, Jr., U.S. Consumer Product Safety Commission

Comment on Proposal No: 2-124

Recommendation: Instead of adding a new section as originally proposed, reconsider Proposal 2-124 by adding the following sentence to the existing section (B) of 210.12:

When a panelboard that contains overcurrent protective devices for the bedroom branch circuits that supply 125-volt, single-phase, 15- and 20-ampere outlets is replaced, arc-fault interrupter protection for the outlets shall be provided.

Substantiation: Occupants of existing homes, homes that data shows are at a greater risk for an electrical wiring-related fire than new homes, should have no less electrical fire prevention capability afforded by AFCIs in bedroom outlet circuits than currently required in the NEC for new construction (data ref: CPSC report "Residential Electrical Distribution System Fires", Dec. 1987). Code Making Panel 2 is urged not to miss the window of opportunity during the 2005 NEC cycle to make this minimal, but critical safety improvement. Panelboards containing branch circuit protective devices are routinely changed in existing homes to provide increased capacity or to correct deficiencies. Panelboard manufacturers report that a significant amount of residential panelboards is sold as replacements. During the panelboard change-out, it would be a relatively small investment in time and dollars to provide AFCI protection for the outlets that serve the bedrooms. In line with Code Making Panel 2's statement in connection with Proposal 2-140, acceptance of this comment does not expand AFCI protection beyond dwelling unit bedrooms at this time.

In response to Code Making Panel 2's statement in connection with Proposal 2-124 regarding retroactive requirements in the NEC, such requirements are not without precedence. See for example, 406.3(D) regarding receptacle replacements.

Panel Meeting Action: Accept in Principle

Panel Statement: See panel action and statement on Comment 2-82.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 8 Negative: 5

Explanation of Negative:

BECKER: See my Explanation of Negative Vote on Comment 2-87a. In existing dwellings, the added cost of these devices will eliminate upgrades that would otherwise be undertaken. There is no evidence that this device is, in fact, detecting and preventing electrically caused fires. The cause of electrical fires needs to be identified. The present device does not appear to provide the protection that was originally envisioned.

DOBSON: See my explanation of negative vote on Comment 2-82.

SIDHOM: See my explanation of negative vote on Comment 2-82.

TOMAN: See my Explanation of Negative Vote on Comment 2-82.

WILKINSON: See my Explanation of Negative Vote on Comment 2-82.

Comment on Affirmative:

ROCHÉ: See my Explanation of Affirmative Vote on Comment 2-82.

2-99 Log #2629 NEC-P02
(210.12(B))

Final Action: Reject

Submitter: Richard & Cheryl Mickle, Best Electric

Comment on Proposal No: 2-133

Recommendation: Revise as follows:

in dwelling unit bedrooms

Exception: No. 1 for an appliance

Exception: No. 2 for a motor control

Exception: No. 3 for smoke detector circuit

Exception: No. 4 for isolated circuits

Substantiation: Fire protection according to the NEC for the entire dwelling.

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

Panel Meeting Action: Reject

Panel Statement: See panel statement on Comment 2-91.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

2-100 Log #2975 NEC-P02
(210.12(B))

Final Action: Reject

Submitter: Joe Renk, Renk Electric

Comment on Proposal No: 2-133

Recommendation: Revise:

All branch circuits that supply 125 volt 15 and 20 amp outlets installed in dwelling unit bedrooms. Exceptions 110 volt interconnected smoke detectors, lighting outlets for ceiling fans and light fixtures.

Substantiation: Problem: If there was to be an arch fault condition in a bedroom and smoke detectors are connected to this circuit full protection of the smoke detectors would be compromised. I have not seen any documentation on how ceiling lighting and ceiling fan outlets could cause arch fault conditions.

Panel Meeting Action: Reject

Panel Statement: See panel statement on Comment 2-107. The panel intends that all outlets in bedrooms be covered by the requirement. The submitter's comment is not applicable to the text of the proposal.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 12 Negative: 1

Explanation of Negative:

DOBSON: See my explanation of negative vote on Comment 2-107.

2-101 Log #3248 NEC-P02
(210.12(B))

Final Action: Reject

Submitter: Michael I. Callanan, IBEW

Comment on Proposal No: 2-140

Recommendation: The panel should reconsider this proposal and accept it.
Substantiation: With the expansion of Arc-Fault Circuit-Interrupters to all living areas in a dwelling unit, a higher level of protection to life and property would be provided. Electrical fires are not limited to dwelling unit bedrooms. The wiring methods used throughout the dwelling unit is the same as those used in the bedrooms. A staple, nail, screw, or other accidental means may compromise a cable during construction or any other time in an older or existing dwelling increasing the risk of an arc fault occurring. The potential use of a faulty piece of equipment or cord may be present in any room.

The panel supports the use of Arc-Fault Circuit-Interrupter Protection in the bedroom of dwelling units and should consider expanding their use.

During the last code cycle, the panel had rejected similar proposals to expand the use of AFCI protection beyond the bedroom of a dwelling unit. In the panel's substantiation for comment 2-78 on Proposal 2-108 they stated "The panel continues to support the introduction of AFCI but intends at this time to limit the requirements to bedroom branch circuits until further data can be obtained and evaluated." AFCIs have been put through rigorous UL test in their development and new products are being manufactured providing more alternatives to meet the needs of the requirements. The cost of these effective with their expanded uses. The same scenario was seen with the introduction of GFCI protection. Waiting another code cycle to expand their use to other locations in a dwelling will only prolong reducing the amount of fires attributed to arc-faults.

This comment represents the official position of the International Brotherhood of Electrical Workers Codes and Standards Committee.

Panel Meeting Action: Reject

Panel Statement: See panel statement on Comment 2-91.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 9 Negative: 4

Explanation of Negative:

KING: See my explanation of negative vote on Comment 2-91.

PAULEY: See my Explanation of Negative Vote on Comment 2-91.

PORTER: See my explanation of negative vote on Comment 2-91.

WEBER: See my explanation of negative vote on Comment 2-91.

2-102 Log #3249 NEC-P02
(210.12(B))

Final Action: Reject

Submitter: Michael I. Callanan, IBEW

Comment on Proposal No: 2-140

Recommendation: This proposal should be accepted.

Substantiation: The submitter of this proposal seeks to expand the requirement for AFCI protection to all living areas in dwelling units and has provided sufficient data to support the change. His substantiation includes a Fact Finding Report prepared by the Consumer Product Fire Safety Task Force for the National Association of State Fire Marshals. The report cite specific examples where beta testing has proven AFCI devices to be both reliable and effective. The report also includes a finding from the Science Advisory Committee, The US Consumer Product Safety Commission, Underwriters Laboratories and the SP Swedish National Testing and Research Institute all resulting in positive assessments of AFCI technology. The need to expand the use of AFCI Technology is imminent. A report prepared by Marty Ahrens from the NFPA in March 2001 with National estimates based on the National Fire Incident Reporting System and an NFPA survey cited an average of 73,500 electrical fires annually which were responsible for 591 deaths, 2,247 injuries and property damage totaling \$1,047,900,00. Of these 73,500 electrical fires 60,900 or 82 percent were caused by arcing faults and not by overloads. These numbers are unacceptable given the availability of AFCI protected devices on the market today. The US Consumer Product Safety Commission in an independent research on AFCIs estimated that employing AFCI technology could prevent 50-75 percent of residential electrical fires. AFCI devices have the ability to mitigate arcing faults that would normally not be detected by conventional overcurrent protection devices. The significant reduction in electrical fires afforded by expanding the requirements for AFCI protection to all living areas in dwelling units should not be ignored. Panel 2 should give this proposal further consideration. This comment represents the official position of the International Brotherhood of Electrical Workers Codes and Standards Committee.

Panel Meeting Action: Reject

Panel Statement: See panel statement on Comment 2-91.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 9 Negative: 4

Explanation of Negative:

KING: See my explanation of negative vote on Comment 2-91.

PAULEY: See my Explanation of Negative Vote on Comment 2-91.

PORTER: See my explanation of negative vote on Comment 2-91.

WEBER: See my explanation of negative vote on Comment 2-91.

2-103 Log #3412 NEC-P02
(210.12(B))

Final Action: Reject

Submitter: Jack Wells, Pass & Seymour/Legrand

Comment on Proposal No: 2-134a

Recommendation: Add new text as follows:

210.12 Arc-Fault Circuit-Interrupter Protection.

(A) Definition. An arc-fault circuit interrupter is a device intended to provide protection from the effects of arc faults by recognizing characteristics unique to arcing and by functioning to de-energize the circuit when an arc fault is detected.

(B) Dwelling Unit Bedrooms. All 120 volt, single phase, 15 and 20-ampere branch circuits supplying outlets installed in dwelling unit bedrooms shall be protected by a listed arc-fault circuit interrupter, combination type or outlet branch circuit type installed to provide protection of the branch circuit.

FPN: For information on types of arc-fault circuit interrupters, see UL 1699-1999, Standard for Arc-Fault Circuit Interrupters.

Exception: The location of the arc-fault circuit interrupter shall be permitted to be at other than the origination of the branch circuit, ~~in compliance with (1) and (2):~~

(1) The arc-fault circuit interrupter installed within 1.8 m (6 ft) of the branch circuit over current device as measured along the branch circuit conductors.

(2) ~~The circuit conductors between the branch circuit over current device and the arc fault circuit interrupter shall be installed in a metal raceway or a cable with a metallic sheath.~~

Substantiation: An Outlet Branch Circuit AFCI provides the same downstream branch circuit protection as a Combination AFCI when the AFCI is located within 6 feet of origin of the branch circuit. Figure 1 and Table 2 of the UL document "Arc Fault Testing and Arc Fault Scenarios" (that I have provided) shows the protection provided by these two types of AFCIs. In addition, the Outlet Branch Circuit AFCI provides upstream series arc protection of the branch circuit conductors between the origin of the branch circuit and the Outlet Branch circuit AFCI. A note in Table 2 states that the Combination AFCI at other than the origin of the branch circuit does not protect upstream branch circuit wiring. The outlet branch Circuit AFCI should be added to 210.12(B) since the Outlet Branch Circuit AFCI provides the same protection as the Combination AFCI, in addition to upstream series arc protection, when located 6 feet from the origin of the branch circuit.

There is also no substantiation that the 6 feet of branch circuit conductors between the branch circuit overcurrent device and the AFCI is subject to conditions that would result in arcing fault. Item (2) of the exception should be deleted.

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

Panel Meeting Action: Reject

Panel Statement: The panel reaffirms its position on Proposal 2-134a. It does not disallow the use of an AFCI outlet device in a box, per the requirements of the exception to 210.12(B).

Number Eligible to Vote: 13

Ballot Results: Affirmative: 11 Negative: 2

Explanation of Negative:

DOBSON: I concur with Mr. Weber's comments.

WEBER: The panel should have Accepted this comment to eliminate the need for a metal raceway or a cable with a metallic sheath as required in the original proposal. The location of the device still remains within 1.8m (6 ft) of the branch circuit overcurrent device as originally agreed to by the panel. Given that length as well as data in the UL document "Arc Fault Testing and Arc Fault Scenarios", this change is justified. The potential of faults occurring within just 1.8m (6 ft) of nonmetallic sheathed cable is extremely remote and given the proximity of the branch overcurrent protection as well as the devices tested performance; the impact of the loss of a metal covering over the conductors is minimal. In my opinion, I believe that most contractors in the field will chose to close nipple a box to the panelboard and place the device there similarly to what we see for GFCI protection in unfinished basement area and only a very short amount of circuit wire will be installed upstream of the AFCI device.

2-104 Log #3491 NEC-P02
(210.12(B))

Final Action: Reject

Submitter: Frank Pologruo North Cape May, NJ

Comment on Proposal No: 2-133

Recommendation: I support this proposal.

Substantiation: Group discussions raised many questions and not all inspectors or “AHJ” can give a uniform decision. There is much confusion as to a receptacle replacement or circuits that go through the bedroom. Does the receptacle or circuit going through the bedroom have to be AFCI protected?

Panel Meeting Action: **Reject**

Panel Statement: It is unclear what the submitter intends. Proposal 2-133 was accepted in principle.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

2-105 Log #3672 NEC-P02 **Final Action: Accept in Principle**
(210.12(B))

Submitter: George D. Gregory, Square D Company

Comment on Proposal No: 2-134a

Recommendation: Continue to accept the proposal.

Substantiation: CMP 2 made significant progress in the battle to improve circuit protection with its development and acceptance of Proposal 2-134a for the 2005 NEC. We recognize that this revision will not be without controversy or without much rhetoric from some portions of the industry.

This comment is intended to provide the panel with some answers to the likely objections and a quick review of the history of how we got here.

History

As many members on the panel will recall, AFCIs were first introduced into the 1999 NEC. At that time the UL 1699 standard was not “final” and AFCIs were being classified to mitigate the effects of arcing faults. CMP 2 did not specify the type of AFCI required simply because the concept of types was still under consideration by the standards body. The requirement entered the Code, but with a January 1, 2002 compliance date.

During this time period, those involved in the standards process were faced with what should constitute an AFCI. One concept being pushed by one manufacturer was that there should be an AFCI that works on arcs 75A and above. The arguments began and the ultimate result was the five types of AFCIs we know today: branch/feeder, outlet circuit, combination, cord and portable. Each had different characteristics and passed different parts of the test portfolio.

During the processing of the 2002 NEC, one manufacturer introduced the concept of an “outlet branch circuit” AFCI with the idea that you could provide the required protection at the first outlet. The panel heard lengthy debate about series arcs, parallel arcs, high level (75A) arcs and low level (5A) arcs. It was at this point that the thinking of many panel members and other segments of the electrical industry began to raise the issue as to why can’t the 210.12 AFCI provide for all of the protection that was originally thought to be coming?

The panel decided to make their point known by changing the language that the AFCI must protect the “entire” branch circuit and left it to the standards body to work out the issue of series and parallel arcing. The UL 1699 standards technical panel received proposals to make it clear that the AFCI contemplated by the NEC must pass all of the arcing tests (series, parallel, ground fault, high and low). However, the STP did not accept these proposals.

So, it was left once again to the code panel to deal with the issue of what is acceptable protection.

Now we enter the 2005 NEC cycle. It was VERY clear from comments throughout the industry over the previous three years that more was expected of the AFCI. The branch/feeder concept of parallel arcing above 75A was not going to be acceptable in moving forward.

Proposals were made to change the code requirement to the “combination-type” AFCI. Key in this change is that this is an AFCI that is ALREADY in UL 1699. It is not a “new” concept. The testing for arc-detection as well as the nuisance trip and related testing is already outlined in the standard. The revision accepted by the panel provides the “complete” protection package. There is no longer an argument about high level versus low level arcing or series versus parallel arcing.

Some panel members were strong in their statements. “This is the AFCI we wanted to begin with!” was the response from more than one member. This proposal 2-134a provides the requirement for that complete product named the “combination” AFCI.

Likely Objections

No Combination AFCI Available – this doesn’t bear out in fact. At the time of this comment, there are three listings for “combination AFCIs”. The standard requirements for the combination AFCI are in the same standard as those for the B/F AFCI and have been available since 1999. The listed products meet that standard. One cannot deny the fact that the Code drives the commercial availability of many electrical devices. This will be no different. The listings prove that the technology and capability is there, the new Code rule will drive the timing and availability.

Detection of series arcs cannot be done – clearly this statement is not accurate. Since before this code cycle, Pass & Seymour indicated to the panel their success in this area. Additional listings since that time reinforce the fact that it can be accomplished. It is true that there may be manufacturers that cannot do adequate series arc detection WITH THEIR PRESENT TECHNOLOGY PLATFORM. However, that is an implementation issue for the manufacturer, not a decision point for the Code.

Arcing at 120V does not occur in a way that will cause fires – Research definitely indicates that arcing and especially arc tracking occur at 120V and causes fire ignition. The standards tests are performed using methods that

cause ignition of either electrical insulation or indicator materials used in testing when the AFCI is not in the circuit. Evidence from fire occurrences clearly indicates the presence of arcing or arc tracking. It is true that a 120V arc in open air will not generally sustain for an extended time without the presence of carbonized material (such as is generated by arc tracking). However, even a sporadic arc at 120V will cause heat and molten metal particles that cause ignition if not interrupted and will lead to higher energy arcing as carbonized material builds up. The AFCI detects and de-energizes these conditions.

Series Arc Detection will lead to Massive “Nuisance Tripping” – The UL standard already has test protocol for “nuisance” tripping situations. The panel should keep in mind that no manufacturer wants to introduce a product that will “nuisance trip”; as such there is significant work that goes into a product to avoid this condition. Field/Beta testing doesn’t support the claim of increased “nuisance” tripping.

Requiring Combination AFCI is “Restraining Trade” – this argument is clearly a red herring. The requirement for a combination AFCI is the panel’s statement about the level of performance expected of the product. In fact, this is no different than making it clear that GFCI protection is a Class A 5mA device instead of a 30mA device. The history of the AFCI product standard has resulted in a situation where CMP 2 is making its expected protection level of AFCI clearly known. The new code rule doesn’t specify the parameters of the test of the criteria for passing, it only states that the product employed to meet the code requirement must meet all of the “tests” specified in UL 1699. This is in contrast to a product of a different “type” that only has to meet a portion of the tests.

Protection from the first receptacle is adequate – AFCIs are for the protection of the circuit wiring and insulation. As a form of circuit protection, AFCIs are needed to protect the entire circuit, not only a portion of it. Protection is needed for lighting circuits, dedicated circuits and other fixed loads as well as outlet circuits.

The present requirements for a branch/feeder AFCI are adequate - there is no doubt that the branch/feeder AFCI is a significant improvement over regular overcurrent protection. However, the panel (and the public in proposals 2-117, 2-119, 2-123, 2-128, 2-130, 2-131, 2-132, 2-149) has an expectation that an AFCI should provide for protection against series, parallel and ground fault arcing as well as high level (75A) and low level (5A).

Branch/Feeder AFCIs should continue to be allowed – The panel has recognized that the B/F AFCI does not provide the levels of protection they originally contemplated. The combination AFCI requirement resolves that issue. However, if the panel is agreeable, it is possible to provide the “combination” protection by using a single device or by using a B/F AFCI along with an Outlet AFCI on the same circuit. We have submitted a separate public comment to allow for such an arrangement. This revision would still allow those that only want to offer a BF AFCI to do so and use an outlet AFCI as well.

We encourage that panel to “stick to their guns” on the combination AFCI. Filling the “gaps” in available protection raised by the public (and panel members) will provide a significant benefit to the public in curtailing fire causes.

Panel Meeting Action: **Accept in Principle**

Panel Statement: See panel action on Comment 2-87a. The submitter’s intent is met but with an extended time frame.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

2-106 Log #3393 NEC-P02 **Final Action: Reject**
(210.12(B) Exception)

Submitter: David A. Kerr, Jr., Tri-State Inspection Agency, Inc.

Comment on Proposal No: 2-158

Recommendation: This proposal and numerous others should be accepted.

Substantiation: I think AFCI is electronic pie in the sky that will never really do what has been touted. There is often a difference between the real world and advertising hyperbole. I have heard that all AFCI’s sometimes trip. That indicates utility blinks on the line side. People will simply throw them in the trash.

Panel Meeting Action: **Reject**

Panel Statement: See panel statement on Comment 2-107.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

2-107 Log #1335 NEC-P02 **Final Action: Reject**
(210.12(B) Exception (New))

Submitter: Joseph A. Ross, Ross Seminars

Comment on Proposal No: 2-134a

Recommendation: Add a new Exception No. 3 as follows:

Exception No. 3: AFCI protection shall not be required for permanently installed alarm systems (fire, smoke, and burglar) in dwelling units.

Substantiation: The submitter agrees with the new additions of Exceptions Nos. 1 and 2, but let’s consider the addition of new Exception No. 3.

Exception No. 1 will permit up to 6 feet of unprotected (AFCI) branch-circuit conductors where installed in a metal raceway or a metal-sheathed cable. This was done more as a convenience to establish a level playing field for the use of receptacle type AFCIs than for safety reasons.

Exception No. 2 will permit an unprotected (AFCI) "individual branch circuit" supplying a dedicated (marked) outlet for life-support equipment in dwelling unit bedrooms. An "individual branch circuit" can serve only one utilization equipment and at least three circuits (PCA pumps, Feeding pumps, Respirators, Beds, etc.) may be needed. This means, that for three such circuits at least 90 feet, on an average, [up the wall (8 ft.), across the ceiling (15 ft.), and down the wall (7 ft.)] (3 x 30 ft. = 90 ft.) may be needed. Consider the use of 90 ft. of unprotected (AFCI) cable (any cable method, not metal raceway or metal-sheathed cable). But, then consider not permitting 3' of cable (of any type) located over the bedroom entry door to supply a life-saving smoke detector. The location above the entry door is virtually free from any physical injury and it is unrealistic to think that a nail, etc. would be driven in that location.

If an AFCI device operates on a bedroom outlet (receptacle or lighting), the worst scenario is to reset the clock radio. A smoke detector is not a bedroom outlet per se, it is a smoke detector outlet located in the bedroom to rouse sleeping families in fire or smoke situations. Smoke detectors are a life-saving device and it is unthinkable to compromise this circuit by connecting it to a sensitive AFCI protected circuit.

Panel Meeting Action: Reject

Panel Statement: The submitter has not provided Panel 2 with any documentation to support his claim that AFCI devices are not compatible with listed smoke or burglar alarms.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 10 Negative: 3

Explanation of Negative:

BECKER: See my explanation of negative vote on comment 2-70.

DOBSON: With AFCI technology still in its infancy it is clear there are many uncertainties. The CMP has decided to redefine the technology because it does not supposedly provide all of the desired protections. The CMP has decided to hold off on any expansion of the device in new construction until enough field data has been provided. We do not know everything about AFCI technology and how it will perform. There is enough skepticism to warrant not taking a chance on having the AFCI technology impede the performance of a proven technology that has been around for well over 30 years. We should not compromise the single most important fire safety device in one-and-two family dwellings - smoke alarms.

This requirement not only impacts the smoke alarms in the bedrooms but also will effect the entire smoke alarm system, as interconnected smoke detectors are required by manufacturers to be wired on the same circuit.

O'NEIL: The panel has rejected this comment because the submitter has not provided substantiation that AFCIs are not compatible with listed alarms. Manufacturers have submitted that current product standards does permit nuisance tripping on products listed to UL 1699-1999. Until any question of the possibility of nuisance tripping is resolved, AFCI devices should not be permitted on life saving devices. Putting AFCI protection on Life Safety devices creates the greater risk of disabling life saving devices at the time proper operation of the life-safety device is most required.

2-108 Log #3247 NEC-P02
(210.12(B) Exception No. 1 (New))

Final Action: Accept

Submitter: Michael I. Callanan, IBEW

Comment on Proposal No: 2-167

Recommendation: This proposal should be rejected.

Substantiation: The substantiation for this proposal is anecdotal in nature and lacks the necessary technical merit to support this change. The submitter's claim "the risk of nuisance trip is greater than the proposed protection" is not substantiated. A Fact Finding Report developed by the Consumer Product Safety Task Force for the National Association of State Fire Marshals on the issue of nuisance tripping of AFCI devices concluded the following: "Fact: UL 1699, Standard for Safety for Arc Fault Circuit Interrupters, addresses nuisance tripping and is far in excess of practical requirements. An AFCI manufacturer told us that an electrician participating in Beta testing of an AFCI device complained about nuisance tripping, only to learn that the problem actually was a severe arcing condition involving a garage door opener. In this situation, the AFCI did what it was designed to do and prevented a fire. In a similar incident, an electrician complained about nuisance tripping although inspection revealed that he had incorrectly installed radon fans, and the tripping of the AFCI had served to prevent fires in several new homes. The UL 1699 standard currently addresses 15 different unwanted tripping tests." The statement from UL 1699 regarding life-safety equipment has not been properly researched. See Mr. Pauley's Explanation of Abstention for this proposal. AFCI protection has a two year history of field use with positive results in terms of reliability and effectiveness. Further evidence supporting the submitter's claim should be required before considering this change. This comment represents the official position of the International Brotherhood of Electrical Workers Codes and Standards Committee.

Panel Meeting Action: Accept

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

2-109 Log #1576 NEC-P02
(210.12(B) Exception No. 2)

Final Action: Reject

Submitter: Jim Pauley, Square D Company

Comment on Proposal No: 2-134a

Recommendation: Add a new Exception #2 to the proposed revision that reads as follows:

Exception No. 2: In lieu of the combination type AFCI, the required AFCI protection shall be permitted to consist of a branch-feeder type AFCI in conjunction with an outlet type AFCI. The branch-feeder type AFCI shall be installed at the origination of the branch circuit and the outlet type AFCI shall be installed as the first outlet in the branch circuit. The outlet type AFCI shall provide protection for all outlets connected to the branch circuit.

Substantiation: As pointed out in other comments, there are three combination AFCIs now listed by Underwriters Laboratories. However, CMP 2 is likely to hear arguments that they should not limit the methods of compliance to a single style of device. This revision provides some relief to those arguments. The revision will permit, as an option, the combination requirement to be met by using a branch/feeder AFCI along with an outlet AFCI in the same branch circuit.

We recognize the desire of the panel to require the full range of arc-fault protection (series, parallel, etc.) and this revision keeps that fundamental desire in tact. The branch/feeder AFCI provides the 75A and above arc detection and the outlet AFCI would provide the 5A series arc detection. The revision simply allows a user to meet the code objective with a different configuration. Users/installers can then select the best method for his/her application. The last sentence of the proposed exception is necessary to make it clear that the outlet AFCI must be of the "feed-thru" type that will provide protection to any downstream outlets.

There are a number of branch/feeder AFCIs already listed and at least two outlet AFCIs listed. These combinations in conjunction with the listed combination units will provide a variety of ways to meet the revised language.

Panel Meeting Action: Reject

Panel Statement: See panel action and statement on Comment 2-87a. Until January 1, 2008 the use of a branch feeder type AFCI alone will meet the requirements of 210.12(B).

Number Eligible to Vote: 13

Ballot Results: Affirmative: 9 Negative: 4

Explanation of Negative:

KING: The submitter has offered an alternative to listed Combination AFCI devices that would provide both series and parallel arc fault protection. I agree with the submitter that the panel is seeking a full range of arc-fault protection. The increased level of arc fault protection afforded by combination devices is well documented. Accepting this comment would ensure that where combination devices are not used the same level of arc fault protection would be provided.

PAULEY: NEMA is voting negative on the panel action. Acceptance of this comment would allow the consumer additional alternatives to meet the AFCI requirement and maintain relatively the same level of protection expected. There is no confusion with the added exception since it is clear that it is an equivalent alternative to the "combination" protection of the main rule.

PORTER: This option should be included in the 2005 Code with a January 1, 2008 effective date together with the combination type AFCI. It will give equivalent protection to the combination AFCI and will allow for the development of a broader range of products to meet the need.

WEBER: The panel was offered a compromise position regarding the use of a combination type AFCI protection that utilizes enhanced technology and increased safety features, with what is presently available today. It offered the use of a branch-feeder type AFCI in conjunction with an outlet type AFCI as the alternative. With the acceptance of this proposal, its enactment would have occurred with the acceptance of the 2005 NEC and an earlier implementation date for the combination concept prior to the now proposed January 1, 2008 timeframe which was established because of the lack of in-field experience of the new technology; if I were to error, I would prefer to error on the side of an increased safety factor as versus waiting a given time lapse to occur and see if perceived events happen or not. Given the industries reluctance to devote capital expenditures to projects that require a lengthy time for in-field verification and then acceptance by the code process on a three year locked step format; the use of cutting edge technology that can improve or augment a safety feature is not a viable solution. In the fast paced world we live in today, there needs to be some procedure developed that can be utilized to take a listed product, with verified documentation to the standards making organization and have consensus made for its use and not have to wait for six to nine years to see its utilization.

2-110 Log #1577 NEC-P02
(210.12(B) Exception No. 2)

Final Action: Accept

Submitter: Jim Pauley, Square D Company

Comment on Proposal No: 2-167

Recommendation: Reject the proposal and do not add the new exception.
Substantiation: There is no basis for an exception for the equipment as outlined in the submitter's proposal. The panel agreed to add the exception because it was indicated that UL 1699 had a statement that indicated that life support equipment should not be connected to an AFCI.

After a closer look at the standard, the text does not have such a prohibition for all AFCIs. The statement regarding life support equipment appears in a portion of the standard that covers installation instructions for an OUTLET CIRCUIT AFCI. There is no such standards limitation on branch/feeder or combination AFCIs.

It should also be noted that the statement in question was simply copied from UL 943 (the GFCI standard) without any consideration given to the type of equipment involved and the application of AFCIs.

In summary, the panel would likely not have agreed to the exception initially had the standard not contained a statement. Further investigation shows that the statement in question doesn't apply except as an installation instruction item for an Outlet Circuit AFCI and it is questionable if there is any technical rationale for the limitation even in that case.

Panel Meeting Action: Accept

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

2-111 Log #74 NEC-P02
(210.12(C))

Final Action: Reject

Submitter: Andrew Schirmacher, Andrews Electric Inc.

Comment on Proposal No: 2-116

Recommendation: Add text to read as follows:

(c) Recreational Vehicle Parks. All branch circuits that supply 125 volt, single-phase, 30 ampere receptacles shall be protected by a listed arc-fault circuit interrupter to provide protection for the entire branch circuit.

Substantiation: I have found that most people do not turn off the circuit breaker or RV load when installing the plug into the receptacle. Thus, the receptacle and plug become compromised, resulting in melted receptacles and plugs. The potential for personal injury and property damage can be reduced with my proposal. See also my related proposal for Article 551.71.

Panel Meeting Action: Reject

Panel Statement: The submitter has not provided any substantiation for his recommendation. This comment is not within the purview of CMP-2. This comment should be submitted to CMP19 for consideration during the next code cycle.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

2-112 Log #509 NEC-P02
(210.12(C))

Final Action: Reject

Submitter: Walter Smittle, National Association State Fire Marshals

Comment on Proposal No: 2-168

Recommendation: Add new text to read as follows:

210-12 Arc-Fault Circuit-Interrupter Protection.
(C) Other Occupancies. All branch circuits that supply 125-volt single phase, 15- and 20-ampere receptacle outlets installed in lodging and rooming houses, educational occupancies K-12, residential board and care occupancies as defined in the Life Safety Code (NFPA 101) and day care centers of preschool age shall be protected by an arc-fault circuit interrupter(s).

Substantiation: The importance of the expanding arc-fault circuit interrupter technology is to provide improved electrical safety for occupants of the occupancies in the proposed comment. Code-Making Panel 2 has concluded that apartments are included in the definition of dwellings, and, therefore, must have the required protection as mandated by 210-12 of the NEC. NASFM agrees with this conclusion. However, Code-Making Panel 2 should review the ponderous data previously submitted, including the fire data reported by NFPA Fire Analysis and Research Division that clearly identifies the fire problems facing America in our homes. Lodging and rooming houses are dwellings, but it is not clear in the Code that these types of facilities are included in the dwelling classification as apartments. The Life Safety Code advises when more than three outsiders are provided accommodations, the dwelling is classified as a lodging and rooming house. Therefore, a lodging and rooming house although it is a dwelling the electrical system should meet the same requirements as a dwelling as described in 210-12 of the NEC. Residential Board and Care Occupancies are converted dwellings or new facilities constructed to provide the residents with a home environment. When this occupancy classification was established in the Life Safety Code, there was much debate regarding this classification. Many believed it was nothing more than a nursing home. However, the classification was intended to provide the residence with a home environment. Code-Making Panel 2 has indicated that full-time staff

was available. Full-time staff cannot detect a parallel arc within the electrical system. Is it more important to have an electrical fire so full-time staff can implement the emergency plan, fire department response, and increase the risk to occupants? An AFCI will detect and prevent an electrical fire and increase the level of safety for the occupants. The residential board and care facility in Hartford, CT, had full-time staff and the loss of life and property damage still occurred. Daycare centers for preschool children should be afforded a higher level of electrical safety. Experience indicates these daycare centers are located in dwellings, apartment buildings, malls, and old school buildings. The full-time staff (caretakers) responsibility is to evacuate the building in the event of a fire and fire department response to suppress the fire. Is it more logical and economical to prevent the fire, rather than experience property losses and loss of life? Code-Making Panel 2 has indicated that educational occupancies are too broad. NASFM's intent is to provide electrical safety in educational occupancies for K through the 12th grade levels. The proposed comment has been more clearly defined to clarify the intent. Educational facilities are investments for the future with our tax dollars. Protecting this investment and making educational occupancies safer is important to the future of our children. The one important aspect that Code-Making Panel 2 has not grasped is that this technology will dramatically curtail and eliminate electrical fires. The continuation of delaying the expansion of AFCI technology will only cost needless loss of lives and property.

NASFM has submitted sufficient data to justify the improvement of electrical safety regarding AFCI technology. Code-Making Panel 2 refers to their panel action and statement on Proposal 2-140 (Log 1623) that refers to a lack of sufficient data available to substantiate the reliability and effectiveness of this new device to justify expansion. NASFM's position is that over 6 million of these devices, as reported by the National Electrical Manufacturers Association, are installed and working throughout American homes. There has been no recall(s) of any AFCI device by the United States Consumer Product Safety Commission. Only minor complaints have been received and resolved. Most of these complaints have identified improper wiring by an electrician and/or the device was actually detecting an arc-fault within an appliance or wiring. "Beta testing" data is used to evaluate a product before production begins. NASFM believes Code-Making Panel 2 should not be reviewing this data as all four manufacturers are manufacturing AFCIs and are available on the market. Furthermore, this information would be considered confidential and NASFM would not be privileged to obtain the data. Code-Making Panel 2 should have sought this information from the manufacturers before ever considering the inclusion of this device in the NEC. In addition, UL 1699 provides for the testing and approving certification of AFCIs. This testing procedure of UL 1699 is effective and valid in providing the necessary parameters for making sure AFCIs perform as specified. NASFM refers the panel to the previous documentation submitted as well as additional documentation forwarded to Code-making Panel 2 on "State Fire Marshal Investigation Reports" of electrical fires involving the loss of life and property for reconsideration of the proposed comment. It is noted that fifty-four (54) adults and fourteen (14) children lost there lives as a result of an electrical failure that would have prevented the fire. Also, additional information on electrical fires is provided to indicate these devices will reduce the electrical fire problem with parallel arcing.

Additionally, submitted to Code-Making Panel 2 is the report on "Structure Fires Caused by Arcing or Overloaded Electrical Equipment in Non-Residential School, Rooming, Boarding, or Lodging Houses, Facilities that Care for the Aged and Have Nursing Staff and Without Nursing Staff and Nursery Schools and Day Care Centers by Area of Origin," 1994-1998 Annual Averages prepared by Marty Ahrens, September 4, 2003. Examples of this data identify "Lodging and Rooming Houses" experienced 208 fires with three deaths, eleven injuries and \$3.5 million in property loss; "Facilities that Care for the Aged and Have Nursing Staff" experienced 960 fires, one death and 68 injuries and \$1.8 million in property loss; "Nursery Schools and Day Care Centers" experienced 213 fires with 2 injuries and \$1.3 million in property loss. In review of this information the need to expand AFCIs is compelling and justified.

NASFM requests Code-Making Panel 2 to adopt the requirement for expanding AFCI into other occupancies to prevent needless loss of life, injuries and the reduction of property losses caused by electrical fires.

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

Panel Meeting Action: Reject

Panel Statement: See panel statement on Comment 2-91.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 11 Negative: 2

Explanation of Negative:

KING: The submitter's substantiation offers compelling data that should have been given further consideration by Panel 2. I agree that expanding AFCI protection to these types of occupancies is warranted. See my Explanation of Negative on Comment 2-91.

WEBER: The panel should have acted to Accept this comment, after careful review of the submitter's substantiation the time for incorporating this safety feature is now. The National Association of State Fire Marshals (NASFM) has put a great deal of time and effort to show actual field fire incidents reports and, in my opinion, the conclusion should be drawn that AFCI protection can prevent needless loss of life, injuries as well as property damage. The life saved in not only dwelling bedroom areas, but in other occupancies is as equally treasured by family and loved ones. We are empowered to make significant decisions on behalf of public safety and act according to the best of our ability

and knowledge as to what is the best course of action. I believe the need to increase the use of AFCI is now.

Comment on Affirmative:

PORTER: The submitter has provided data that shows that fires in these areas may be reduced by the use of AFCI devices. However, the requirements in UL 1699 were developed based upon profiles of the arc signature produced by normally-operating equipment used in a dwelling unit. A companion study is needed to confirm that the normal operation arc signatures of equipment used in these expanded occupancies (such as science laboratory equipment in schools) will not cause nuisance tripping of the AFCI.

2-113 Log #1392 NEC-P02 **Final Action: Reject**
(210.12(C))

Submitter: Kevin J. Brooks, IBEW Local #16
Comment on Proposal No: 2-171

Recommendation: This proposal should be accepted as submitted. 210-12(C).

Substantiation: There still seems to be a small group of people who have it in their mind that AFCI protection does not work. I can say I have seen it work both in the lab and in the field. This Protection Does Work!!! I feel that some people in the industry would resist any changes in safety in order to save a dollar. What they seem to forget is that the purpose of the code is to PROTECT HUMAN LIFE AND PROPERTY!!!! When you have a device that clearly works to improve safety and thus save lives, it should be adopted. These devices work by detecting an arc from either the grounded conductor or the grounding conductor, and that is the simple truth. Those who will say they do not work need to go to a demonstration and perhaps broaden their horizon. When a service is upgraded, this is the perfect time to improve safety even more. By adopting these devices now, we can save a terrible loss of life at a later date. I would ask each person who is against this proposal this, "if it was YOUR family and you know these devices work, the price is inexpensive, why would you even put a price on your family's life?????" I know in my heart that mine is worth the price of this protection. New houses are a selling point when you have the very best protection possible in arc fault protection for a family. People MUST understand that they work and for the price, they are worth the protection. They also fall in line with the purpose of the code which I hope we are not getting lost with, that being the Protection of Life and Property.

Panel Meeting Action: Reject

Panel Statement: See panel statement on Comment 2-114.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 10 Negative: 3

Explanation of Negative:

KING: See my explanation of negative vote on Comment 2-114.
PORTER: See my explanation of negative vote on Comment 2-114.
WEBER: See my explanation of negative vote on Comment 2-114.

2-114 Log #3246 NEC-P02 **Final Action: Reject**
(210.12(C) (New))

Submitter: Michael I. Callanan, IBEW
Comment on Proposal No: 2-171

Recommendation: This proposal should be accepted.

Substantiation: Panel 2 has not properly addressed the technical merit of this proposal. The references made to panel statements for proposals 2-124 and 2-140 are general in nature and do not apply directly to the content of this submitter's substantiation. Retroactive enforcement of section 210.12 should not be at the discretion of the authority having jurisdiction, as is referenced in the panel statement for proposal 2-124. As the submitter of this proposal has clearly presented, there are existing sections in the code that require retroactive compliance where a new technology will bring an increased level of safety to an existing dwelling unit. The same requirement for retroactive compliance should be applied where AFCI protection is covered in section 210.12. The panel reference to panel statement 2-140 requesting further Beta testing as a condition for accepting this proposal needs to be clarified. Why is Panel 2 requesting further beta testing for an application of AFCI devices that have already been accepted by this panel and adopted in the 1999 and 2002 NEC? AFCI devices are required to meet UL Standard 1699 which addresses 15 unwanted tripping tests. There is currently a two-year history of use of these devices in the field. If there were any issues with the reliability and effectiveness of these devices it would have been reflected in the Proposals for the 2005 code cycle. The submitter of this proposal is not seeking to expand the application of AFCI devices beyond the scope of section 210.12, but rather is attempting to extend the existing requirements for these devices to dwelling units where the technology is most needed. According to a 1987 CPSC report ("Residential Electrical Distribution System Fires" Smith & McCoskrie) fires originating in branch circuit wiring predominately occurred in dwellings over 20 years old, with the highest rates of fires occurring in dwellings over 40 years old. Extending the requirements of section 210.12 as recommended in this proposal could greatly reduce the number of fires that occur in dwellings. The US Consumer Product Safety Commission, in an independent research

on AFCIs, estimated that employing AFCI technology could prevent 50-70% of residential electrical fires. AFCI devices have the ability to mitigate arcing faults that would normally not be detected by conventional overcurrent devices. Extending the requirements of 210.12 to include this protection for existing dwellings when overcurrent devices are replaced will greatly reduce the number of fires in dwellings and in the long run save many lives. This Comment represents the official position of the International Brotherhood of Electrical Workers Codes and Standard Committee.

Panel Meeting Action: Reject

Panel Statement: The submitter's intent is not practical given the existence of outdated service equipment which may not have AFCI's available. See panel action and statement on Comment 2-82 in reference to panelboard replacements.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 10 Negative: 3

Explanation of Negative:

KING: This comment should have been accepted. Panel 2 has recognized the need for requiring AFCI protection on existing circuits where new panels are installed with the action taken on Comment 2-82. Accepting this comment provides the same increased level of protection for existing bedroom circuits when new overcurrent devices are installed in existing panelboards. Although I agree with the panel that AFCI overcurrent devices may not be available for some existing panel boards, 210.12 provides an alternative to provide AFCI protection where overcurrent devices are not available.

PORTER: The exception to 210.12 in Comment 2-87a allows for the use of an AFCI located outside the service equipment panel, so the panel's statement regarding the lack of AFCIs designed for use in outdated service equipment is not valid.

WEBER: I would like to congratulate the Panel on its positive action and acceptance in principle on Comment 2-82, which mandates the need for AFCI protection per proposed 210-12(C), when a panel board that contains the overcurrent protection devices for branch circuits is replaced. This is referred to in our area as a service up-grade and nonnally also requires other non code complying items to be addressed as well. That said, I believe the panel should have accepted the original Proposal 2-171 as well as the supporting comment during the ROC cycle. The panel statement indicates that the requirement "is not practical given the existence of outdated service equipment which may not have AFCIs available." It is very common to have feeder circuits added to existing service equipment or when an upgrade is made, going to a sub-panel for additional branch circuits and in my opinion is very practical to incorporate the requirements so noted in the proposal. The proposal also addresses circuits that do not have an equipment grounding conductor to be able to have AFCI protection which I believe is the ultimate goal of comment 2-82 as an increased safety feature. Given the fact that housing stock continues to age and that most home owners wait until they absolutely have to have some electrical work done, normally (when there is blinking lights, smoke or numerous blowing or tripping of overcurrent protection) after incidents provide enough frustration that costs are put aside and repairs or replacement is initiated. Given the fact that this only occurs after long periods of the systems use that all of the safety features presently available should be incorporated as mandatory requirements then the proposal's value is evident. It seems to me that the public at large appreciates beautiful chandeliers or lighting fixtures and devices but, take a very casual attitude towards how they are wired or afforded circuitry protection. We are then charged with determining what is in the best public interest and altering the code to reflect that chosen position through an informed review of the data presented. New structures are already covered but how do we get all of the existing structures to be brought into compliance in the future without similar Code language?

2-115 Log #1397 NEC-P02 **Final Action: Reject**
(210.13)

Submitter: Bradley S. Becker, S. L. Electric
Comment on Proposal No: 2-176

Recommendation: Change the panel action from reject to accept in principle and in part. Add the underlined words to the title and first paragraph, and accept the remainder to the original proposal. The new section would then read as follows:

210.13 Dwelling Unit Smoke Alarms. Listed smoke alarms that receive power from the ac wiring system, and have battery back-up, shall be installed in the following dwelling unit locations:

- (1) One smoke alarm in each sleeping room.
- (2) One smoke alarm outside of each separate sleeping area in the immediate vicinity of the bedrooms.
- (3) One smoke alarm on each additional story, including basements and cellars but not including crawl spaces and uninhabitable attics.

For dwellings with split levels and without an intervening door between the adjacent levels, one smoke alarm installed on the upper level shall be permitted as protection for the adjacent lower level where the lower level is less than one full story below the upper level.

Where more than one smoke alarm is installed in any one living unit, the alarm devices shall be interconnected in such a manner that the actuation of one alarm will activate all alarms in the individual living unit.

The smoke alarm shall be permitted to be supplied from a general purpose branch-circuit that supplies other outlets. Smoke alarms shall not be installed on the load side of a ground-fault circuit-interrupter or an arc-fault interrupter.

Substantiation: I realize that the requirements for installation of smoke alarms are contained in a number of documents, but at least for dwelling units those requirements need to be in the NEC stated clearly so there is no question where and how they are to be installed and inspected. If a survey of electrical contractors and electrical inspectors was taken, I am sure you will be amazed how many do not understand the requirements for this very important human life protection requirement. The average electrical contractor making dwelling wiring installations is intimidated at the volume of rules when looking at documents other than the NEC. At least for dwelling units those requirements need to be stated clearly in the NEC.

Panel Meeting Action: Reject

Panel Statement: Smoke alarm requirements are already addressed in numerous building codes, including NFPA 101 and NFPA 5000. It is the responsibility of both the installer and the local authority having jurisdiction over the installation to apply all codes required.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

2-116 Log #168 NEC-P02 **Final Action: Reject**
(210.19(A)(1))

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education

Comment on Proposal No: 2-182

Recommendation: Accept, but after “met” add “, particularly with reference to AFCIs.”

Substantiation: First, FPNs do not contain requirements, and, therefore, speaking to application of Code rules to design issues does not violate their purpose. Second, and the reason for adding the proposed phrase, branch circuit-type AFCIs rely on high current levels for their AFCI (as opposed to GFP) operation. Designers may not be aware of this, and certainly may not be aware of the UL research Mr. Conlon referenced, in which bolted, not arcing, faults failed to reach 10 times breakers’ ratings.

Panel Meeting Action: Reject

Panel Statement: The submitter has not provided any substantiation that a 5 percent voltage drop limitation is necessary for the proper operation of an arc fault circuit interrupter.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

2-117 Log #1112 NEC-P02 **Final Action: Reject**
(210.19(A)(1))

Submitter: Paul Dobrowsky Holley, NY

Comment on Proposal No: 2-181

Recommendation: Accept the proposal.

Substantiation: Although it can be inferred that the existing language is applicable to grounded conductors, adding the words will improve clarity and avoid varying interpretations. Some have argued that because the grounded conductor is not “connected” to an overcurrent device, there is no reason to apply the 125% factor.

Panel Meeting Action: Reject

Panel Statement: As currently worded, the requirement already applies to both the ungrounded and grounded circuit conductors. The existing language does not limit the requirement to those conductors that are “connected” to an overcurrent device.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

2-118 Log #2205 NEC-P02 **Final Action: Accept**
(210.19(A)(3) Exception No. 1)

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

Comment on Proposal No: 2-183

Recommendation: Accept the proposal in principle. Change “pigtail” to “leads”.

Substantiation: The word “pigtail” is a slang term not suited for the NEC.

Panel Meeting Action: Accept

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

2-119 Log #81 NEC-P02 **Final Action: Reject**
(210.21(B)(2))

Submitter: Dan Leaf Rancho Santa Margarita, CA

Comment on Proposal No: 2-189

Recommendation: Accept proposal.

Substantiation: Panel comment did not address the substantiation. How can this section be enforced when listed utilization equipment rated over 12 amperes is factory equipped with a 15-ampere rated cord and plug? Please refer to comment on vote.

Panel Meeting Action: Reject

Panel Statement: The existing wording conveys the panel’s intent. Questions regarding how this requirement has been applied to products rated more than 12 amps and provided with 15 ampere plugs should be addressed to the responsible listing organization.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

2-120 Log #86 NEC-P02 **Final Action: Reject**
(210.21(B)(2))

Submitter: Dan Leaf Rancho Santa Margarita, CA

Comment on Proposal No: 2-189

Recommendation: Accept proposal.

Substantiation: Please refer to proposal substantiation. There are listed portable appliances such as hair blow dryers, air compressors, etc., with rated currents over 12 amperes equipped with factory-installed plugs which permit connection to a 15-ampere rated receptacle. Why does a listing lab “approve” a 15 ampere rated attachment plug for portable equipment rated over 12 amperes?

Panel Meeting Action: Reject

Panel Statement: See panel statement on Comment 2-119.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

2-121 Log #167 NEC-P02 **Final Action: Reject**
(210.25)

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education

Comment on Proposal No: 2-193

Recommendation: Accept with the addition of acceptable to the authority having jurisdiction after “other needs,” and changing “the disconnecting means of” to “a disconnecting means for”.

Substantiation: The submitter makes a valid point, and the Code-Making Panel’s concerns are addressed by restricting other loads to ones the Authority Having Jurisdiction considers similarly minor. The other language tweak is offered because it is not necessary that all tenants access the “A” unit’s distribution equipment, only that they have a means of shutting down such loads when safety demands.

Panel Meeting Action: Reject

Panel Statement: The code text is enforceable as written. In accordance with 90.4, the AHJ can already make a different determination if equivalent safety objectives are met.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

2-122 Log #435 NEC-P02 **Final Action: Reject**
(210.52)

Submitter: Jon DaBoi S. Dartmouth, MA

Comment on Proposal No: 2-196

Recommendation: This proposal should have been accepted.

Substantiation: 210.52 contains a whole list of rules for the installation of receptacle outlets in dwelling units. These receptacle outlets are installed to provide the occupant with a convenient source of power for the general use of electrical utilization equipment. Hence, the spacing rules, the requirement for additional receptacles when receptacles are installed in cupboards or cabinets or are a part of an appliance or luminaire. 210.60(B) gives emphasis to this by requiring receptacle outlets in guest rooms to be readily accessible. 210.52 is all about having a sufficient (minimum) amount of receptacle outlets available to eliminate the misuse of cords that can lead to fire and/or shock hazards.

When a wall switched controlled receptacle outlet is installed as permitted by 210.70(A)(1) Exception No. 1 that receptacle outlet becomes the source of illumination for that room and there is now no receptacle outlet for general use. As an example: In a bedroom, the two receptacle outlets installed beside the headboard of the bed are controlled by a wall switch. A lamp is plugged into each receptacle and serves as the only source of illumination for the room. The occupant wants to plug in an alarm clock on the nightstand along side the bed. He/she has to run an extension cord or two to reach the next receptacle outlet that will provide constant power. The objective of the provision has been defeated. Remember, 210.70 permits “one or more receptacle outlets

controlled by a wall switch” to be installed. A wall switch could control all the receptacles in that bedroom.

This proposal will prevent this from happening and ensure that there is always a receptacle outlet for general use within the spacing requirements of this section. I understand that the code is not intended to be a design manual, but it should also not contain provisions that defeat the minimum requirements and promote unsafe methods to provide power for everyday functions.

Panel Meeting Action: Reject

Panel Statement: The scenario proposed in the comment is an example of a design issue, which is outside the scope of the Code per 90.1(C). Decisions regarding the number and location of switched receptacles and how they affect the functional use of the space are the responsibility of the circuit designer.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 11 Negative: 2

Explanation of Negative:

KING: This Comment should have been accepted. I disagree with the panel statement that this is a design issue. The requirements for receptacle location and spacing in 210.52 are to minimize the need for extension cords in dwelling units. A receptacle that is switched to meet the requirements of 210.70 is de-energized when area illumination is not needed. The de-energized receptacle is not available for other electrical appliances at that location thus requiring the use of an extension cord from a receptacle located elsewhere to supply power to the appliance. Compliance with both sections 210.52 and 210.70 are essential for a safe electrical installation. Accepting this Comment would ensure that the minimum requirements of both sections 210.52 and 210.70 are met.

O’NEIL: Proposal 2-196 clarifies existing requirements of existing code. Minimum requirements of 210.52 set the location of receptacle outlets. The code needs to be clarified to explain if a switched receptacle outlet installed as permitted by 210.70(A)(1). The switched receptacle either falls under the minimum spacing requirements under 210.52 or it does not. Current code does not allow interpretation of the issue. Multiple proposals dating back to 1978 ask for clarification on this issue to make for a more understandable code.

2-123 Log #2207 NEC-P02
(210.52)

Final Action: Reject

Submitter: Frederic P. Hartwell, Hartwell Electrical Services, Inc. / Rep. Massachusetts Electrical Code Advisory Committee

Comment on Proposal No: 2-196

Recommendation: The proposal should be accepted.

Substantiation: Location and operation of receptacle outlets may be considered design issues, but they are addressed in this section and others because their location and operation impacts safety. If the room is laid out such that a load that should remain energized, such as an alarm clock, happens to be near a receptacle outlet that is entirely under the control of a snap switch, then the switch will either be left in the “ON” position [defeating the purpose of 210.70(A)(1)], or (perhaps more likely) an extension cord will be run across a traveled area from a receptacle not controlled by the switch, defeating the purpose of 210.52(A).

The panel action on the proposal to date is reminiscent of repeated panel actions over the years rejecting, also as representing a design consideration, all proposals calling for switched control of lighting at the top and bottom of stairways since the advent of these rules in the 1975 NEC. See, for example, Proposals 2-136 (1978 cycle), 2-111 (1981 cycle), 2-106 (1984 cycle), and 2-175 (1987 cycle). Then, of course, the very next cycle the rule changed (Proposal 2-168).

This is a sensible, carefully worded proposal that has been in effect for numerous code cycles in Massachusetts. Some version of it has also been repeatedly proposed over the years as well. This Committee expects to continue to resubmit this primarily due to our belief that it truly enhances public safety.

Panel Meeting Action: Reject

Panel Statement: See panel statement on Comment 2-122.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 12 Negative: 1

Explanation of Negative:

KING: See my explanation of negative vote on Comment 2-122.

2-124 Log #2901 NEC-P02
(210.52(A)(3))

Final Action: Reject

Submitter: David H. Kendall, Carlon

Comment on Proposal No: 2-202

Recommendation: This proposal should be accepted as revised.

(3) Floor Receptacles. Floor Receptacle(s) shall be installed at least 450 mm (18 in) from the wall in rooms other than basements, kitchens, bathrooms, and pool rooms that are 60 m (625 ft) in area or greater and where one two walls is are at least 3.8 m (12 ft) from the center of the room. Receptacles shall be located in the general area that electrical appliances will be located. Receptacle outlets in floors shall not be counted as part of the required number of receptacle outlets in the wall unless located within 450 mm (18 in.) of the wall.

Substantiation: I agree that the placement of a floor receptacle would be difficult to enforce therefore I have deleted it from the proposed text. In addition, 210.52(C)(2), 210.52(C)(3) and 210.52(E) does not locate the receptacle but just indicates that one is required.

The long term use of extension cords is a known safety hazard. The only purpose of this proposal is to try and reduce the number of extension cords used in a home. Many of the extension cords would be hidden by throw rugs which could be damaged by the family members walking on them and cause a shock or fire hazard.

The use of additional listed floor boxes would require an increase in labor and cost but these cost would be off-set by the increase degree of safety and the reduction of the probability of a fire.

Panel Meeting Action: Reject

Panel Statement: No substantiating data were submitted to support this comment. Positioning required floor receptacles in such a space would be problematic, because the layout of furniture would be constantly changing. The need for outlets within this space would also vary, and the use of wall or ceiling-mounted luminaires may reduce or eliminate it entirely.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

2-125 Log #2211 NEC-P02
(210.52(C))

Final Action: Accept in Principle

Note: The Technical Correlating Committee directs that the Exception to (1) in Proposal 2-211a be revised to read as follows:

“Receptacle outlets shall not be required on a wall directly behind a range or sink in the installation described in Figure 210.52.”

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

Comment on Proposal No: 2-211a

Recommendation: Accept the proposal in principle. Make the following changes in Figure 210.52:

1) In the left hand drawing, place a dimension arrow between the back of the sink (or range) and the front edge of the wall, with the dimension shown as “X”. Revise the legend “Outlets not required” to say “Outlets not required if X < 300 mm (12 in.)”

2) In the right hand drawing, place a dimension arrow normal to the back edge of the sink and extending to the corner, with the dimension shown as “X”. Revise the legends for this space to say: “Outlets not required if X < 450 mm (18 in.)”

Substantiation: Some counter layouts will have substantial usable space behind a sink or cooktop. It has been reasonably well established for a number of code cycles that the threshold for requiring receptacles at counter spaces is reached for a 1 ft x 2 ft counter. This comment applies that concept here. If the space behind the sink or cooktop is over 1 ft deep, then the normal spacing rules would continue. The corner application is more complicated, but follows the same principles. A 1 ft by 2 ft counter has 2 sq. ft of space. An isosceles triangle with an altitude of 18 in. and a base of 3 ft has an area of 2.25 sq. ft, which is reasonable because some of that space isn’t quite as usable as for a rectangular area. However, any reasonable person looking at the right-hand portion of the proposed drawing would likely conclude the rear space was usable. This submitter’s wife would definitely use that space for her electric teapot, which gets refilled at the tap quite frequently.

Panel Meeting Action: Accept in Principle

Modify Figure 210.52 as follows:

(figure shown on following page)

Panel Statement: Modify figure as suggested; also modify exception text to read “Receptacle outlets shall not be required on a wall directly behind a range or sink in the installation described in Figure 210.52.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

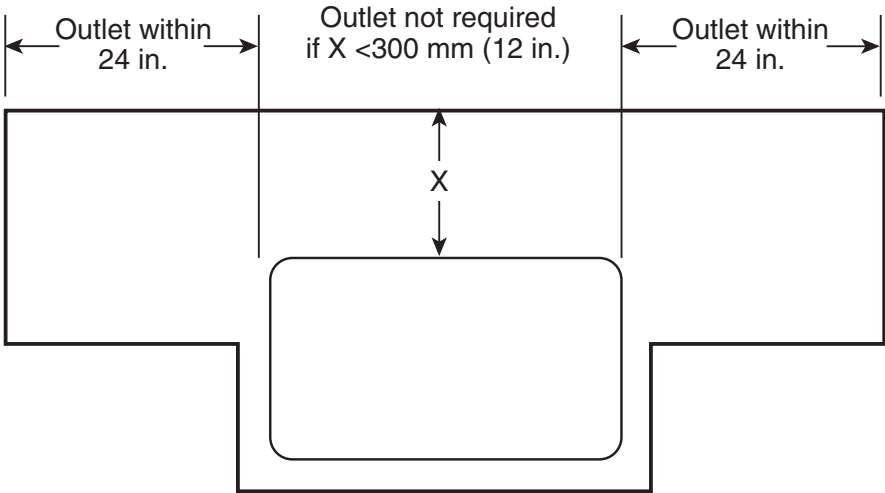
Comment on Affirmative:

WEBER: I agree whole heartedly with the panel position and once again see the wisdom of the NEC code making process to allow input from the field and comments from those not able to attend the meeting but are still able to provide alternative concepts back to the panel to add clarity or strengthen code adherence from a reasonable viewpoint. The concept that if a space is less than

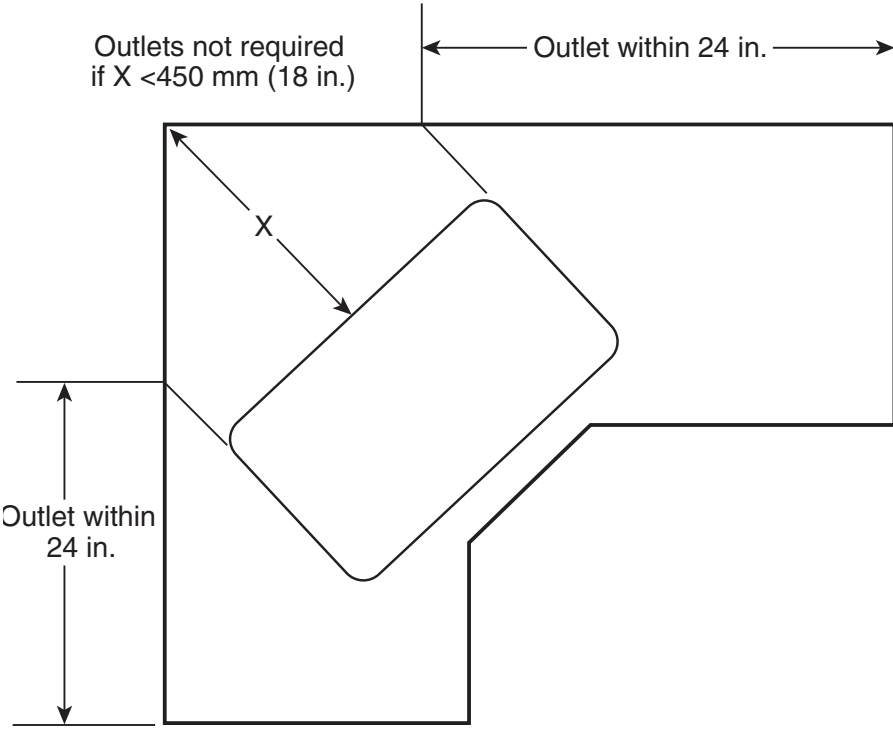
300 mm (12 in.) on a wall directly behind range top or sink, and it may not be a used countertop area it is a starting point; however if that space is of a greater dimension, than a receptacle should be provided for, at that location is reasonable. Similarly for wall

corner or wall and peninsular base cabinet units configuration and a corner mounted unit with an altitude of 450mm (18 in.) or greater and a base line of three feet or more, then a useable counter top space is evident and it will have a receptacle located adjacent to it. I am concerned that by using the new figures to 210-52 as presented that the symbol (<) considered to mean less than, will convey the actual meaning in the field and if the term “less than” would provide clarity to the figures as indicated.

Comment 2-125 (Log #2211)



Sink or range extending from face of counter



Sink or range mounted in corner

2-126 Log #3387 NEC-P02
(210.52(C)(1) Exception No. 1)

Final Action: Reject

Submitter: Bob Fahey Evansville, WI

Comment on Proposal No: 2-211a

Recommendation: Revise text as follows:

210.52(C)(1) Exception to (1) Receptacle outlets shall be required on a wall directly behind a range top or sink if the countertop space behind the range top or sink is mounted in a corner and the countertop space is not bound by the walls on both side.

Substantiation: Figure 210.52 (2-211a) on page 2787 in the ROP. When the sink or range top are located in a corner and the counter space is accessible by means of a breakfast bar, this area is usable counter top space and a receptacle is needed. Many times there is a receptacle installed for a toaster, radio or even a television. I inspect almost 300 homes every year and this configuration is very common and without this receptacle, we will see short extension cords used for these portable appliances. Please see my attached diagram showing the wall on one side and the peninsula/breakfast bar with the sink in the corner.

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

Panel Meeting Action: Reject

Panel Statement: See panel action on Comment 2-125, which the panel believes will address the submitter's concerns.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

2-127 Log #1912 NEC-P02
(210.52(C)(4))

Final Action: Reject

Submitter: Donald R. Offerdahl, North Dakota State Electrical Board

Comment on Proposal No: 2-220

Recommendation: Revise text to read as follows:

Receptacles installed in appliance garages are accessible to the user and should be allowed for the required receptacles on the kitchen counter. It is impossible to comply with 210.52(C)(1) with the requirement of "Receptacle outlets shall be installed so that no point along the wall line is more than 600 mm (24 in.) measured horizontally from a receptacle outlet in that space". Most appliance garages cover more than 4 ft of the counter wall space. Example, a corner appliance garage is 2 ft by 2 ft measured on the counter wall space side. Also if these receptacles are not readily accessible then does it have to comply with 210.8(A)(6) Kitchens - where the receptacles are installed to serve the countertop surfaces would not need GFCI protection. The appliances that are stored in an appliance garage, they are taken out of the appliance garage and used. They need to have GFCI protection. By deleting the appliance garage from this text would also rectify this problem.

Substantiation: From the Panel Statement for Proposal 2-220 the panel needs to give direction on where the receptacle needs to be installed for that usable counter space.

Panel Meeting Action: Reject

Panel Statement: Access to the receptacles inside an appliance garage is limited by the appliances stored within the space. Outlets need to be accessible for those appliances which are not stored within the garage but which may be used in the same area. Section 210.8(A)(6) requires ground-fault protection for all receptacles installed to serve the countertop spaces, which would include those located within an appliance garage.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

2-128 Log #3517 NEC-P02
(210.52(C)(5))

Final Action: Reject

Submitter: Henry A. Jenkins, Wake County, Inspections Development

Comment on Proposal No: 2-223

Recommendation: Delete the words "appliance garage" in 210.52(C)(5) to read as follows:

Receptacle Outlet Location. Receptacle outlets shall be located above, but not more than 500 mm (20 in.) above, the countertop. Receptacle outlets rendered not readily accessible by appliance fastened in place....., or appliances occupying dedicated space shall not be considered as these required outlets.

Substantiation: Based on the panel statement for Proposal 2-220, Panel 2 does not agree that the appliance garage splits the countertop and the discussion during Panel deliberation was to not require additional receptacles for the installation. Since the appliance garage receptacle can be readily accessed by simply sliding the appliance garage cover up to access the receptacles, the existing text in 210.52(C)(5) should be amended to exclude appliance garages from the not "readily accessible" list.

"Readily accessible" is defined as "being capable of being reached quickly for operation, renewal or inspections without requiring those to whom ready access is requisite to climb over or remove obstacles or to resort to portable ladders, and so forth."

Rolling up the cover of the appliance garage would provide ready access to the receptacle for countertop use, therefore, there does not appear to be a safety related reason to exclude the use of this receptacle as a usable receptacle for

the countertop. Deletion of this text in (5) will permit the use of this receptacle and solve the problems in the field where appliance garages are installed after the kitchen, drywall, painting, and electrical trim have been installed. This is often the time when the electrician finds out that an appliance garage is being installed and then an additional receptacle must be cut in since the original receptacle for the countertop is now in the appliance garage.

Panel Meeting Action: Reject

Panel Statement: See panel action on Comment 2-127. Ensuring that the receptacle outlets are situated to comply with this requirement is a matter of forethought.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

2-129 Log #166 NEC-P02
(210.52(D))

Final Action: Accept in Principle

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education

Comment on Proposal No: 2-229

Recommendation: Accept in principle with these changes: "...on the face or side of the basin a cabinet not more than 300 mm (12 in.) below or above the countertop.

Substantiation: No hazard has been shown to exist as the result of installing a properly-protected and easily accessible receptacle facing to the side rather than forward, or in the cabinet above rather than below the basin. Therefore, these perhaps-unintentional limitations in the proposed wording are unwarranted.

Panel Meeting Action: Accept in Principle

Panel Statement: See panel action on Comment 2-130.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

2-130 Log #3020 NEC-P02
(210.52(D) Exception)

Final Action: Accept

Submitter: Monte Ewing, State of Wisconsin

Comment on Proposal No: 2-229

Recommendation: The receptacle shall not be required to be mounted in the wall or partition where it is installed on the side or face of the basin cabinet not more than 300 mm (12 in.) below the countertop.

Substantiation: Most of the time there is no location to mount a receptacle to the front of the cabinet and the side seems to be the preferred location to achieve installing a flush device box. Also a side mount avoids the people from leaning over the receptacle.

Panel Meeting Action: Accept

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

2-131 Log #165 NEC-P02
(210.52(E))

Final Action: Accept in Principle

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education

Comment on Proposal No: 2-235

Recommendation: Accept as proposed.

Substantiation: Bubble covers accept padlocks.

Panel Meeting Action: Accept in Principle

Panel Statement: See panel action on Comment 2-136.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 12 Negative: 1

Explanation of Negative:

DOBSON: See explanation of negative vote on comment 2-136.

2-132 Log #1974 NEC-P02
(210.52(E))

Final Action: Accept in Principle

Submitter: James T. Dollard, Jr., IBEW Local 98

Comment on Proposal No: 2-235

Recommendation: This proposal should be Accepted.

Substantiation: The submitter has identified a serious problem that must be addressed. I disagree with the panel statement. A single outdoor outlet could not be expected to safely serve multiple ground floor dwelling units. Occupants in each dwelling unit will make use of outdoor electrical equipment in the form of electrical tools, radios, TVs, holiday lighting/displays garden tools etc. The use of a single receptacle outlet will promote the use of extension cords in a permanent fashion. This proposed change is necessary to provide the same level of safety for dwelling units in multi-unit occupancies as is presently required for one and two-family dwelling occupancies.

I agree with the explanation of negative as written by Mr. Weber.

Panel Meeting Action: Accept in Principle

Panel Statement: See panel action on Comment 2-136.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 12 Negative: 1

Explanation of Negative:

DOBSON: See explanation of negative vote on comment 2-136.

2-133 Log #2213 NEC-P02 **Final Action: Accept in Principle**
(210.52(E))

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

Comment on Proposal No: 2-235

Recommendation: Accept the proposal in principle. Add the following sentence to the existing NEC text:

“For the purposes of this section, “accessible at grade level” shall mean readily accessible from grade, and no more than 2 m (6 ft 6 in.) above grade level.”

Substantiation: This issue is going to keep coming back until CMP 2 addresses it with common sense. Unlike the receptacle behind the doorway issue, where there is an excellent reason to count that space, there has never been a good reason to disallow a receptacle on an open porch or deck as counting as the exterior receptacle, especially under the terms of this comment. It would still need to be readily accessible, which means not obstructed from someone approaching from grade, and not up more than a few steps. It would not be more likely to require an extension cord, and in fact, it might be less likely since it would be placed nearest the likely location for electrical appliance usage. It might even be in a damp, as opposed to a wet location, resulting in a less hazardous condition. CMP 2 should carefully reconsider this question.

Panel Meeting Action: Accept in Principle

Panel Statement: See panel action on Comment 2-136.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 12 Negative: 1

Explanation of Negative:

DOBSON: See explanation of negative vote on comment 2-136.

2-134 Log #2532 NEC-P02 **Final Action: Accept in Principle**
(210.52(E))

Submitter: Vince Baclawski, National Electrical Manufacturers Association (NEMA)

Comment on Proposal No: 2-235

Recommendation: Reject the panel action and accept this proposal.

Substantiation: 210.52(E) requires outdoor receptacle outlets for one and two family dwellings. The submitter points out that this section in the code is intended to prevent the hazard of running cords through doors and windows. This hazard exists in multifamily dwelling units as well as in one and two family dwelling units. The panel rejected this proposal with the statement “because of general access to the receptacle by all occupants of the multiunit complex, the panel does not agree with mandating a receptacle at all ground level units.” The panel statement is unrelated to safety. Although there may be concerns with general access to the receptacle can be controlled by other means (such as by a switch or circuit breaker within the individual unit, or by a locking cover plate or outlet box hood), these concerns seem to be unrelated to the hazards described by the submitter.

The submitter clearly defines a safety hazard that exists in one family, two family and multifamily dwellings. The panel failed to address the submitter’s safety concern. The panel should accept this proposal or clearly explain why the hazard that is prevented by requiring outdoor receptacle outlets for one and two family dwellings is not the same for the multifamily dwellings described in the submitter’s proposal.

Panel Meeting Action: Accept in Principle

Panel Statement: See panel action on Comment 2-136.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 12 Negative: 1

Explanation of Negative:

DOBSON: See explanation of negative vote on comment 2-136.

2-135 Log #2902 NEC-P02 **Final Action: Accept in Principle in Part**
(210.52(E))

Submitter: David H. Kendall, Carlon

Comment on Proposal No: 2-235

Recommendation: The Panel should have taken further consideration to this proposal. Please consider the following revision:

(E) Outdoor Outlets. For a one-family dwelling and each unit of a two-family dwelling that is at grade level, at least one receptacle outlet accessible at grade level and not more than 2.0 m (61/2 ft) above grade shall be installed at the front and back of the dwelling. See 210.8(A)(3).

Each unit of a multifamily dwelling shall have at least one GFCI protected receptacle outlet located at each exterior balcony, patio or entrance. Receptacles located at grade level shall not be located higher than 2.0 m (6 ft) above grade.

Substantiation: The submitter is correct in his substantiation. The revised text takes in consideration those units that are above the first floor level that may have balconies. It is common for holiday lighting and other electrical appliances to be used on the balconies and patios of these units. Without receptacles,

extension cords are run from inside the unit and pinched between the sliding door or window.

Mr. Weber was correct when he stated that each outlet could be controlled by a switch inside the dwelling to protect against unwanted consumption.

Panel Meeting Action: Accept in Principle in Part

Revise the text to read as follows:

“(E) Outdoor Outlets. For a one-family dwelling and each unit of a two-family dwelling that is at grade level, at least one receptacle outlet accessible at grade level and not more than 2.0 m (61/2 ft) above grade shall be installed at the front and back of the dwelling. See 210.8(A)(3).”

Panel Statement: See panel action on Comment 2-136. The panel does not accept the recommendation to require exterior receptacles at all units of a multi-family building.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 12 Negative: 1

Explanation of Negative:

DOBSON: See explanation of negative vote on comment 2-136.

2-136 Log #3027 NEC-P02 **Final Action: Accept in Principle**
(210.52(E))

Note: The Technical Correlating Committee directs that the text accepted in this comment be inserted as a second sentence to the text accepted in Comment 2-135.

Submitter: Monte Ewing, State of Wisconsin

Comment on Proposal No: 2-235

Recommendation: Revised text:

For each dwelling unit of a multifamily dwelling where the dwelling unit is located at grade level and provided with individual exterior entrance/egress, at least one receptacle outlet accessible from grade level and not more than 2.0 m (6 1/2 in.) above grade shall be installed.

Substantiation: I request that you reconsider this addition to the code. There are many three to eight unit two-story condominiums that are no different than a group of single family or two-family dwellings built together for which there is no exterior convenience receptacle requirement. People buy and live in these as if they were single family dwellings with the same electrical appliances. Many take care of their own lawn and shrubs. In looking at the accepted proposal of 2-264 the panel has no problem with general tenant access to the required air conditioning receptacle so for safety sake let’s require at least one receptacle for the grade level dwelling units that use the yard like a single family dwelling.

Panel Meeting Action: Accept in Principle

Replace the second sentence with the text proposal by Comment 2-136.

Panel Statement: The panel action meets the intent of the submitter.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 12 Negative: 1

Explanation of Negative:

DOBSON: The substantiation provided with comment 2-136 is describing a townhouse type of dwelling unit. In this instance these dwelling units would be treated as 1&2 Family Dwellings and would require exterior outlets. The addition of this outlet for the described multi-family application was never specifically substantiated. Further, this outlet will actually be required in an area that is not necessarily a part of the dwelling unit and may present problems of both using electrical devices in common space and outlets accessible to the public. Finally during the discussions of this issue, this outlet was identified as a convenience outlet. There was very little if any discussion about the proposed outlet as necessary for safety concerns. It sets bad precedence for future requirements of convenience outlets.

2-137 Log #77 NEC-P02 **Final Action: Reject**
(210.60)

Submitter: Dan Leaf Rancho Santa Margarita, CA

Comment on Proposal No: 2-241

Recommendation: Accept proposal.

Substantiation: Guest rooms in hotels and motels appear to meet the definition of dwelling unit if provided with permanent provisions for cooking and sanitation. As such the provisions of 210.11(C)(3) apply. With no permanent provisions for cooking, they do not apply. What difference can provisions for cooking have on the use of high wattage appliances such as hair blow dryers? Listed hair blow dryers rated 1800 watts are extant and ones I have seen are factory-equipped with 15-amp rated plugs. This makes it virtually impossible to limit use to an individual circuit.

Panel Meeting Action: Reject

Panel Statement: The panel reaffirms its statement on Proposal 2-241. The circuit provisions associated with dwelling units are applicable to guest rooms only when the permanent provisions for cooking are provided and, by definition, making the unit similar to a dwelling unit.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

2-138 Log #2214 NEC-P02
(210.60)

Final Action: Reject

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

Comment on Proposal No: 2-240

Recommendation: Accept the proposal in principle. Revise the second sentence of 210.60(B) to read as follows: "These receptacle outlets shall comply with the spacing requirements in 210.52(A), but adjustments where necessary to accommodate a permanent furniture layout shall be permitted."

Substantiation: Recently this submitter was asked for advice with respect to this section, in a case where the size of the room would require five receptacle outlets, and the architect had only specified four. The electrical contractor proposed placing a fifth receptacle outlet one foot (and in the same stud bay) from one of the existing four receptacle outlets. In support of this, he said he was accommodating a permanent furniture layout. The room, indeed, had a permanent furniture layout, but this section was never intended to allow, for example, all the receptacles to be located on one wall just because some of furniture somewhere had a permanent location. This proposal provides an opportunity to clarify that installers must follow 210.52(A), with only those adjustments as required to meet the permanent layout.

Panel Meeting Action: Reject

Panel Statement: The submitter's recommendation is no clearer than the present Code text.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

2-139 Log #1984 NEC-P02
(210.60(A))

Final Action: Accept in Principle

Submitter: James T. Dollard, Jr., IBEW Local 98

Comment on Proposal No: 2-242

Recommendation: Recommendation: Accept in principle proposal 2-242 by modifying the panel action as follows:

Revise the second sentence of 210.60(A) as follows:

Guest rooms or guest suites meeting the definition of a dwelling unit provided with permanent provisions for cooking meet the definition of a dwelling unit and therefore shall have receptacle outlets installed in accordance with all of the applicable rules in 210.52.

Substantiation: The new definitions of "Guest Room and Guest Suite" as accepted in Proposal 1-101 will increase usability of all sections of this code in which these terms are located. However, the action taken by CMP-2 in the proposal stage modifies the definitions accepted by CMP-1. The definitions accepted by CMP-1 are as follows:

Guest Room. An accommodation combining living, sleeping, sanitary, and storage facilities within a compartment.

Guest Suite. An accommodation with two or more contiguous rooms comprising a compartment, with or without doors between such rooms, that provides living, sleeping, sanitary, and storage facilities.

Note that there is clearly no reference in either of these definitions to "permanent provisions for cooking." The introduction of "permanent provisions for cooking" to an occupancy clearly eliminates the occupancy from being designated as a "Guest Room or Guest Suite."

The result of the continued acceptance of 2-242 will be the modification of an Article 100 definition in Article 210. This action will confuse the users of this code and create problems for the enforcement community.

The new definitions of "Guest Room and Guest Suite" must be completely and easily separable from the long standing definition of "Dwelling Unit." Stating that we can have a "Guest Room/Suite" with permanent provisions for cooking will cause serious confusion. The only difference between a dwelling unit, as defined in the 2002 NEC and guest room/suites is permanent provisions for cooking and space for eating.

Modifying these new definitions will certainly create confusion and spur further modifications of other definitions as a precedent will be set, allowing a global definition to be modified anywhere in any Article. The usability task group has gone to great lengths and has achieved a great deal of success in making the NEC more user friendly and eliminating language that confuses the user of this code. The proposed revision in this comment to the accepted proposal 2-242 is absolutely necessary for more than section 210.60. The application of sections 210.4(B), 210.11(C), 210.25, 230.79(C), 240.24(B) to name a few will be severely impacted if a guest room/suite as modified by proposed text to 210.60 implements what is essentially a dwelling unit requiring compliance with only 210.52.

Panel Meeting Action: Accept in Principle

Add a new 210.18 to read as follows:

"210.18 Guest Rooms and Guest Suites. Guest rooms and guest suites that are provided with permanent provisions for cooking shall have branch circuits and outlets installed to meet the rules for dwelling units."

Panel Statement: The panel acknowledges the issue raised by the submitter. The addition of the new definitions creates a gap in protection for guest rooms that include provisions for cooking. CMP 2 has maintained the position that

these units are required to have branch circuits that reflect the dwelling unit requirements, and AHJs have applied the dwelling unit definition. With the addition of the new definitions, it makes applying the dwelling unit definition difficult, which was not the intent of the panel. Adding the new section as noted in the panel action text will maintain the application of the rules as it was in previous codes.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

2-140 Log #164 NEC-P02
(210.61)

Final Action: Reject

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education

Comment on Proposal No: 2-244

Recommendation: Change "is used" to "may be used".

Substantiation: 210.50(B) is going to be impossible to enforce, to satisfy the submitter's concern, before the space is set up, yet that's when inspection is most likely to occur.

Panel Meeting Action: Reject

Panel Statement: The submitter's recommendation is not clear. The panel cannot determine if the submitter is modifying the proposal language or the existing code text.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

18-4 Log #552 NEC-P18
(210.63)

Final Action: Accept

Submitter: Technical Correlating Committee on National Electrical Code®

Comment on Proposal No: 2-248

Recommendation: It was the action of the Technical Correlating Committee that this proposal be forwarded to Code-Making Panel 18 for action in Article 406. 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 Meeting Action: Accept

The panel accepts the direction of the TCC on this comment, and has considered Proposal 2 248. The panel rejects Proposal 2 248.

Panel Statement: The panel intends that outdoor receptacles for this application be protected with a "while in use cover." No technical substantiation was presented to the contrary.

Number Eligible to Vote: 10

Ballot Results: Affirmative: 10

2-141 Log #163 NEC-P02
(210.63)

Final Action: Reject

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education

Comment on Proposal No: 2-250

Recommendation: Reject.

Substantiation: I can testify that the use of battery-powered tools is not the norm where I work, and that when there's no power handy an extension cord gets dragged over. Provide a receptacle. If there's absolutely no power to be had, a generator may be brought in for a big job.

Panel Meeting Action: Reject

Panel Statement: The panel reaffirms its position that power is not a necessity to service evaporative coolers. The submitter has not substantiated that the revision results in a hazard.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 11 Negative: 2

Explanation of Negative:

KING: This Comment should have been accepted. I disagree with the panel statement. There are many incidents where power would be needed to service this type of equipment. I agree with Mr. Weber's Explanation of Negative for Proposal 2-50. Panel 2 should have considered the remote location of the equipment and not assumed that all service work on the equipment would be done with battery powered tools. Persons servicing this type of equipment are at a greater risk of electric shock or electrocution as a result of this panel action.

WEBER: As I voted against the panel action to accept in principle on the original proposal, I would also agree with the commentator and the statement in the substantiation as being a valid concern. It is in my opinion better to provide a readily accessible GFCI receptacle at that location, which may be used for other types of maintenance work or projects; than to not have anything at all and the supposed use of only battery powered tools appears to be a job preference issue as to what a home owner or contractor may have available and put into use.

2-142 Log #162 NEC-P02
(210.70(A)(2))

Final Action: Reject

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education

Comment on Proposal No: 2-258

Recommendation: Revise text to read as follows:

Accept as proposed with the substitution of “each path of egress, except by approval of the authority having jurisdiction,” for “The path of egress:”

Substantiation: The submitter’s concern is valid, as is the Code-Making Panel’s. With “each” substituted, installers cannot guess wrong. Still, some “paths of egress” may clearly not be relevant, for instance if for some reason they never would be used at night. This would need to be cleared with the Authority Having Jurisdiction. Similarly, if a control is in one path of egress, but close enough to another that it is handy, the Authority Having Jurisdiction can give the nod.

Panel Meeting Action: Reject

Panel Statement: The submitter has not presented any additional substantiation to warrant a change. The panel reaffirms its panel statement on Proposal 2-258.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

2-143 Log #2947 NEC-P02
(210.70(A)(2)c)

Final Action: Reject

Submitter: Jake Pauls, Jake Pauls Consulting Services

Comment on Proposal No: 2-261

Recommendation: Adopt proposed revision as proposed:

As originally proposed, this comment asks that the NEC text be revised to read as follows:

210-70(A)(2)(c) “...control the lighting outlet(s) where the stairway between floor levels has six risers to more.”

Exception to (c): For stairways with 3 or fewer risers, a single wall switch shall be permitted that is located so as to be accessible from both the upper and lower floors or landing without traversing any step of the stairway.

Substantiation: Apparently, when this rule was originally adopted (reportedly for the 1990 NEC), the intention was to reduce the danger of traversing an interior stair in relative darkness. Thus there is a need for switching of the stair lighting from areas that would not require traversing the stair. For some unknown reason (that the committee in its rejection statement did not reveal) five risers (originally referred to as “steps”) were chosen as the limit beyond which a switch would have to be provided at each floor level. It is my contention, based on the absence of a committee reason in defense of the six-riser criterion—for requiring switching on each level—that the six-riser criterion was arbitrary and, from a safety perspective, unreasonable and potentially dangerous to stair users.

While it does not take ergonomics data to appreciate that it is clearly impossible for a person to reach a wall switch that is too distant as would be the case with the current six-step (riser) rule, I am providing such data in this comment. Five risers or four treads—the limit for a single switch controlling the stair lighting—requires that a person reaches up or down, parallel to the slope of the stair nosings for a distance of at least 23.4 inches on the assumption that the person stands—*leaning forward far enough to place ones shoulder-arm joint above the front of the toes*—with feet as close as possible to the top or bottom risers while reaching for a *centrally located* single switch located directly above the middle riser of the flight. This assumes the smallest step size currently permitted for dwellings by NFPA 5000 and NFPA 101 with a tread depth of 11 inches and a rise of 4 inches. For more-typical stair step geometry the distance would be between 25 and 26 inches. Now, the reach distances, from the shoulder-arm joint, for the range of 5th percentile female stature to 95th percentile male stature (according to the anthropometric data presented in *Humanscale*, by Henry Drefuss Associates) are 21.8 to 26.9 inches respectively. In fact, about one half, or more, of the adult population, with a reach distance of 24 inches or less, would not be able to reach the switch with the current NEC rule. Children would, of course, be even more disadvantaged. How then did the responsible NEC committee originally determine the limit? Could it be that it was composed of men who had longer arms and/or a propensity to live dangerously in reaching for things, including the critical light switch for stair lighting?

Note that the foregoing analysis assumes that a person approaching the stair can readily see exactly where the stair begins; that is, it assumes that there is already some lighting on to allow the person to find the light switch specifically controlling the stair lighting!

NFPA 5000 and, even earlier, NFPA 101 have included important rules developed and adopted to address the leading safety problem associated with building features—injurious falls on stairs. Over the last 25 years this problem has been extensively addressed in proposals and comments that led to these important codes’ requirements for stair safety and usability. The following information is drawn from some of those proposals and comments, published in NFPA ROPs and ROCs. First, to underline the dangers of stairs generally, refer to Table 1. Clearly stairs are a relatively dangerous product. Data from

the CPSC National Electronic Injury Surveillance System (NEISS) indicate that there are approximately one million hospital emergency room treatments annually in the US associated with stair-related injuries and about an additional 1.4 million stair-related injuries are treated medically elsewhere. Annual comprehensive/societal costs of stair-related injuries were estimated at nearly 50 Billion dollars for 1995 and the growth of injuries over the last few decades has been about twice the rate of population growth. The vast majority of these injuries occur in residential settings, thus the NEC requirements for home stairs are important to get right. Appropriate lighting (now required by NFPA 101-2003) and lighting controls are important in this regard. (See excerpt from NFPA 101 below.) Clearly, the evidence is not that the NEC requirements for stair lighting controls have worked well; on the contrary, they are ergonomically flawed—particularly in relation to the topic addressed by this comment. For a relatively recent, thorough review of stairway usability and safety issues, see Pauls, “Life Safety Standards and Guidelines Focused on Stairways,” *Universal Design Handbook*, McGraw-Hill, 2001, pp. 23.1-23.20. Abundant information on stairway safety has also been provided in prominent proposals and comments (by Pauls) to NFPA 101 and NFPA 5000 in recent years. Table 1 comes from such proposals and comments. Much more could be said but, with the potential limitation on comment length, this will be saved for the May 2004 Annual Meeting and Standards Council appeal should the NEC committee again reject the proposed improvement to the NEC without providing a sufficient reason for its action.

The only other committee actions that would be acceptable to the proponent/commenter would be either (1) to accept wording consistent with NFPA 101-2003 or (2) to accept the proposed change without the new exception. Regarding the first option, here follows the text from NFPA 101-2003 (which calls for 10 ft-candles or 108 lux via its reference to Section 7.8.1.3 in the Means of Egress chapter):

24.2.5.2 Interior stairways shall be provided with means capable of providing artificial light at the minimum level specified by 7.8.1.3 for exit stairs, measured at the center of treads and on landing surfaces within 610 mm (24 in.) of step nosings.

24.2.5.3 For interior stairways, manual lighting controls shall be reachable and operable without traversing any step of the stair.

Regarding option 2, having a single light switch above a three-riser, two-tread stair does mitigate the reach problem (for the full range of adult anthropometric data) with the current rule but it is far from ideal as a solution to the critical issue of stair illumination and its control.

The automatic control of lighting, permitted by the current NEC, would be a preferred solution for stair lighting, especially with the newer lighting control systems that permit multi-level output. For example, a low illuminance level appropriate for nighttime conditions could be maintained except that, in daytime conditions (when surrounding spaces are illuminated), the stair lighting could automatically be brought up to at least the 10 ft-candle illuminance level when an occupant approaches and uses the stair. The need for better lighting and the existence of such automatic control systems have been discussed over the last couple of years with Mr. Willard (Bill) Warren who is the lighting and energy use expert active in IESNA and with adoptions of the NEC in New York City. His work, plus that of his IESNA colleagues responsible for *The IESNA Lighting Handbook*, Ninth Edition (by the Illuminating Engineering Society of North America)—with its recommendations on greater care with stair lighting, complements and supports my original proposal and this comment. (Indeed, a proposal has been submitted to NFPA for an educational session to be given at the May 2004 NFPA meeting—where the NEC comes up for final action—on the subject of means of egress lighting; Mr. Warren has agreed to collaborate with me, along with another colleague, in presenting such a session at which the important issue of lighting controls will be prominent.)

Note that there is an separate proposal submitted for NFPA 5000 for its adoption of requirements—consistent with NFPA 101—for minimum illuminance capability of 10 ft-candles (108 lux) for stair lighting. That separate proposal is extensively based on *The IESNA Lighting Handbook*, Ninth Edition. Again, for reasons of comment length, the technical background on the special importance of lighting for stairs is not included in this NEC comment. But the NEC committee processing this comment should be aware that, if its action is again to reject this proposal/comment, there is a great deal of technical information that can be brought to bear on the further pursuit of this matter through the full NFPA code-development system and, as one representing public health concerns on eight NFPA technical and technical correlating committees (for NFPA 101, 5000 and 501), I am very conversant with using the code-development system. If the NEC committee wishes to have further information provided for its deliberations, I would be pleased to comply.

Panel Meeting Action: Reject

Panel Statement: The submitter’s substantiation is relative to stairs in general and does not indicate that the implementation of the six riser rule has been inadequate. The panel also notes that for stairs with three risers, it is likely that some illumination is provided from an adjacent light source that led the user to the stairs.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

ARTICLE 215 — FEEDERS

2-144 Log #387 NEC-P02 **Final Action: Reject**
(215.2(A)(1))

Submitter: Dan Leaf Rancho Santa Margarita, CA

Comment on Proposal No: 2-270

Recommendation: Reject proposal.

Substantiation: This requirement would only be effective if the feeder conductors are physically isolated from all other conductors. A large ungrounded feeder could also possibly short to a grounded conductor of another circuit, smaller than the grounded conductor of the feeder, whereby the feeder grounded conductor size required by 250.122 would be of no effect in preventing overcurrent of the smaller grounded conductor.

Panel Meeting Action: Reject

Panel Statement: The submitter fails to consider the issue of a fault to the grounded conductor at the load end of the conductors. See panel action on Comment 2-148 for the final wording on this rule.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

2-145 Log #1014 NEC-P02 **Final Action: Reject**
(215.2(A)(1))

Submitter: Noel Williams, Noel Williams Consulting

Comment on Proposal No: 2-272

Recommendation: This proposal should be accept in principal and the issue should be resolved. Only the underlined new words "ungrounded conductors" should be added, or replaced with "conductors connecting to overcurrent devices." The panel statement should be corrected.

Substantiation: The requirement for sizing feeder neutral (ungrounded) conductors is covered by the first sentence - not less than the load to be served. For a feeder neutral, this load is calculated according to 220.22. (paragraph) The requirement for over-sizing conductors for continuous loads is not about the conductors or conductor terminations overheating. The rule is about conductors connecting to overcurrent devices, as clearly indicated by the exception. The conductors do not have to be oversized for continuous loads if the overcurrent device is rated at 100% for these loads. (Ampacity is a continuous current-carrying capacity by definition.) Since the grounded conductor rarely connects to an overcurrent device, it makes no sense to require a grounded conductor to be increased in size for a continuous load. It only needs to be big enough to carry the load and big enough to comply with the terminal temperature provisions of 110.14(C). (paragraph) The panel statement that "the present requirement applies to all feeder circuit conductors" flies in the face of the rules in Article 220 for sizing feeder neutral conductors. Even with a continuous load on the ungrounded conductors, the feeder neutral (grounded conductor) is permitted to be sized for the maximum offbalance - this is not a continuous condition - it accounts for a possible "worst case" abnormal condition. (paragraph) Panel 2 made a similar comment on Proposal 2-181 that is equally questionable, but at least there is no branch-circuit neutral calculation in Article 220 to conflict with the statement in that case.

Panel Meeting Action: Reject

Panel Statement: The panel has considered the information from both the proposal and the comment and does not agree that a change is warranted at this time. There are a number of variations in the circuit configurations, some of which will require that the grounded conductor be sized the same as the ungrounded conductor. Given the limited number of proposals on the issue, it appears most prudent to leave the text as it presently appears.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

2-146 Log #1113 NEC-P02 **Final Action: Accept in Principle**
(215.2(A)(1))

Submitter: Paul Dobrowsky Holley, NY

Comment on Proposal No: 2-270

Recommendation: Continue to accept the proposal in principle but change the first sentence of the second paragraph to read as follows:

"The size of the grounded conductor shall not be smaller than that required by 250.122."

Substantiation: This language is similar to that in 250.32(B)(2). Using it will help usability and for consistent interpretations. Avoiding the term equipment grounding conductor in this section helps prevent confusion because this conductor can carry fault current under the conditions indicated by the proposal submitter but by definition is not an equipment grounding conductor. The term required could cause confusion also because if the feeder conductors were installed in RMC for example, a 250.122 sized conductor is not required.

Panel Meeting Action: Accept in Principle

Panel Statement: See panel action on Comment 2-148.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

2-147 Log #1114 NEC-P02 **Final Action: Reject**
(215.2(A)(1))

Submitter: Paul Dobrowsky Holley, NY

Comment on Proposal No: 2-272

Recommendation: Accept the proposal.

Substantiation: Although it can be inferred that the existing language is applicable to grounded conductors, adding the words will improve clarity and avoid varying interpretations. Some have argued that because the grounded conductor is not "connected" to an overcurrent device, there is no reason to apply the 125% factor.

Panel Meeting Action: Reject

Panel Statement: See panel statement on Proposal 2-145

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

2-148 Log #2215 NEC-P02 **Final Action: Accept in Principle**
(215.2(A)(1))

Note: The Technical Correlating Committee directs that the text accepted by the Panel replace the first sentence of the paragraph in the Panel Action on Proposal 2-270. The Technical Correlating Committee notes that the reference to Proposal 2-146 in the Panel Statement should be to Comment 2-146.

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

Comment on Proposal No: 2-270

Recommendation: Accept the panel action in principle. Insert an additional clause after "specified in 250.122" as follows:

“, except 250.122(F) shall not apply where grounded conductors are run in parallel.”

Substantiation: This comment is intended to support the comments in the voting on Proposal 2-276, which are even more applicable to this proposal.

Panel Meeting Action: Accept in Principle

Revise the last paragraph of 215.2(A)(1) of the ROP to read as follows: "The size of the feeder circuit grounded conductor shall not be smaller than that required by 250.122, except that 250.122(F) shall not apply where grounded conductors are run in parallel."

Panel Statement: The panel has accepted the submitter's concept but has revised the language to take into account the recommendation of Proposal 2-146.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

2-149 Log #2953 NEC-P02 **Final Action: Reject**
(215.2(A)(1))

Submitter: David Beach, PAE Consulting Engineers

Comment on Proposal No: 2-270

Recommendation: Reject the proposal.

Substantiation: This proposal does not present sufficient substantiation to justify such a far-reaching change. An argument could perhaps be made for some minimum size for the neutral, but not this change. Working with conductors 500 kcmil and smaller, this proposal sets single conduit minimum neutral ratings of 25-35 percent for circuits in the 200A-400A range, unsubstantiated, but not necessarily unreasonable.

Continuing to work with conductors 500 kcmil and smaller, but with multiple conduits in parallel, the required neutral size reaches 100 percent of the phase conductor size; a 4000A circuit with 11 sets or 500 kcmil phase conductors, and 500 kcmil equipment ground conductors, will be required to have 500 kcmil neutral conductors, regardless of the neutral load served. Under the 2002 and previous codes, this 4000A circuit would be required to have a minimum size of a mere 41 percent of the circuit rating using 1/0 AWG conductors. Is that not sufficient? Certainly there is no substantiation showing that 1650A of neutral conductor is not sufficient. In this circuit, if the phase-to-neutral fault to be considered occurs in one of the conduits, there is a high likelihood that both the phase and neutral could burn open without the breaker clearing the fault, but if all conductors are included in the evaluation, the 1/0 AWG neutrals are protected if the fault is cleared within about 4.25 seconds at a fault value of 40,000A.

The proposal could be made more acceptable, but would still be unsubstantiated, if an exception were added stating that the neutral shall not be required to be larger than 1/0 AWG unless required by the load served.

Code Panel 5 rejected Proposals 5-63 and 5-71, which would have required a neutral sized equal to the phase conductor, as not having sufficient substantiation, but this proposal does just that for a 4000A circuit with 500 kcmil phase conductors.

Panel Meeting Action: Reject

Panel Statement: See panel action and statement on Comment 2-148. The submitter's concern regarding parallel conductors has been addressed in the panel action on Comment 2-148.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

2-150 Log #79 NEC-P02 **Final Action: Reject**
(215.2(B))

Submitter: Dan Leaf Rancho Santa Margarita, CA

Comment on Proposal No: 2-276

Recommendation: Reject proposal.

Substantiation: This proposal is too drastic and based on a “what if” substantiation. No data was provided to indicate present rules have resulted in the scenario indicated. The Code cannot provide for all possible scenarios. The vast majority of feeder neutrals with 500 kcmil phase conductors are not 10 AWG. The provisions of 215.2(A)(2)(3) would seem to preclude the use of 10 AWG neutrals where 500 kcmil phase conductors are installed. It is unlikely the Code will ever result in conductors never being damaged or destroyed.

Panel Meeting Action: **Reject**

Panel Statement: The panel does not agree that the entire concept should be rejected. See the panel action and statement on Comment 2-152 for the final wording on this section.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

2-151 Log #386 NEC-P02 **Final Action: Reject**
(215.2(B))

Submitter: Dan Leaf Rancho Santa Margarita, CA

Comment on Proposal No: 2-276

Recommendation: Reject the Proposal.

Substantiation: This requirement would only be effective if the feeder conductors are physically isolated from all other conductors. A large ungrounded feeder could also possibly short to a grounded conductor of another circuit, smaller than the grounded conductor of the feeder, whereby the feeder grounded conductor size required by 250.122 would be of no effect in preventing overcurrent of the smaller grounded conductor.

Panel Meeting Action: **Reject**

Panel Statement: The submitter’s substantiation doesn’t consider a fault to the grounded conductor at the load end of the feeders. See the panel action and statement on Comment 2-152 for the **Final Action** on this revision.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

2-152 Log #2217 NEC-P02 **Final Action: Accept in Principle**
(215.2(B))

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

Comment on Proposal No: 2-276

Recommendation: Accept the panel action in principle. Insert an additional clause after “specified in 250.122” as follows:

“, except 250.122(F) shall not apply where grounded conductors are run in parallel.”

Substantiation: This comment is intended as support for the comments in the voting. In a paralleled installation, imposing 250.122(F) is overkill.

Panel Meeting Action: **Accept in Principle**

Revise the second sentence of 215.2(B) of the ROP to read as follows:

“Where installed, the size of the feeder circuit grounded conductor shall not be smaller than that required by 250.122, except 250.122(F) shall not apply where grounded conductors are run in parallel.”

Panel Statement: The panel has accepted the submitter’s concept and revised the wording to be consistent with the action on 215.15(A)(1).

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

2-153 Log #2954 NEC-P02 **Final Action: Reject**
(215.2(B))

Submitter: David Beach, PAE Consulting Engineers

Comment on Proposal No: 2-276

Recommendation: Reject the proposal.

Substantiation: This proposal does not present sufficient substantiation to justify such a far-reaching change. The example used is entirely bogus, as it would apply only for systems between 600V and 2000V, a range in which there are very few circuits. Above 2000V, the minimum neutral would be 8 AWG or larger, depending on voltage.

Panel Meeting Action: **Reject**

Panel Statement: The panel action on Comment 2-152 is a reasonable approach to handle a fault to a grounded conductor. The Final Action addresses the issue of parallel conductors.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

2-154 Log #3114 NEC-P02 **Final Action: Accept**
(215.9)

Submitter: Kenneth E. Vannice, Leviton/NSI-Colortran / Rep. United States Institute for Theatre Technology

Comment on Proposal No: 2-283

Recommendation: Continue to reject adding the proposed new text.

Substantiation: We have recently checked with UL and Intertek (ETL). We can find no record of available Listed Special Purpose GFCIs (also known as Class C, D and E GFCIs) to implement the proposed requirement. Even if Listed equipment were to become available in the near future, there would be insufficient time to evaluate it for appropriate application in this situation.

Panel Meeting Action: **Accept**

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

2-155 Log #3296 NEC-P02 **Final Action: Reject**
(215.9)

Submitter: Dennis Robbins, GFS, Incorporated

Comment on Proposal No: 2-283

Recommendation: Add new paragraph as follows:

Electrical installations where voltages exceed 120 volts, ampere ratings of receptacles that exceed 20 amperes and are single phase or three phase circuits, and where personnel are exposed to potential electrical shock shall be protected with special purpose Ground-Fault Circuit Interrupter for personnel.

Substantiation: New technology now being provided by multiple manufacturers, has evolved and provides listed Ground-Fault Circuit Interrupter devices to protect personnel and equipment at 240 vac, 480 vac, up to 600 vac, single and three phase, 20 amperes to 400 amperes.

There are many industrial and commercial applications where personnel are exposed to shock hazards 230 volts and above. Such as welding machines, power saws, steam cleaners, milling machines, food processing equipment.

Personnel are exposed to electrical shock hazards where equipment may be connected to power through 240 vac, 480 vac, three and single phase power at higher amperes cord receptacles in hostile environments. Such as food processing facilities, shipyards, construction job sites, mining, etc.

Panel Meeting Action: **Reject**

Panel Statement: The panel reaffirms the panel statement on Proposal 2-283. The submitter has not provided any additional substantiation.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

2-156 Log #3619 NEC-P02 **Final Action: Accept**
(215.9)

Submitter: Michael D. Skinner, Alliance of Motion Picture and Television Producers (AMPTP).

Comment on Proposal No: 2-283

Recommendation: Continue to Reject This Proposal.

Substantiation: The Motion Picture and Television Industry fully supports the Panel Action and Statement.

Panel Meeting Action: **Accept**

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

2-157 Log #1242 NEC-P02 **Final Action: Reject**
(215.11 Exception No. 2)

Submitter: Charles M. Trout, Maron Electric Co. Inc.

Comment on Proposal No: 2-287

Recommendation: This proposal should be Accepted in Principle. Do not delete as the proposal suggests but rather add a second and third paragraph to the exception to read:

The name(s) of the qualified person(s) shall be kept in a permanent record at the office of the establishment in charge of the completed installation and at the office of the Authority Having Jurisdiction. Notification of any changes in the employment of the designated qualified person(s) shall be made to the office of the Authority Having Jurisdiction.

A person designated as a qualified person shall possess the skills and knowledge related to the construction and operation of the electrical equipment and installation and shall have received documented safety training on the hazards involved. Documentation of their qualifications shall be on file with the office of the Authority Having Jurisdiction and the office of the establishment in charge of the completed installation.

Substantiation: It was not necessarily my desire to have the wording in the exception deleted, if the exception could be changed to include prescriptive requirements that could ensure that qualified persons are actually performing the maintenance and supervision as required by the exception. Based on the Panel Statement that “the authority having jurisdiction has the responsibility

to evaluate whether persons responsible for the supervision and maintenance are qualified before permitting such installations," it would appear that the National Electrical Code could be reduced to one performance oriented statement that "all electrical installations shall be done properly" and the Authority Having Jurisdiction could handle it from there. However, that's not the case, the National Electrical Code is a prescriptive code and it is the technical committees' responsibility to ensure that prescriptive requirements are present for the Authority Having Jurisdiction to use.

It is difficult to understand how it is possible to relax requirements for safety in a Code that tells us in 90.1(B), "this Code contains provisions that are considered NECESSARY for safety." This section further states that "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." It appears to me that this tells us that these requirements are the MINIMUM requirements for safety and anything less will result in an installation that is NOT FREE FROM HAZARD.

Proponents of this travesty, knowing the truth in this, attempt to circumvent the obvious degradation of safety by using phraseology such as "the installation is under engineering supervision" or "a qualified person will monitor the system." What is monitoring the installation? What does engineering supervision mean?

I have submitted several proposals to delete these exceptions to requirements for safety but they were all rejected. Perhaps in the comment stage, enough persons will comment in favor of accepting these proposals or at least accepting them in a manner where some prescriptive requirements will be added to accurately describe what "engineering supervision" entails. What does "monitoring" the installation mean, what type of record keeping is necessary to assure compliance, what is a "monitor" or what is a "qualified person?" How is documentation of the qualifications and presence of a "qualified person" accomplished by the Authority Having Jurisdiction?

Without these prescriptive requirements, these exceptions to the requirements for safety appear to be "just another subterfuge to avoid compliance with the safety requirements of the National Electrical Code without regard to putting persons and equipment at risk."

Panel Meeting Action: Reject

Panel Statement: It is not realistic for an AHJ to keep a listing of all qualified personnel. The decision on how to enforce the provision of the exception has to be made by each AHJ based on their local needs.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

Comment on Affirmative:

KING: I agree with the Panel that it is not realistic for an Authority Having Jurisdiction to keep a listing of all qualified personnel. I disagree with the second sentence in the panel statement. Text that is not practical or is impossible for the Authority Having Jurisdiction to enforce should not be permitted.

2-158 Log #1012 NEC-P02 **Final Action: Accept in Principle**
(215.12 (New))

Submitter: Noel Williams, Noel Williams Consulting

Comment on Proposal No: 2-289

Recommendation: This proposal should continue to be accepted in principal as modified by Panel 2.

Substantiation: This information is redundant. It is already covered in a more broadly applicable location - 310.12. Nevertheless, a specific rule for feeders may be useful. (I'd have a new paragraph here if I could.) Color coding is a good practice, but the methods and colors proposed seem to be based on the assumption that there will not be more than two three-phase systems in a given facility. This is plainly mistaken. Many facilities, especially industrial facilities have four or more three phase systems and possibly other single phase or DC power systems as well. (Not all are used for multiwire branch circuits, but all may well be used for branch circuits or feeders.) The assignment of color codes as proposed simply falls apart when two of the systems that use the same colors are present in a single facility. In my experience, it has not been uncommon to have single phase 120/240 and three phase 208Y/120 volt systems in the same facility or building, and this proposal would require that both be marked using the same colors, so they would be indistinguishable. This proposal does not recognize other frequency systems or DC systems at all, and both systems are common in certain industries (400 hz for avionics, for example, and DC for many industrial systems and communications.) Industrial users often use a color to identify a voltage system and then use tags or other means to identify phases. A mandated color code in the NEC also creates problems for those who want to use a color code under NFPA 79. The panel has been wise to resist the repeated proposals to mandate a color code and should continue to recognize the variety of installations that exist and the resulting need for some design flexibility.

Panel Meeting Action: Accept in Principle

Panel Statement: The panel is continuing to accept the revision but has modified the language in accordance with the recommendation of Comment 2-159.

The panel does not agree that the information is redundant with Section 310.12. 310.12 only requires that the conductors be distinguished from grounded and grounding conductors.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

2-159 Log #1578 NEC-P02 **Final Action: Accept**
(215.12(C))

Submitter: Jim Pauley, Square D Company

Comment on Proposal No: 2-289

Recommendation: Revise the last sentence of the accepted text as shown below:

The means of identification shall be permitted to be by separate color coding, marking tape, tagging, or other approved means and shall be permanently posted at each feeder panelboard or similar feeder distribution equipment.

Substantiation: This revision is offered to clarify where the means of identification must be posted. As presently worded, the language implies that the ID system for the feeders must be posted at each panelboard, regardless of whether the panelboard contains the feeders in question. It would appear that the requirement from CMP 2 is to require that the ID system for the feeders appear at each panelboard containing feeders. For instance, would it be required to post the ID system at a lighting panel that contains branch circuits and no feeders (other than perhaps the supply to the panel)? 210.5(C) will handle the ID requirement for the branch circuits, so it should be clear that 215.12(C) is intended to cover the feeders only.

Panel Meeting Action: Accept

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

ARTICLE 220 — BRANCH-CIRCUIT, FEEDER, SERVICE CALCULATIONS

2-160 Log #1115 NEC-P02 **Final Action: Reject**
(220.2(B))

Submitter: Paul Dobrowsky Holley, NY

Comment on Proposal No: 2-296

Recommendation: Accept the proposal.

Substantiation: Safety is enhanced by having language that is consistently interpreted. Additionally if the fractions (.49) of a large number of different types of loads are dropped, the resulting calculated load is significantly different than if the fraction is only dropped after totaling the loads and then selecting the conductor size.

Panel Meeting Action: Reject

Panel Statement: The submitter's comment does not provide substantiation that the current method of calculation decreases safety. Further, the Code does not prohibit carrying fractions less than 0.5 as deemed appropriate. In addition, accepting the comment may further restrict Article 220 calculations beyond the submitter's intent.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

2-161 Log #19 NEC-P02 **Final Action: Reject**
(220.3)

Submitter: Stanley J. Folz, Folz Electric, Inc.

Comment on Proposal No: 2-299

Recommendation: The panel should reconsider and accept this proposal.

Substantiation: The Panel Statement refers to being able "to calculate adequate service and feeder capacities but does not require the entire capacity be connected". The whole point of Mr. Hertel's proposal was to calculate adequate service and feeder capacities using the local energy standard. In areas where such standards are enforced, large savings could be realized in smaller services and feeders.

Panel Meeting Action: Reject

Panel Statement: See panel statement on Comment 2-163.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

2-162 Log #1015 NEC-P02 **Final Action: Reject**
(220.3)

Submitter: Noel Williams, Noel Williams Consulting

Comment on Proposal No: 2-299

Recommendation: This proposal should have been accepted.

Substantiation: The panel states that the NEC is not in conflict with energy codes, and that is probably true. However, the NEC is supposed to be about safety. The need to provide adequate capacity is certainly a safety issue, but the idea that excess capacity should be required is not based on any safety

requirement. Where the excess capacity is not permitted to be used due to other codes and standards, there is no legitimate reason for the NEC to require significantly oversized feeders to supply a load that is not permitted to exist. The only design argument that can be made for requiring this excess capacity is that it will allow for future expansion, and that is not supposed to be an outcome of following the NEC. (I suppose you could argue that the oversized panels and conductors might also help to support the conductor and electrical equipment industries, or even electricians and contractors, but that is not supposed to be the purpose of the code either.) Currently, the NEC requires feeders supplying lighting loads to be over 2 times the load permitted to be used. This is capacity that does not add to the safety of a building, encourages (requires) waste of resources, and penalizes the purchasers of electrical services. To many engineers, designers, and plan reviewers, the requirement is so unreasonable that they choose instead to ignore the code provisions. I believe the code panels should encourage respect for the rules by making sure the rules have a reasonable basis.

Panel Meeting Action: Reject

Panel Statement: See panel statement on Comment 2-163.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

2-163 Log #1016 NEC-P02 **Final Action: Reject**
(220.3)

Submitter: Noel Williams, Noel Williams Consulting

Comment on Proposal No: 2-305

Recommendation: This proposal should have been accepted in principal.

Substantiation: See my comments on Proposal 2-299 which should have been accepted.

Panel Meeting Action: Reject

Panel Statement: The panel agrees that at times branch circuit loads as shown in 220.3 may exceed the requirements of other codes. The panel is concerned that deferring to a minimum energy standard may compromise further expansion of the utilization system.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

2-164 Log #1930 NEC-P02 **Final Action: Reject**
(Table 220.3(A))

Submitter: James M. Imlah, City of Hillsboro

Comment on Proposal No: 15-8

Recommendation: Revise table to read as shown below:

Substantiation: This proposal was submitted to CMP 15 and was to be forwarded to CMP-2 for comment and action.

As stated from the original proposal, there has been confusion as to determining the minimum lighting densities for medical or dental facilities that are not part of a hospital environment. There have been many medical and dental facilities that are performing various outpatient care services. Some facilities that were once used for retail, but with the change of occupancy, inspections of the lighting systems appear to be inadequate. However, upon reviewing code articles 517 and 220.3 there is no clear path to help determine the amount of lighting necessary to perform the medical procedures on patients. Please provide an expansion on the types of facilities similar to hospitals and performing many of the same functions.

Please consider this forwarded proposal to provide clarity for the safety of procedures that provide services to human beings.

Panel Meeting Action: Reject

Panel Statement: Medical and dental facilities could have substantially different environments than a hospital. Accepting the proposal would reduce the lighting load requirements for medical and dental office environments/buildings, since they fall under the "office buildings" provision of Table 220.12.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

2-165 Log #1387 NEC-P02 **Final Action: Reject**
(220.14)

Submitter: Justin Hemgesberg Chesaning, MI

Comment on Proposal No: 2-320

Recommendation: Change panel action from Reject to Accept in Principle.

Revise the text of 220.50 to read as follows: Motor loads shall be calculated using the current as determined in accordance with 430.24, 430.25, and 430.26 and with 440.6 for hermetic refrigerant motor compressors. Where the calculated load is to be in volt-amperes, the motor current shall be multiplied by the nominal circuit voltage for single-phase and direct current motors, and by the nominal circuit voltage and 1.73 for three-phase motors.

Substantiation: Except for farm load calculations, the demand load for a feeder or service conductors is determined on the basis of volt-amperes. The section simply makes reference to 430.24, 430.25, and 430.26 which is for the purpose of determining circuit or feeder current. It needs to be pointed out in this section that what is being determined is the motor current that will be used

[Proposal 2-303 (Log #3082)]		
Table 220.3(A) General Lighting Loads by Occupancy Unit Load		
Type of Occupancy	Volt-Amperes per Square Meter	Volt-Amperes per Square Foot
Armories and auditoriums	11	1
	Proposed Line Location	
Banks	39b	3 1/2 b
	Proposed Line Location	
Barber shops and beauty parlors	33	3
	Proposed Line Location	
Churches	11	1
Clubs	22	2
Court rooms	22	2
Dwelling units	33	3
	Proposed Line Location	
Garages – commercial (storage)	6	1/2
	Proposed Line Location	
Hospitals, medical or dental Facilities	22	2
	Proposed Line Location	

to determine the load. Those sections do not determine the load. There needs to be an additional sentence that points out how the current as determined in 430.24, 430.25, and 430.26 is to be converted to volt-amperes. The motor load is not calculated in accordance with 430.24, 430.25, and 430.26, the motor current is determined using these sections.

Panel Meeting Action: Reject

Panel Statement: The submitter did not adequately substantiate why the proposed wording to Article 220.14 adds clarity or is needed.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

2-166 Log #390 NEC-P02
(220.15)

Final Action: Reject

Submitter: Dan Leaf Rancho Santa Margarita, CA

Comment on Proposal No: 2-321

Recommendation: Accept proposal.

Substantiation: Please refer to original substantiation. Proposals 17-42 Section (426.4), 17-15 (422.13), 17-30 (424.3(B)), 17-47 (427.4) relating to electric heating loads have been accepted (to be considered as continuous loads). For consistency, electric space heating loads should also be included. The present requirement infers a continuous load but doesn't apply continuous load requirements to feeder, services and overcurrent devices.

Panel Meeting Action: Reject

Panel Statement: Even when fixed electrical space heating is defined as a continuous load (per code requirements), it is still appropriately computed at 100%. It is rather the branch circuit that must be sized at 125% in accordance with Article 424.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

2-167 Log #2410 NEC-P02
(Table 220.19)

Final Action: Accept

Submitter: Leif O. Pihl, IBEW LU 292

Comment on Proposal No: 2-292

Recommendation: I have not had the opportunity to fully understand the reasons behind this proposal, therefore I can neither support nor object to it.

However, the submitter did not address one glaring typo: In Table 220-19 (new Table 220-55), under column C, change the FIRST value of '23' to '22' in the row for 7 Appliances (NOT the row for 8 Appliances).

Substantiation: Self evident.

Panel Meeting Action: Accept

Correct Table 220.55 as recommended by the submitter.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

2-168 Log #2955 NEC-P02
(220.19)

Final Action: Accept

Submitter: David Beach, PAE Consulting Engineers

Comment on Proposal No: 2-324

Recommendation: Reject the proposal.

Substantiation: The diagram that accompanies this proposal is incorrect. In a transformer, the phases, and neutral where applicable, are at the ends of the windings, not the windings themselves. Thus in the delta diagram, the three windings are between phases A and B, between B and C, and between C and A. Any range connected to this transformer shown would be connected to two phases, and the 2002 NEC language is correct.

The only condition where the 2002 NEC language would not be correct would be single phase ranges connected phase to neutral, such as 240V single phase ranges connected to a 415Y/240V system, but the proposed language does not address that condition.

Perhaps 220.19 could be rewritten to state:

220.19 "...Where two or more single-phase ranges, rated for phase-to-phase voltage, are supplied by a 3-phase, 4-wire feeder or service, the total load shall be computed on the basis of twice the maximum number connected between any two phases."

Panel Meeting Action: Accept

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

2-169 Log #969 NEC-P02
(220.37)

Final Action: Reject

Submitter: Dorothy Kellogg, American Chemistry Council

Comment on Proposal No: 11-24

Recommendation: Panel should accept Proposal 2-357.

Substantiation: The NEC should specifically recognize the use of demand factors in the determination of loads in Supervised Industrial Installations.

In the absence of recognized demand factors, NEC determined loads for Supervised Industrial Installations are overly conservative and require distribution systems with higher than needed ratings. This practice results in the misuse and undue consumption of natural resources. The current approach is also inconsistent with historical experience found in both utilities and industry. Utilities have been successfully sizing and operating supplies using a demand-based approach for many years. Industry has also had success applying a demand-based approach in calculating loads when allowed by the authority having jurisdiction.

The NEC was established to safeguard persons and property. Allowing a demand-based approach for sizing feeders in Supervised Industrial Installations does not compromise safety to persons or property. This is due to the overcurrent protection requirements already given in Article 240. Even if an error in calculation is made, the required overcurrent protection will de-energize overload equipment ensuring safety of persons and property.

Although 430.26 allows the use of a demand factor in sizing motor feeders and services, it is only at the discretion of the AHJ. This is seldom practical, as in most industrial installations, demand factor calculations and equipment specifications/purchases are made years in advance of the AHJs involvement.

The code recognizes this as an issue and partially address it in Article 220 by allowing sixteen optional methods that make use of demand factors for determining particular types of loads. However, none of these optional methods address Supervised Industrial Installations. The NEC should be consistent in approach by allowing a demand-based solution for sizing electrical feeders in Supervised Industrial Installations. Either the original, or revised proposal (offered in Pat Roche's Explanation of Negative) should be accepted by the panel.

Panel Meeting Action: Reject

Panel Statement: The panel reaffirms its position in Proposal 2-357.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 11 Negative: 2

Explanation of Negative:

DOBSON: I concur with Mr. Roche's comments.

ROCHE: The revised code text offered in my "Explanation of Negative" provided during the proposal stage should be Accepted. See below. The NEC feeder requirements as written are overly conservative and result in plant distribution systems with ratings/equipment larger than needed. In the event of a miscalculation, allowing a demand based approach for sizing feeders in Supervised Industrial Installations will not compromise safety to persons or property given the overcurrent protection requirements of Article 240. The NEC recognizes this as an issue and allows sixteen optional methods for determining feeder sizes using a demand based approach. The same consideration should be allowed for Supervised Industrial Installations.

220.37 Optional Calculations - Supervised Industrial Installations

For services and feeders in Supervised Industrial Installations, calculation of load shall be permitted to be the product of the total connected load and a demand factor. The demand factor shall be calculated and applied under engineering supervision and meet the following requirements.

- (1) The application of a determined demand factor must yield a sufficient ampacity capable of serving the actual operating load.
- (2) The allowable demand factor applied shall not be less than 50 percent.
- (3) The allowable demand factor is not less than that determined from 220.35 for a similar industrial installation in the manufacture of the same product.

For the purposes of this Article, Supervised Industrial Installations shall be defined as installations meeting the following conditions:

- (1) Conditions of maintenance and engineering supervision ensure that only qualified persons design, control, monitor and service the system.
- (2) The premises has at least one service or feeder that is more than 150 volts to ground and more than 300 volts phase-to-phase.

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, substation, or control center.

ARTICLE 225 — OUTSIDE BRANCH CIRCUITS AND FEEDERS

4-4 Log #3345 NEC-P04 **Final Action: Reject**
(225.9)

Submitter: Daniel R. Neeser, Cooper Bussmann

Comment on Proposal No: 4-8a

Recommendation: The panel action for the proposal should be reject.

Substantiation: The panel action will decrease usability. Overcurrent protection is essential for all conductors and if the panel action is accepted, there will be no reference to overcurrent protection requirements for outside branch circuits and feeders. This can lead to confusion and decrease usability since there is no direction for the user on how to comply with proper overcurrent protection for the conductor. By requiring protection in accordance with 210.20 for branch circuits and Article 240 for feeders the user is pointed in the proper direction for necessary overcurrent protection requirements.

In addition, if any change should occur to this section, it should be to change the wording to "Overcurrent protection shall be in accordance with 210.20 for branch circuits and 215.3 for feeders." 215.3 will then guide the user for additional requirement per Part I of Article 240.

Panel Meeting Action: Reject

Panel Statement: Section 225.2 already provides a reference for the user of the NEC to apply Articles 210 and 215 for branch circuits and feeders, making existing Section 225.9 unnecessary. Where installing outside branch circuits and feeders, overcurrent protection must be installed in accordance with 210.20 for branch circuits and 215.3 for feeders, in addition to other requirements for these circuits in Articles 210, 215, and 240.

Number Eligible to Vote: 10

Ballot Results: Affirmative: 10

4-6 Log #2162 NEC-P04 **Final Action: Accept in Principle**
(225.17)

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

Comment on Proposal No: 4-9a

Recommendation: Accept the proposal in principle. Revise the last sentence to avoid the word “herein” as follows:

“Only branch-circuit and feeder conductors within the scope of this article shall be permitted to be attached to a mast.”

Substantiation: The Style Manual at 3.3.4 objects to the use of this word, and in this case the objection is legitimate. Where exactly is “herein”? The article? The section? The intent, as in the perennial battles over 230.28, is to exclude other systems.

Panel Meeting Action: Accept in Principle

Continue to accept the text in the proposal, but change the last line in proposed 225.17 to read as follows:

Only the feeder or branch circuit conductors specified within this section shall be permitted to be attached to a feeder and/or branch circuit mast.

Panel Statement: The panel agrees with the submitter and has added text to clearly indicate which conductors and which mast are being referenced in this section. The intent of this sentence is to restrict the attachment of other systems to these masts for structural integrity of the installation.

Number Eligible to Vote: 10

Ballot Results: Affirmative: 10

4-7 Log #45 NEC-P04 **Final Action: Reject**
(225.18)

Submitter: Eric G. Schneier, Bechtel Savannah River Inc. (BSRI)

Comment on Proposal No: 4-12

Recommendation: The original proposal appears to have been misunderstood. The revised text of 225.18 should read “Overhead spans of single conductors and multiconductor cables (not in raceway or cable tray) of not over 600 volts, nominal, shall conform to the following:..”.

Substantiation: The panel statement on the proposal demonstrated a misunderstanding of the proposed revised text. The proposal asks for the deletion of the words “open” in two places and the addition of the phrase in parentheses. The proposed revised wording makes its clearer to what situations the article applies and eliminates confusion over the definition of the word “open” in this context.

Panel Meeting Action: Reject

Panel Statement: The substantiation for the proposal has assumed that people will misunderstand the use of the phrase “open conductor” or “open multiconductor cable” as those conductors that are not insulated or are open to air. The phrase “open conductor” does not address the insulation on the conductors or on the cables; it simply addresses the fact that the conductors are not enclosed and are installed outside in an overhead run. Deleting the word “open” in both cases, as stated in the proposal recommendation, does not provide clarity. The word “open” simply describes these overhead conductors as open as defined in the dictionary as exposed conductors or cables.

Number Eligible to Vote: 10

Ballot Results: Affirmative: 10

4-8 Log #423 NEC-P04 **Final Action: Reject**
(225.18)

Submitter: Eric G. Schneier, Bechtel Savannah River Inc. (BSRI)

Comment on Proposal No: 4-12

Recommendation: The original proposal appears to have been misunderstood. The revised text of 225.18 should read:

“Overhead spans of single conductors and multiconductor cables (not in raceway or cable tray) of not over 600 volts, nominal, shall conform to the following:..”.

Substantiation: The panel statement on the proposal demonstrated a misunderstanding of the proposed revised text. The proposal asks for the deletion of the words “open” in two places and the addition of the phrase in parentheses. The proposed revised wording makes its clearer to what situations the article applies and eliminates confusion over the definition of the word “open” in this context.

Panel Meeting Action: Reject

Panel Statement: See panel action and statement on Comment 4-7.

Number Eligible to Vote: 10

Ballot Results: Affirmative: 10

4-9 Log #46 NEC-P04 **Final Action: Reject**
(225.18(3))

Submitter: Eric G. Schneier, Bechtel Savannah River Inc. (BSRI)

Comment on Proposal No: 4-13

Recommendation: Revise proposal wording as follows: Change “750V” to “600V”.

Substantiation: Submitter did not realize that proposal addressed two separate parts of Article 225. In panel comments on the affirmative, panel member ROGERS must be unaware that 225.18(1) is restricted to conductors 150 volts to ground or below.

Panel Meeting Action: Reject

Panel Statement: In the technical substantiation for the original proposal (4-13), the submitter states that this change will bring the NEC and the NESC into agreement. This is not true.

Clearances in the NESC are not solely based on the voltage of the conductor but also include a reference to the type of conductor involved. For example, separate 120/240 volt open wire conductors not in contact with a grounded messenger have clearances that are 6 inches larger than 120/240 volt multiconductor cables. (See NESC Rule 230C for a more complete description of these conductors.) NEC conductors are not similarly described in this section, and therefore the required clearances may not necessarily be the same.

Number Eligible to Vote: 10

Ballot Results: Affirmative: 10

4-10 Log #424 NEC-P04 **Final Action: Reject**
(225.18(3))

Submitter: Eric G. Schneier, Bechtel Savannah River Inc. (BSRI)

Comment on Proposal No: 4-13

Recommendation: Revise proposal wording as follows: Change “750V” to “600V”.

Substantiation: Submitter did not realize that proposal addressed two separate parts of Article 225. In panel comments on the affirmative, panel member Mr. Rogers must be unaware that 225.18(1) is restricted to conductors 150 volts to ground or below.

Panel Meeting Action: Reject

Panel Statement: See panel action and statement on Comment 4-9.

Number Eligible to Vote: 10

Ballot Results: Affirmative: 10

4-5 Log #3609 NEC-P04 **Final Action: Reject**
(225.19(A) Exception No. 2)

Submitter: Louis Santoro Norwood, MA

Comment on Proposal No: 4-15

Recommendation: The panel should reconsider its statement and action to accept the submitter’s proposal.

Substantiation: SLOPE is to incline up or down

PITCH is downward slant

PITCH is the degree of such slant

RUN is 1/2 of the span

RISE is the greatest height above the span

Slope is used on a Gambrel roof as having a double slope. Ex. 12/12 = 1/2 pitch, 6/12 = 1/4 pitch, 12/24 = full pitch

The panel statement is incorrect:

1. Overhangs are not figured in the run

2. SPAN would only be 38 ft

3. If the roof is 1/4 pitch the height of the span would be 9 ft 6 in.

4. Roofs are referred to as pitch not slope

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

Panel Meeting Action: Reject

Panel Statement: The copies of the supporting material provided by the submitter are not clear enough to provide the necessary information for determining the submitter’s point in his appeal to reconsider the proposal action of reject. It is much easier for electricians, who are faced with having to determine the approximate incline of a roof, to use the rise over the run of a roof. This can be done with a measuring tape, so providing a ratio of pitch, as the proposal is recommending, does not accomplish anything for the person actually doing the work in the field.

Number Eligible to Vote: 10

Ballot Results: Affirmative: 10

4-11 Log #1224 NEC-P04 **Final Action: Reject**
(225.19(C)(2))

Submitter: Donald A. Ganiere Ottawa, IL
Comment on Proposal No: 4-18

Recommendation: Panel should accept this change.

Substantiation: The panel is correct that under normal conditions final spans within 3 ft. of windows that are not designed to open is not a safety hazard, but this proposal is not about normal conditions. It is about making it easier for firefighters to place ladders under emergency conditions. The placement of fire service ladders is already difficult without the additional problems that are posed by interfering final spans. The extra time that it takes the firefighters to place this ladder may result in death for the occupant of the fire building. Why can't we make the job of the firefighter a little easier? Have any of the panel members asked a firefighter about the problems that overhead lines cause for ladder placement?

Panel Meeting Action: Reject

Panel Statement: This section does not provide any information on the size of windows with respect to the placement of the final span attachment to the building. As stated in the proposal stage, providing a 3-foot clearance from windows that can be opened is meant to ensure that these overhead lines are not easily accessible from inside the window, not from outside. As state before, a ladder can access any of these overhead final spans from outside the building. Furthermore, the window can be accessed with a ladder from just below or from either side of the window with ladder placement on the side opposite from the final span attachment to the building.

Section 225.19(E) provides a clear space or a clear zone, where buildings exceed three stories or 50 feet, so overhead lines permit a free space to facilitate the raising of ladders when necessary for fire fighting.

Number Eligible to Vote: 10

Ballot Results: Affirmative: 10

Comment on Affirmative:

ROGERS: When raising ladders on the fire-ground the proximity of overhead electrical conductors is always a safety consideration. As long as buildings are supplied with overhead service drops this will always be true. It would be far too restrictive to limit these installations on this basis, especially due to the fact that in some cases this might be the only location where power could be brought to the building. In the rare instance that this particular window, fixed or movable, is the only location that firefighters could effect a rescue, I am sure that their fire scene ingenuity would allow them to do so. At least in this scenario the conductors are readily visible, there could be an even greater hazard if the building was supplied elsewhere and there were energized conductors in the window area that were not readily visible.

4-12 Log #1077 NEC-P04 **Final Action: Reject**
(225.19(D)(1) Exception)

Submitter: Neil F. LaBrake, Jr., Niagara Mohawk, a National Grid Company / Rep. Edison Electric Institute

Comment on Proposal No: 4-19

Recommendation: Accept the Proposal.

Substantiation: This proposal should be Accepted. Section 225.4, Exception, allows circuit conductors to be bare as permitted elsewhere in the Code. In Section 230.22, Exception, the grounded conductor of a multiconductor cable shall be permitted to be bare. Section 230.9, Exception, allows conductors installed above the top level of a window to be less than 3 feet from the windows designed to be opened. There is no technical justification not to allow the installation of feeder drops to buildings in the same manner as service drops to buildings. The service drops with grounded bare messengers (neutrals) have been demonstrated over time to be safe installations. This proposal was intended to clarify this fact and this proposal would recognize the same installation requirements for feeder drops to buildings. There was no technical justification for the rejection of the proposal to recognize the installation of bare grounded conductors and permit only the installation of insulated conductors for feeder drops. The purpose and intent of the Panel's reference to Section 310.2 is not clear because bare grounded conductors are permitted in the Code.

Panel Meeting Action: Reject

Panel Statement: The additional text suggested in the proposal is not necessary, since 225.4 already requires open overhead conductors to be insulated or covered, with an exception that permits equipment grounding conductors and grounded circuit conductors to be bare where permitted elsewhere in the Code. Any ungrounded phase conductors must either be insulated or covered within 10 feet of the building. If a messenger-supported wire was installed in accordance with Article 396, the bare equipment grounding conductor or the bare grounded conductor being used as a messenger wire could be run above the window based on the exception in 225.19(D)(1).

Number Eligible to Vote: 10

Ballot Results: Affirmative: 10

4-13 Log #83 NEC-P04 **Final Action: Accept in Principle**
(225.22)

Submitter: Dan Leaf Rancho Santa Margarita, CA
Comment on Proposal No: 4-20

Recommendation: Accept proposal.

Substantiation: Same as proposal substantiation. Use of the word "watertight" in the substantiation is a typo. But does not affect the proposal Panel Statement that devices installed outside should be watertight does not take into account outside locations that are damp, not wet. (see definitions).

Panel Meeting Action: Accept in Principle

Panel Statement: See panel action and statement on Comment 4-16.

Number Eligible to Vote: 10

Ballot Results: Affirmative: 10

4-14 Log #99 NEC-P04 **Final Action: Accept in Principle**
(225.22)

Submitter: Dan Leaf Rancho Santa Margarita, CA

Comment on Proposal No: 4-20

Recommendation: Accept the proposal.

Substantiation: The proposal did not indicate raceways to be watertight as stated by the panel. The words "wet location" are not used in 225.22 as stated by the panel. The panel statement that if devices are outside they can be exposed to rain and should be raintight is not supported by the definition of Location, Damp. 314.15 only requires boxes, conduit bodies, fittings, (lock-nuts, bushings, connectors, couplings, etc.) in WET locations to be listed for such use. 376.10(3) and 378.10(3) do not require wireways in damp locations to be watertight.

Panel Meeting Action: Accept in Principle

Panel Statement: See panel action and statement on Comment 4-16.

Number Eligible to Vote: 10

Ballot Results: Affirmative: 10

4-15 Log #161 NEC-P04 **Final Action: Accept in Principle**
(225.22)

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education

Comment on Proposal No: 4-20

Recommendation: Accept as proposed.

Substantiation: As Mr. Rogers pointed out, if I run EMT on the underside of a soffit it simply won't get rained on. Damp, sure; it could get splashed in some circumstances. But that's most likely not a wet location. There are plenty of other examples.

Panel Meeting Action: Accept in Principle

Panel Statement: See panel action and statement on Comment 4-16.

Number Eligible to Vote: 10

Ballot Results: Affirmative: 10

4-16 Log #2164 NEC-P04 **Final Action: Accept in Principle**
(225.22)

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

Comment on Proposal No: 4-20

Recommendation: Accept the proposal.

Substantiation: The panel statement is not responsive. Many exterior locations are damp locations, and not subject to beating rain. A case in point would be a surface-mounted disconnect switch located well under a protected overhang, such as on a porch. Referring to 312.2(A), the switch must be arranged so water will not enter or accumulate within the enclosure, but it need not be weatherproof. That classification is reserved for wet locations.

Panel Meeting Action: Accept in Principle

Revise the main paragraph of 225.22 to read as follows:

"Raceways on exteriors of buildings or other structures shall be arranged to drain and shall be raintight in wet locations."

[The title and exception remain unchanged by this action.]

Panel Statement: The panel disagrees with the submitter's statement that the panel statement on the proposal is not responsive. The text is revised to provide clarity. The panel refers this action to CMP 8 for information only.

Number Eligible to Vote: 10

Ballot Results: Affirmative: 10

4-17 Log #1078 NEC-P04 **Final Action: Reject**
(225.30)

Submitter: Neil F. LaBrake, Jr., Niagara Mohawk, a National Grid Company / Rep. Edison Electric Institute

Comment on Proposal No: 4-24

Recommendation: Accept the Proposal.

Substantiation: The substantiation for this Proposal is essentially the basis for the change proposed in Proposal 4-26a. This will clarify that service and distribution equipment shall not be considered a separate structure and thereby eliminate the need for redundant equipment.

Panel Meeting Action: **Reject**

Panel Statement: Eliminating the ability to classify a free-standing service or switchboard feeding a single building as a structure would mean that Part II of Article 225 would not apply. There was no substantiation provided with either the proposal or the comment to justify locating this equipment up to 50 feet away, and if the equipment is a feeder distribution board supplying a single building, then none of the requirements within Part II of Article 225 would apply, since the title of this section is "More Than One Building or Structure."

Number Eligible to Vote: 10

Ballot Results: Affirmative: 10

4-18 Log #3048 NEC-P04 **Final Action: Reject**
(225.30)

Submitter: D. Thomas Branson, Madison Gas & Electric

Comment on Proposal No: 4-24

Recommendation: We support the original proposal and feel that it should not have been rejected by the committee.

Substantiation: This proposal should have been accepted. It solves the problem as identified in the submitter's substantiation in a simple and straightforward manner as opposed to 4-26a Log #CP407 which is more complex.

Panel Meeting Action: **Reject**

Panel Statement: See panel action and statement on Comment 4-17.

Number Eligible to Vote: 10

Ballot Results: Affirmative: 10

4-19 Log #1579 NEC-P04 **Final Action: Accept in Principle**
(225.30(A)(6))

Submitter: Jim Pauley, Square D Company

Comment on Proposal No: 4-25a

Recommendation: Revise new item (6) to read as follows:

(6) Equipment with a double-ended main configuration installed for the purpose of enhanced reliability of the supply.

Substantiation: The language as accepted by the panel is confusing because it implies that an additional feeder or branch circuit can be installed to supply a "redundant system". In reality, the second feeder helps to create a redundant system in a configuration such as a main-tie-main. Since "redundant system" is not defined, it would appear that the best course of action is to describe the specific instance where the second feeder can be installed. This comment is an attempt to revise the wording to allow the double-ended configurations that seem to be the target of the original language.

The wording as presently in the ROP will be confusing and likely cause misinterpretations because of the implication that you can have a second feeder to a "redundant system" and nobody knows what a redundant system is.

Panel Meeting Action: **Accept in Principle**

Revise the proposed text to read as follows:

"(6) Systems designed for connection to multiple sources of supply for the purpose of enhanced reliability."

Panel Statement: The submitter is correct in pointing out that the term "redundant system" may be confusing. The type of equipment used to facilitate such a system is not defined, since different types of equipment may be used depending on the application.

Number Eligible to Vote: 10

Ballot Results: Affirmative: 10

4-20 Log #3276 NEC-P04 **Final Action: Reject**
(225.30(D))

Submitter: D. Thomas Branson, Madison Gas & Electric

Comment on Proposal No: 4-26

Recommendation: Original Recommendation:

Propose to add to end of existing text a second sentence: "The different voltages, frequencies or phases, or different uses shall be maintained throughout the system."

Substantiation: This proposal should have been accepted. It solves the problem as identified in the submitter's substantiation in a simple and straightforward manner as opposed to 4-26a (Log #CP 407) which is more complex.

Panel Meeting Action: **Reject**

Panel Statement: Once the power for different phases, voltages, frequencies, or uses enters the building, then these systems can be changed within the building by transformers, converters, or any other method. The purpose of this section is to limit the number of branch circuits or feeders entering the building and thus provide a limit to the number of disconnecting means that must

be operated to disconnect power to a building. The existing text in the NEC provides that limitation.

Number Eligible to Vote: 10

Ballot Results: Affirmative: 10

4-21 Log #160 NEC-P04 **Final Action: Reject**
(225.31)

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education

Comment on Proposal No: 4-26a

Recommendation: Accept as proposed.

Substantiation: The Authority Having Jurisdiction never has control of violations that may appear subsequent to installation and inspection, but "ready access" forbids barriers.

Panel Meeting Action: **Reject**

Panel Statement: In recent Code cycles, the panel has tried to develop a set distance at which a feeder or branch circuit disconnecting means can be located outside the building or structure. Based on architectural design of the building, problems with landscaping obscuring the disconnect, and issues with establishing a proper ground plane for a remote feeder or branch circuit disconnect, the panel has decided that the present text as written in the 2002 NEC provides a workable format. The present text as written in the 2002 NEC provides the flexibility to permit the feeder or branch circuit disconnecting means to be located where it is readily accessible nearest the point of entrance of the conductors under whatever design issues may be the case for a particular location. It gives the electrical design team, the electrician, the electrical contractor, premises owner or operator, and the inspector the ability to determine the feeder or branch circuit disconnect location based on the particular site, power availability, and the best design for the installation.

Number Eligible to Vote: 10

Ballot Results: Affirmative: 10

4-22 Log #750 NEC-P04 **Final Action: Accept**
(225.31)

Submitter: Mark Shapiro Farmington Hills, MI

Comment on Proposal No: 4-26a

Recommendation: Reject the proposal.

Substantiation: This proposal, and proposal 4-84a for 230.70, raise similar problems as to how to address grounding and bonding at buildings or structures served by circuits with disconnects that could be up to 50 ft. away.

250.32(B) requires grounding electrode conductors to be connected at the feeder disconnect for a "remote" building. If this disconnect is 50 ft. from the building, the effectiveness of the grounding electrode conductor will have been greatly reduced.

How would the installation of neutrals and grounds be handled from these disconnects, to the buildings? 250.32 does seem to anticipate this question and is not clear. However, it would seem that separate neutrals and grounds would be required, from these disconnects. So, if we have a 100 ft. feeder to a building, we could have a neutral, with no equipment ground, for the first 50 ft. and need to provide separate neutrals and grounds for the remaining 50 ft.

This proposal should not be accepted without companion, coordinating proposals in Article 250 that would address and resolve these questions.

Panel Meeting Action: **Accept**

Panel Statement: In recent Code cycles, the panel has tried to develop a set distance at which a feeder or branch circuit disconnecting means can be located outside the building or structure. Based on architectural design of the building, problems with landscaping obscuring the disconnect, and issues with establishing a proper ground plane for a remote feeder or branch circuit disconnect, the panel has decided that the present text as written in the 2002 NEC provides a workable format. The present text as written in the 2002 NEC provides the flexibility to permit the feeder or branch circuit disconnecting means to be located where it is readily accessible nearest the point of entrance of the conductors under whatever design issues may be the case for a particular location. It gives the electrical design team, the electrician, the electrical contractor, premises owner or operator, and the inspector the ability to determine the feeder or branch circuit disconnect location based on the particular site, power availability, and the best design for the installation.

Number Eligible to Vote: 10

Ballot Results: Affirmative: 10

4-23 Log #1079 NEC-P04 **Final Action: Reject**
(225.31)

Submitter: Neil F. LaBrake, Jr., Niagara Mohawk, a National Grid Company / Rep. Edison Electric Institute

Comment on Proposal No: 4-26a

Recommendation: Accept the Proposal.

Substantiation: This will clarify that service and distribution equipment shall not be considered a separate structure and thereby eliminate the need for redundant equipment.

Panel 4 received numerous proposals over the prior two code cycles relating to and attempting to address the concepts of “near” and “nearest”. Also, the Panel became aware that the requirements for building disconnects has been incorrectly interpreted and applied in a manner that would result in multiple enclosures and disconnects being installed. For example, in some local jurisdictions, if a building disconnect is not placed immediately on the building (even if, due to design and building issues, it is within 5 feet or 10 feet of the building being supplied) another disconnect is required to be installed. Current Code language does not make that a requirement and that was not the Panel’s intent.

These two proposals were originally developed by CMP 4 members and approved by panel members in the 2002 Code cycle as a reasonable attempt to address these concepts and to resolve long-standing confusion. Other persons stated that they considered the proposals a good solution to an ongoing situation and were looking forward to the incorporation of the proposals into the Code. The Panel originally used the Code understanding and definition of “within sight” and the 50-foot limitation incorporated in that definition as a reasonable alternative to various distances being suggested. The phrase “not to exceed” was originally intended to be used for building disconnects. Regardless, all other distances being suggested had no technical substantiation why one distance was better than another; other than the fact it was just “liked better” by a particular person or interest.

It is interesting to note that Mobile Home Service equipment is permitted by 550.32 to be located 30 feet from the exterior wall of the home it serves and references grounding in accordance with 250.32 and meeting the requirements for services as contained in Article 230. At the NFPA Annual Meeting in Anaheim, the effort to adopt the changes was “clouded” by claims of Grounding and Bonding issues. However, the technical aspects of those issues have still not been made perfectly clear to the Panel or resolved. In addition, the requirements of Article 250, and specifically 250.32, 250.92 and 250.142, remain in effect regardless of what distance is specified. More to the point, even now the current Code language actually perpetuates the lack of clarity and reasonable requirements in the Code. With the current language, technically, there is no limitation on distance for building disconnects; it is open to interpretation and arbitrary.

These two proposals need to be accepted to place safe, reasonable requirements and limitations, as well as take the burden off the inspectors to make arbitrary judgment calls in the field, and to reduce confrontation in the field. For those who think 250.32 250.92, 250.142 needs to be referenced for clarity, they can be incorporated. Yet that action may be challenged as unnecessary by the Technical Correlation Committee as those are already Code requirements and could be considered redundant text.

Panel Meeting Action: Reject

Panel Statement: See panel action and statement on Comment 4-21.

Number Eligible to Vote: 10

Ballot Results: Affirmative: 10

Comment on Affirmative:

ROGERS: The submitter has this issue somewhat reversed. The question is not whether or not a free standing disconnect located 50 feet from the building that it supplies should be considered a separate structure and thus require another disconnect at the building, but rather is it safe to have a disconnect located 50 feet from the building with no disconnect at the building? It is my opinion that the answer is no. Building occupants normally look for disconnects in the vicinity of where the power supply enters the building, or where the branch circuit overcurrent devices are located. If someone wanted to place an additional disconnect at some distance from the building they are not prohibited from doing so, provided the installation complied with any other NEC requirements. There is some justification for locating the disconnect in the direct vicinity and yet not directly attached to the building served, at this time this type of an installation would be permitted by the AHJ, it is my opinion that this should be addressed in the next code cycle.

4-24 Log #1404 NEC-P04
(225.31)

Final Action: Reject

Submitter: Lanny G. McMahon Phoenix, AZ

Comment on Proposal No: 4-26a

Recommendation: Accept this proposal as submitted by Code Making Panel 4.

Substantiation: Panel 4 is commended for their work in submitting this code proposal. Being active in the enforcement community, I can assure you that this change is long overdue. Providing language to clarify the distance (50 feet) and location (within sight), the disconnecting means (feeder or branch circuit) can be from the building or structure provides the necessary guidance and clear understanding for the design and enforcement communities. Code Making Panel 4 member Mr. Beck’s comments are absolutely correct. This proposal should have been implemented the last code cycle, but unfortunately was challenged on the floor at the NFPA meeting without reasonable justification. This was unfortunate. The jurisdiction that I work for currently allows the disconnecting means to be a distance of 25 feet from the building or structure. This is more than reasonable and I can assure you that 50 feet would be more than reasonable too in many instances. As Mr. Beck noted in his comments, the current text implies that outside the building could be any distance. Adding the text “within sight” will clarify this distance. In addition,

there should be no concern related to grounding at the building or structure disconnecting means. Regardless of whether the disconnecting means is located inside or outside the building, the grounding requirements are the same. Logically, the disconnecting means being located 50 feet from the building or structure is no different than if it were located on the roof of a 100-story building; or no different than if the disconnecting means were inside the building and 500 foot from the grounding electrode system. The distance the disconnecting means is located from the building or structure grounding electrode system should not be a concern. Therefore, to provide mandatory language and clear guidance, I encourage Panel 4 to accept this proposal. It can only enhance the intent of this code section, as the word “outside” is somewhat vague.

Panel Meeting Action: Reject

Panel Statement: See panel action and statement on Comment 4-21.

Number Eligible to Vote: 10

Ballot Results: Affirmative: 10

4-25 Log #3238 NEC-P04
(225.31)

Final Action: Accept

Submitter: Michael I. Callanan, IBEW

Comment on Proposal No: 4-26a

Recommendation: The panel should reject Proposal 4-26a.

Substantiation: The additional language would not improve safety. The addition of the term “within sight from” would permit the disconnecting means for a building to be up to 50 feet away. This is unacceptable. After the installation is complete, it is likely that alteration to the premises could make the disconnecting means not visible or accessible. The additional language would not improve usability. There is no documentation that there is an enforceability problem with the current language. This is simply an example of why 90.4 gives the AHJ the responsibility for making interpretations of rules. This comment represents the official position of the International Brotherhood of Electrical Workers Codes and Standards Committee.

Panel Meeting Action: Accept

Panel Statement: In recent Code cycles, the panel has tried to develop a set distance at which a feeder or branch circuit disconnecting means can be located outside the building or structure. Based on architectural design of the building, problems with landscaping obscuring the disconnect, and issues with establishing a proper ground plane for a remote feeder or branch circuit disconnect, the panel has decided that the present text as written in the 2002 NEC provides a workable format. The present text as written in the 2002 NEC provides the flexibility to permit the feeder or branch circuit disconnecting means to be located where it is readily accessible nearest the point of entrance of the conductors under whatever design issues may be the case for a particular location. It gives the electrical design team, the electrician, the electrical contractor, premises owner or operator, and the inspector the ability to determine the feeder or branch circuit disconnect location based on the particular site, power availability, and the best design for the installation.

Number Eligible to Vote: 10

Ballot Results: Affirmative: 10

4-26 Log #3314 NEC-P04
(225.31)

Final Action: Reject

Submitter: Charles Mello, Electro-Test, Inc.

Comment on Proposal No: 4-26a

Recommendation: Revise the proposed text from the 2005 NEC ROP as follows:

225.31 Disconnecting Means.

Means shall be provided for to disconnecting 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 within sight from the building or structure supplied. Where the disconnecting means is not located on the building or structure supplied, grounding at the remote disconnecting means and at the building or structure supplied shall comply with 250.32.

(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.

Exception No 1. to (1) and (2): 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 to (1) and (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 to (1) and (2): For towers or poles used as lighting standards, the disconnecting means shall be permitted to be located elsewhere on the premises.

Exception No. 4 to (1) and (2): 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.

(B) Conductors Considered Outside. For the purposes of this section, the requirements of 230.6 shall be permitted to be used.

Substantiation: This comment is from CMP 5 as referred by the TCC and is only on the aspects of the grounding electrode and grounding and bonding requirements relative to the proposed Code text.

When the disconnecting means is installed on the exterior or the interior of the building or structure served, the requirements for grounding and bonding are clearly specified from section 250.32 depending on the wiring methods used and the presence of common metallic paths.

If the disconnecting means is outside but not installed on the exterior of the building then it, by definition from Article 100, becomes its own structure similar to the service pedestal for mobile homes in sections 550.32(A) and 550.33. The missing part in the proposed language is the reference to section 250.32. The revised language adds this reference to clarify the requirements for the user.

Panel Meeting Action: Reject

Panel Statement: See panel action and statement on Comment 4-21.

Number Eligible to Vote: 10

Ballot Results: Affirmative: 10

4-27 Log #3363 NEC-P04 **Final Action: Reject**
(225.31)

Submitter: Mark R. Hilbert Wolfeboro, NH

Comment on Proposal No: 4-26a

Recommendation: Revise to read as follows:

225.31 Disconnecting Means. Means shall be provided for disconnecting 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, nearest the point of entrance of the supply conductors 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 it shall be located ~~within sight from immediately adjacent~~ to 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:~~

Exception No. 1 to (1) and (2): 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 in the premises.

Exception No. 2 to (1) and (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 to (1) and (2): For towers or poles used as lighting standards, the disconnecting means shall be permitted to be located elsewhere on the premises.

Exception No. 4 to (1) and (2): 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.

(B) Conductors Considered Outside. For the purposes of this section, the requirements of 230.6 shall be permitted to be used.

Substantiation: The panel should accept the proposal in principle and revise 225.31(A)(1) by replacing the within site from language and relocating the term "nearest the point of entrance of the supply conductors". The rewriting and combining of 225.31 and 225.32 adds clarity and provides a more logical layout of the requirements for the disconnecting means and therefore should go forward. No technical substantiation for locating the disconnecting means up to 50 ft from the building or structure has been submitted. Locating this disconnecting means 50 ft away from the building or structure also increases the possibility of an obstruction being placed in the line of site. The proposed wording will make it clear to the users that the disconnecting means does not have to be located on the building.

Panel Meeting Action: Reject

Panel Statement: See panel action and statement on Comment 4-21.

Number Eligible to Vote: 10

Ballot Results: Affirmative: 10

4-28 Log #3388 NEC-P04 **Final Action: Reject**
(225.31(A)(1))

Submitter: Bob Fahey Evansville, WI

Comment on Proposal No: 4-26a

Recommendation: Revise Text as follows:

225.31(A)(1). The service disconnecting means shall be on the building or structure served or shall be located within sight of the building or structure and not more than 10 feet from the building or structure served.

Substantiation: I have a real problem with the new language (within sight)

this will allow the service disconnect up to 50 feet from the building. At the time of original inspection this may be obvious where this service disconnect is located, but after the bushes and trees are planted and grow up and around the service disconnect, the location will become less obvious. Therefore, I believe a disconnect located up to 50 feet away is a recipe for an unsafe situation when an emergency may arise and the power is required to be disconnected in a hurry. Think safer and reduce the 50 feet to 10 feet!!!

Panel Meeting Action: Reject

Panel Statement: See panel action and statement on Comment 4-21.

Number Eligible to Vote: 10

Ballot Results: Affirmative: 10

4-29 Log #2166 NEC-P04 **Final Action: Reject**
(225.32)

Submitter: Frederic P. Hartwell, Hartwell Electrical Services, Inc. / Rep. Massachusetts Electrical Code Advisory Committee

Comment on Proposal No: 4-27

Recommendation: The proposal should be accepted.

Substantiation: It is difficult to imagine any installation scenario for which local conditions would make it necessary for a building disconnect to be located at a greater distance from a building or structure, and still end up with an installation where it would be obvious in an emergency that the outside disconnect was still the appropriate on-site disconnect for that building. A 10-ft (or lesser) spacing allows for the disconnect label to be seen while standing at the conductor entrance to the building, and the switch could be reached in only about four steps. A location anywhere within sight greatly increases the hazard, because the building tenant may not correctly interpret the function of the remote disconnecting means at the fifty foot spacing that would be allowed, particularly if a vehicle or other visual obstruction is present at the wrong time.

The issue of such a remote connection to the local grounding electrode conductor needs to be better addressed as well. Remember that Chapter 8 articles now require communications grounding electrode conductors not to exceed 20 ft in length in some occupancies in order to address reactance issues. Refer also to the comments in the voting on the original proposal. The MEC Advisory Committee appreciates that some panel members may be reluctant to set a specific numerical distance limitation, and have settled on "within sight" because that is defined elsewhere. We continue to recommend the 10-ft limitation because it is so familiar to the trade. However, CMP 4 may wish to consider the expression "on or immediately adjacent thereto" as a compromise if it is clear the 10-ft distance will not receive the required two-thirds support.

Panel Meeting Action: Reject

Panel Statement: See panel action and statement on Comment 4-21.

Number Eligible to Vote: 10

Ballot Results: Affirmative: 10

4-30 Log #2877 NEC-P04 **Final Action: Reject**
(225.32)

Submitter: Robert P. McGann, City of Cambridge / Rep. IAEI

Comment on Proposal No: 4-27

Recommendation: Proposal should be accepted.

Substantiation: A reasonable distance to satisfy the authority having jurisdiction and emergency personnel has been provided. Who will reeducate the emergency personnel on a rule that had been in place for years at least with a ten foot limit it will surely be readily accessible. This has worked very well in Massachusetts without problems.

Panel Meeting Action: Reject

Panel Statement: See panel action and statement on Comment 4-21.

Number Eligible to Vote: 10

Ballot Results: Affirmative: 10

2-170 Log #557 NEC-P02 **Final Action: Accept**
(225.35(B))

Submitter: Technical Correlating Committee on National Electrical Code®

Comment on Proposal No: 4-33

Recommendation: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 2 for action as related to branch circuits and feeders in dwelling units. This action will be considered by Code-Making Panel 2 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 Meeting Action: Accept

The panel accepts the direction of the TCC to consider the referred proposal and is rejecting the proposal.

Panel Statement: This is not a safety issue but rather a design issue.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

4-31 Log #445 NEC-P04 **Final Action: Accept in Principle in Part**
(225.39)

Submitter: Dan Leaf Rancho Santa Margarita, CA

Comment on Proposal No: 4-36

Recommendation: Accept the proposal as revised:

Rating of Disconnects. The feeder or branch circuit disconnecting means for the conductors that supply or pass through the building or structure shall have a rating(s) not less than the loads to be supplied carried determined in accordance with 220.3 and Part II of Article 220. In no case shall the aggregate rating be less than specified in 225.39(A), (B), (C), or (D).

(A) One Circuit Installation. For installations to supply only limited loads of a single branch circuit, the branch circuit disconnecting means shall have a rating of not less than 15-amperes. For the purpose of this section a multiwire branch circuit shall be considered a single circuit.

(B) No change from 2002 NEC.

(C) No change from 2002 NEC.

(D) All Others. For all other installations where the supply is single-phase or direct-current the feeder or branch circuit disconnecting means shall have a rating of not less than 60 amperes.

Substantiation: The proposal incorporates conductors that pass through the building or structure to clearly apply this section to 225.51. "Limited loads" is superfluous and not defined. 225.30 considers a multiwire circuit as a single circuit and should be applicable. It should be reasonable for (D) not to apply to 3-phase circuits where a 208, 240, or 480 volt 3-phase system can supply a volt-ampere load equivalent or greater than that of a 60-ampere single phase disconnect and utilize a smaller disconnect rating. For example (1) 60-ampere disconnect @ 240 volts = 14400 va, (2) 40 ampere circuit breaker or molded case switch @ 240 volts 3-phase = 16200 volt-amperes, (3) 40 ampere circuit breaker or molded case switch @ 208 volts 3-phase = 14400 voltamperes, (4) 20 ampere circuit breaker or molded case switch @ 480 volts 3-phase = 16600 voltamperes.

Panel Meeting Action: Accept in Principle in Part

Accept the change that the word "carried" be replaced by "supplied" as indicated in the comment and use specific Parts from Article 220 for the references for determining the load. Reject the remainder of the comment. The text to read as follows:

225.39 Rating of Disconnect. The feeder or branch-circuit disconnecting means shall have a rating of not less than the load to be carried supplied, determined in accordance with Parts I and II of Article 220 for branch circuits, Parts III or IV for feeders, or Part V for farm loads. In no case shall the rating be lower than specified in 225.39(A), (B), (C), or (D).

Remainder of comment rejected and remainder of text to stay the same as in present Code.

Panel Statement: The panel has accepted a modified version of the references to Article 220, using the newly formatted Parts as passed in the 2005 proposal stage. This provides compliance with the NEC Style Manual on references to other articles. "Carried" has been replaced with the word "supplied" to more appropriately describe the load used to determine the disconnect rating.

The word "aggregate" was not accepted, since the rating of each of the disconnecting means would be applied in accordance with individual installations and not a combined rating of all disconnects in (A) through (D) as would seem to be the indication when using "aggregate."

Adding the final sentence to (A) explaining that a multiwire branch circuit is considered to be a single circuit is not necessary since it is already stated in 225.30, last sentence and does not need to be restated here.

The suggested change to (D) in the comment is incorrect since the branch circuit or feeder could be single phase, three phase, or direct-current at any voltage. The requirement for a disconnect rating of 60 amperes is a minimum and is determined on the basis of the load, not the voltage or whether it is single phase or three phase.

Number Eligible to Vote: 10

Ballot Results: Affirmative: 10

ARTICLE 230 — SERVICES

4-32 Log #698 NEC-P04 **Final Action: Reject**
(230.2(A), FPN)

Submitter: Dan Leaf Rancho Santa Margarita, CA

Comment on Proposal No: 4-43

Recommendation: Accept deletion of Optional Standby Systems.

Substantiation: 702.2 indicates on-site power generation for optional standby systems. This section indicates a service supply. Service is defined as a supply from a utility. 702.2 is a definition of a system, not service, and though a definition it appears to be a quasi-rule and as such would appear to modify 230.2(A), per 90.3. Article 702 has no requirements for separation.

Panel Meeting Action: Reject

Panel Statement: The submitter has misunderstood the reason for optional standby systems to be covered in 230.2(A). A separate service could be installed to supply power to a transfer switch with normal power on one side and optional standby power from a generator feeding the other side of the

transfer switch. Large computer systems and similar loads would be permitted to have a separate service that would be used in an Article 702 application.

Number Eligible to Vote: 10

Ballot Results: Affirmative: 10

Comment on Affirmative:

ROGERS: The submitter is correct in his understanding of the definition of a service. As such this subpart of Section 230.2 allows the installation of an additional service to building if it is installed for the purpose of supplying an optional standby system. If such an installation is sufficient for emergency systems it is clearly sufficient for optional standby systems should someone choose this method. The primary rule in 230.2 is that only one service can be brought to this building, 230.2(A) specifies when more than one service can be brought to a building.

4-33 Log #1580 NEC-P04 **Final Action: Accept in Principle**
(230.2(A)(6))

Submitter: Jim Pauley, Square D Company

Comment on Proposal No: 4-44a

Recommendation: Revise new item (6) to read as follows:

(6) Equipment with a double-ended main configuration installed for the purpose of enhanced reliability of the supply.

Substantiation: The language as accepted by the panel is confusing because it implies that an additional service can be installed to supply a "redundant system". In reality, the second service helps to create a redundant system in a configuration such as a main-tie-main. Since "redundant system" is not defined, it would appear that the best course of action is to describe the specific instance where the second service should be installed. This comment is an attempt to revise the wording to allow the double-ended configurations that seem to be the target of the original language.

The wording as presently in the ROP will be confusing and likely cause misinterpretations because of the implication that you can have a second service to a "redundant system" and nobody knows what a redundant system is.

Panel Meeting Action: Accept in Principle

Revise the proposed text to read as follows:

"(6) Systems designed for connection to multiple sources of supply for the purpose of enhanced reliability."

Panel Statement: Refer to the panel statement on Comment 4-19.

Number Eligible to Vote: 10

Ballot Results: Affirmative: 10

4-34 Log #159 NEC-P04 **Final Action: Reject**
(230.5)

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education

Comment on Proposal No: 4-48

Recommendation: Accept in part, deleting the first phrase (up to the comma), but move to Article 80.

Substantiation: Article 80 offers ready made language for Authorities Having Jurisdiction to adopt in whole or part. This will help serve that purpose.

Panel Meeting Action: Reject

Panel Statement: See panel action and statement on Comment 4-35.

Number Eligible to Vote: 10

Ballot Results: Affirmative: 10

4-35 Log #1044 NEC-P04 **Final Action: Reject**
(230.5 (New))

Submitter: Noel Williams, Noel Williams Consulting

Comment on Proposal No: 4-48

Recommendation: This proposal should have been accepted or accepted in principal and revised to agree with the existing language in 215.5.

Substantiation: This requirement or a similar requirement already applies to feeders in the referenced section of Article 215. To have such a requirement for all the feeders but not for the combined load on the service is a significant inconsistency and a real problem, and does not promote the usability or logic of the NEC. In many cases, a service supplies multiple feeders and may supply branch circuits directly. A load calculation for the service is as important or more important than the existing requirement that applies to feeders. The reference to Article 80 is neither appropriate nor helpful.

Panel Meeting Action: Reject

Panel Statement: An additional requirement is not needed. The code already requires a load calculation be provided in Sections 230.23, 230.31, and 230.42.

Number Eligible to Vote: 10

Ballot Results: Affirmative: 9 Negative: 1

Explanation of Negative:

ROGERS: This proposal and comment should have been accepted. This does not place a hardship on the building owner or the electrical installer, it simply would provide uniform language for the calculation of service loads. As the Panel noted in its Panel Statement, these requirements are already being applied by reference back to 220 in various Sections of Article 230, this would have made the requirement crystal clear.

4-36 Log #1268 NEC-P04
(230.6(5))

Final Action: Reject

Submitter: Barry F. O'Connell, Tyco Thermal Controls

Comment on Proposal No: 4-50

Recommendation: Add new text as follows:

230.6(5) In existing occupancies, listed fire-rated mineral insulated cable may be installed in accordance with manufacturer's instructions.

Substantiation: The panel comment raised questions on equivalence of this system to concrete encasement; on limiting of the length of the run; and on the relevance of the fire rating. There was also concern that the use of MI would suddenly proliferate in service applications. I think this wording, and independent testing performed, should make the proposal acceptable.

Equivalence to concrete encasement:

- A test was conducted at Kinectrics, an independent test laboratory. A fault was deliberately created in the MI cable, and 40kA at 600V fed into it, and sustained for a period beyond that in which primary protection would be expected to act. The traveling arc resulted in a very fine spray of copper, largely contained by the tray; cardboard sheets 12" below the tray were not ignited. A copy of the independent testing is appended.

- MI is inherently tough; mounting it in a tray high in service spaces and marking it clearly as service makes it difficult to accidentally breach. It is also unaffected by fire (better than 2" of concrete).

Limiting the Use:

- Limiting the use to "existing occupancies" limits it to where it is actually used - retrofits, where the alternative methods are often not feasible. The runs are generally short, typically 30 - 100'. The system has been accepted on a carte blanche or case-by-case basis by 7 major cities - New York, Philadelphia, Washington, Houston, New Orleans, Kansas City, San Francisco and Los Angeles. The projects are not everyday; it is only used as a last resort. Recognition in the code will not result in huge growth in application, but will reduce the difficulty of employing the method in those cities where the problem arises.

Fire rating:

- This is relevant in terms of equivalence to concrete, which affords fire protection to conventional service cables.

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

Panel Meeting Action: Reject

Panel Statement: The panel reaffirms the panel statement in Proposal 4-50. The physical protection issue has not been adequately addressed. The concept of considering service conductors to be outside the building where encased in concrete or brick, or locating them under the earth or concrete or in a vault, has two purposes. The first purpose is to protect the conductors from damage. The second purpose is to limit exposure of the building construction to a possible fire caused by either a bolted or an arcing fault of the cables themselves.

Number Eligible to Vote: 10

Ballot Results: Affirmative: 10

Comment on Affirmative:

ROGERS: The service installation method that was presented by the submitter has substantial merit. I remain opposed to allowing this method in the manner in which it was proposed. The submitter wanted this installation method to be considered "outside of the building" and it clearly was not outside of the building. The other installation methods that are addressed here either have to be sealed in concrete and be totally segregated from the building interior or be enclosed in a vault. This technology may be necessary in certain installations within existing buildings, this is a decision best left to design personnel and the AHJ and not granted carte-blanche to all "existing occupancies".

4-37 Log #2882 NEC-P04
(230.6(5) (New))

Final Action: Accept

Submitter: Joseph A. Ross, Ross Seminars

Comment on Proposal No: 4-50

Recommendation: Reaffirm the "Rejection" of Proposal 4-50.

Substantiation: The intent of 230.70(A)(1) is to install a service disconnecting means at a readily accessible location...inside nearest the point of entrance of the service conductors. The phrase "nearest the point of entrance" is to keep that dimension as short as possible to limit the length of unprotected conductors entering a building.

The intent of 230.6 is to keep (unprotected) service conductors outside of a building or to consider them to be outside of a building according to the provisions of (1) installed under 2 inches of concrete beneath a building (2) in a raceway encased in 2 inches of concrete (3) in a proper vault, or (4) in a conduit under 18 inches of earth beneath a building. Reason: To protect the building from fire caused by the intense heat of a fault condition on the unprotected service conductors.

Panel Meeting Action: Accept

Number Eligible to Vote: 10

Ballot Results: Affirmative: 10

4-38 Log #3008 NEC-P04
(230.6(5) (New))

Final Action: Accept

Submitter: James Conrad, Rockbestors-Surprenant Cable Corp.

Comment on Proposal No: 4-50

Recommendation: Reject Proposal 4-50.

Substantiation: The intent of 230.6 is to protect the building from the conductors not the cable insulation as stated by the submitter. There is no fire rating requirements for service-entrance conductors. The reason for encasement or burial is to protect the building and equipment from the conductors should a fault occur between the utilities and service equipment. These conductors have no overcurrent device and if a short circuit would occur the conductors become very hot (hot enough to start a fire) regardless of the type of insulation.

Panel Meeting Action: Accept

Number Eligible to Vote: 10

Ballot Results: Affirmative: 10

2-171 Log #158 NEC-P02
(230.11)

Final Action: Reject

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education

Comment on Proposal No: 4-56

Recommendation: Accept with the addition of one phrase at the end of the first sentence "...in sleeping areas".

Substantiation: AFCIs were developed foremost to help with concerns about deterioration of older wiring systems, so it is meet that we require upgrades to include them. I don't know that we're ready to adopt them wholeheartedly yet, so compromising on sleeping areas, as we have in previous Code cycles for new circuits, appears a reasonable compromise.

Panel Meeting Action: Reject

Panel Statement: The issue of service upgrades has been handled through the action on Comment 2-82.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

2-172 Log #558 NEC-P02
(230.11)

Final Action: Accept

Submitter: Technical Correlating Committee on National Electrical Code®

Comment on Proposal No: 4-56

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. This action will be considered by Code-Making Panel 2 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 Meeting Action: Accept

The panel accepts the direction of the TCC to consider the referred proposal and is rejecting the proposal.

Panel Statement: The issue on service upgrades has been handled on Comment 2-82.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 13

2-173 Log #1948 NEC-P02
(230.11)

Final Action: Reject

Submitter: Michael I. Callanan, IBEW

Comment on Proposal No: 4-56

Recommendation: This proposal should be accepted.

Substantiation: This proposal should be reconsidered and not simply dismissed for lack of technical substantiation. The fact that an ever-increasing number of fires occur in older dwelling units throughout the country should in itself be enough substantiation for this proposal to merit discussion. As the purpose of the NEC is the practical safeguarding of people, buildings and their contents, arc-fault technology could greatly enhance the industry's ability to do this. While it may not be practical to require that all 15 and 20 ampere outlets be AFCI protected, this proposal merits consideration, not rejection. This comment represents the official position of the International Brotherhood of Electrical Workers Codes and Standards Committee.

Panel Meeting Action: Reject

Panel Statement: See panel statement on Comment 2-82.

Number Eligible to Vote: 13

Ballot Results: Affirmative: 12 Negative: 1

Explanation of Negative:

KING: I concur with the submitter's substantiation. This Comment should have been accepted in Principal with reference to the panel action and statement for Comment 2-82. I agree that the submitter's concerns are more adequately addressed with the panel action taken for Comment 2-82.

4-39 Log #111 NEC-P04 **Final Action: Reject**
(230.24(B)(2))

Submitter: Rene Hernandez, Schneider Engineering, Inc.

Comment on Proposal No: 4-63

Recommendation: Revise text to read as follows:

230.24(b)(2):

"...over residential property and driveways, and those commercial areas not subject to truck..."

Substantiation: This will resolve a conflict with the NESC C2-2002, Table 232-1, Category 3, footnote 7, which is limited to residential driveways only.

Reason: There are many instances where residential property is subject to truck traffic.

Panel Meeting Action: Reject

Panel Statement: This comment introduces a concept that has not had public review. However, the same clearances on residential property should apply as the clearances required for residential driveways that are subject to truck and vehicle traffic. The text as is presently written would require the same clearances for both the residential driveway and the residential property since people may use various parts of the property for parking or bring trucks in for rubbish removal, etc.

Number Eligible to Vote: 10

Ballot Results: Affirmative: 10

4-40 Log #1188 NEC-P04 **Final Action: Reject**
(230.28)

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

Comment on Proposal No: 4-69

Recommendation: Revise text to read as follows:

I would urge CMP 4 to reconsider and accept this proposal in light of the frequent unavailability of acceptable intersystem bonding means at many installations.

Substantiation: The NEC provides for intersystem bonding means in 250.94, 800.40(B)(1), 820.40(B)(1), and 830.40(B)(1). However, because of the frequent unavailability of these means at many installations, intersystem bonding is sometimes performed inadequately. Mr. LaBrake, in his substantiation for his proposal 16-225, cites unacceptable practices such as the use of a clip on a meter socket trough. The clarification that an intersystem bonding attachment to the metallic service mast, in the area of the mast's attachment to the meter enclosure, is an acceptable means of intersystem bonding will help mitigate the incidences of inadequate intersystem bonding practices. 250.94 presently states that "exposed nonflexible metallic raceways" may be used for intersystem bonding. Accepting Proposal 4-69 will clarify the discrepancy between 250.94(1) and 230.28 that states "Only power service-drop conductors shall be permitted to be attached to a service mast". In the case of an underground power service exiting the earth via metallic conduit to the meter enclosure, intersystem bonding to that metallic conduit is acceptable. There is no reason why a similar intersystem bond to the metallic service raceway for aerial power service, in the area of the meter enclosure, should not be permitted. Such attachment will not add additional strain or stress to the service mast.

Panel Meeting Action: Reject

Panel Statement: The NEC is very explicit as to where the intersystem bonding is to occur. Section 250.94 states that the bonding of intersystem grounding conductors "shall be at the service equipment and at the disconnecting means." This does not preclude the attachment of a bonding connection on the service raceway where it attaches to or enters the service equipment.

Number Eligible to Vote: 10

Ballot Results: Affirmative: 10

4-41 Log #3548 NEC-P04 **Final Action: Reject**
(230.28)

Submitter: Percy E. Pool, Verizon NS

Comment on Proposal No: 4-69

Recommendation: I urge CMP 4 to reconsider and accept Proposal 4-69.

Substantiation: 250.94, 800.40(B)(1); and 820.40(B)(1) require intersystem bonding. However, quite frequently the means to accomplish common bonding are not made available. Consequently, at many installations the intersystem bonding is sometimes performed inadequately. The clarification to be provided by the proposed exception, that an intersystem bonding attachment to the metallic service mast is an acceptable means of intersystem bonding will help mitigate the incidences of inadequate intersystem bonding practices. The proposed exception correlates with 250.94 that indicates that "exposed nonflexible metallic raceways" may be used for intersystem bonding. There is no reason why an intersystem bond to the metallic service raceway for aerial power service should not be permitted. Such attachment will not add additional stresses to the mast.

Panel Meeting Action: Reject

Panel Statement: See panel action and statement on Comment 4-40.

Number Eligible to Vote: 10

Ballot Results: Affirmative: 10

4-42 Log #2011 NEC-P04 **Final Action: Reject**
(230.40 Exception No. 1)

Submitter: Julian R. Burns, Burns Electrical/Quality Power Solutions, Inc.

Comment on Proposal No: 4-72

Recommendation: CMP-4 should accept or accept in principle Proposal 4-72. **Substantiation:** Phil Simmons is absolutely correct that the issue covered in Section 230.40 Exception 1 is clearly covered in Section 230.2(D) no matter if a service with a different characteristic is required in a single occupant building or in more than one occupancy. Being redundant is not being more clear.

Panel Meeting Action: Reject

Panel Statement: See panel action and statement on Comment 4-45.

Number Eligible to Vote: 10

Ballot Results: Affirmative: 10

4-43 Log #2168 NEC-P04 **Final Action: Accept in Principle**
(230.40 Exception No. 1)

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

Comment on Proposal No: 4-71

Recommendation: The proposal should be accepted in principle. Add the following wording to the end of the existing exception instead of the wording in the original proposal: "If the number of service disconnect locations for any given classification of service is not more than six, the requirements of 230.2(E) shall apply at each location. If the number of service disconnect locations is more than six for any given supply classification, all service disconnect locations for all supply characteristics shall be clearly described using suitable graphics or text or both on one or more plaque(s) located in an approved, readily accessible location(s) on the building or structure served and as near as practicable to the point(s) of attachment or entry(ies) for each service drop or lateral.

Substantiation: The panel statement is in serious error as to the notion that 230.2 applies to multiple service disconnects when they are supplied by a single drop or lateral, and when they are in locations remote one from another. The number of disconnects, whether grouped or remote, does not now and never has determined the number of services. On the contrary, referring to Article 100, the number of utility supply conductor sets that actually deliver electric energy from the utility (through or at service points) determines the number of services. This exception has nothing to do with the number of services; it has to do with the number of service entrance conductor sets that can be supplied from any given service. Contrary to the substantiation in Proposal 4-72, this exception does not apply only when there are different characteristics of supply. It is more generally applied to a single characteristic of supply. In fact, this was the only use for this exception from the 1984 NEC forward to the inception of the 1999 NEC, when it was broadened so it could be applied to multiple supply classifications.

This comment responds to concerns in the voting that when the exception is applied to allow a large number of remote service entrance conductor sets and their disconnects, it may become unwieldy to provide full reciprocal labeling at each location. The comment proposes a limit of six disconnecting means, considered for each classification of supply characteristics. Suppose, for example, there were one 480Y/277V service for large power loads using a single disconnect at the owner's mechanical room and one 208Y/120V service with service entrance conductors run to each of ten occupancies with service disconnects in each. Assuming each occupancy does not qualify as a separate building, this wording would result in either one or two plaques (instead of eleven) depending on whether the two service drops or laterals arrive at the same or at different locations. The proposed text includes the word "approved" in order to allow the AHJ to review the proposed locations for suitability.

Panel Meeting Action: Accept in Principle

Panel Statement: See panel action and statement on Comment 4-44, which addresses the submitter's concern.

Number Eligible to Vote: 10

Ballot Results: Affirmative: 10

4-44 Log #2427 NEC-P04 **Final Action: Accept in Principle**
(230.40 Exception No. 1)

Note: The Technical Correlating Committee directs that the second sentence in the Exception of the Panel Action Text on Comment 4-44 be deleted because it introduces new material that has not had public review and was not part of the Recommendation.

Submitter: J. Philip Simmons, Simmons Electrical Services / Rep. National Armored Cable Manufacturers Association

Comment on Proposal No: 4-72

Recommendation: Exception No. 1: A building with one or more than one occupancy shall be permitted to have one set of service-entrance conductors for each service of different characteristics, as defined in 230.2(D), run to each occupancy or ground of occupancies.

Substantiation: The words "one or" are proposed to be deleted to comply with the Panel Statement on Proposal 4-72.

Panel Meeting Action: Accept in Principle

Revise the text of the recommendation to read as follows:

Exception No. 1: A building shall be permitted to have one set of service-entrance conductors for each service, as defined in 230.2, run to each occupancy or group of occupancies. The requirements of 230.2(E) shall apply to each service disconnect location.

Panel Statement: The panel action now clarifies that the exception applies to a building of one or more occupancies. Each service can have multiple service entrance conductors run to a single occupancy or group of occupancies. The exception now clarifies that 230.2(E) applies at each service disconnect location.

Number Eligible to Vote: 10

Ballot Results: Affirmative: 10

4-45 Log #3893 NEC-P04
(230.40 Exception No. 1)

Final Action: Reject

Submitter: Julian R. Burns, Burns Electrical/Quality Power Solutions, Inc.
Comment on Proposal No: 4-72

Recommendation: CMP 4 should accept or accept in principle Proposal 4-72.

Substantiation: Phil Simmons is absolutely correct that the issue covered in Section 230.40 Exception No. 1 is clearly covered in Section 230.2(D) no matter if a service with a different characteristic is required in a single occupant building or in more than one occupancy. Being redundant is not being more clear.

Panel Meeting Action: Reject

Panel Statement: The exception is needed. Section 230.2 addresses the number of services to a building, not the number of service entrance conductors. The panel clarified the exception by deleting the text "with one or more than one occupancy." See panel action and statement on Comment 4-44.

Number Eligible to Vote: 10

Ballot Results: Affirmative: 10

4-46 Log #447 NEC-P04
(230.41 Exception (New))

Final Action: Reject

Submitter: Dan Leaf Rancho Santa Margarita, CA

Comment on Proposal No: 4-73

Recommendation: Accept the proposal.

Substantiation: 230.41 Exception (e) permits a bare grounded service conductor in an auxiliary gutter which may be metal and provide a parallel path for current. A (bare) grounded conductor in cablebus is supported on insulating blocks. The definition of cablebus in 370.2 is not a "rule" as is 230.41 Exception (e). Does a definition modify a rule?

Panel Meeting Action: Reject

Panel Statement: A cablebus and an auxiliary gutter are two totally separate wiring methods as can be determined by the two totally separate articles covering them. Cablebus is covered in Article 370 and auxiliary gutters are covered in Article 366. Section 368.8 clearly shows that auxiliary gutters can have bare live parts within the gutter while 370.2 makes it very clear that cablebus is an assembly of insulated conductors within a metal housing. Permitting a bare grounded conductor within a cablebus, would violate the basic definition of a cablebus. Section 370.2 would need to change before a bare grounded conductor would be permitted in a cablebus and Article 370 is outside the jurisdiction of Panel 4.

Number Eligible to Vote: 10

Ballot Results: Affirmative: 10

4-47 Log #2368 NEC-P04
(230.44 and Exception)

Final Action: Reject

Submitter: James M. Imlah, City of Hillsboro

Comment on Proposal No: 4-77

Recommendation: Revise text to read as follows:

230.44 Cable Trays. Cable tray systems shall be permitted to support service entrance conductors. Cable trays used to support service entrance conductors shall contain only service entrance conductors.

~~Exception: Conductors other than service entrance conductors shall be permitted to be installed in a cable tray with service entrance conductors provided a solid fixed barrier of a material compatible with the cable tray is installed to separate the service entrance conductors from other conductors installed in the cable tray.~~

Substantiation: To make the meaning of "entrance conductors" easier to apply and match the action of CMP-8 for Proposal 8-262 for 392.3. For consistency, removal of the word "entrance" to understand that identified "service conductors" are acceptable when installed in cable tray. Please consider this change in principle.

For the exception, please reject separation between protected and unprotected conductors. 230.7 is very clear that "conductors other than service conductors shall not be installed in the same service raceway or cable service." There are exceptions for grounding and bonding conductors or load management conductors with overcurrent protection. Cable trays are made in numerous sizes to fit conductors and there should be separation of cable trays for protection and unprotected conductors to follow the basic principles of 230.7. There has

been no substantiation for what type of material that would be acceptable for a separation barrier and the material for separation should be listed, labeled, or identified for use as a cable tray separation material. There is no other raceway system that allows "service conductors" to be mixed with non-service conductors. If the service conductors are rated over 600 volts the cable tray can be required to be covered, as per 300.31 and 300.37 which requires "locations accessible to qualified persons only." This becomes very difficult when a cable tray could be for mixed use of service conductors and other power conductors. Please reject the exception and accept in principle the change from service entrance conductors to service conductors.

Panel Meeting Action: Reject

Panel Statement: There is not an inconsistency between the proposed changes in 230.44 and the change that was initiated by Panel 8, since the action in Section 392.3 by Proposal 8-262 changed from a more specific phrase "service entrance conductors" to a less specific term "service conductors." Section 230.44 is in Part IV of Article 230 and covers only service entrance conductors.

Section 230.7 covers service conductors in a raceway or a cable, not a cable tray. Cable trays are not considered to be raceways. Based on the definition for cable trays in 392.2, cable trays are a unit or assembly of units or sections and associated fittings that form a structural system used to securely support cables and raceways. Cable trays are a support system for raceways and cables. Section 230.7 applies to conductors, other than service conductors, installed in a raceway or cable with service conductors. It does not apply to cable trays.

The barrier that must be installed, if the exception is used, must be a solid, fixed barrier of a material that is compatible with the cable tray. Cable tray separators are used to separate low voltage and communications cables from power cables, under 600 volt cables from over 600 volt cables, intrinsically safe from non-intrinsically safe circuits, among other required separations.

Number Eligible to Vote: 10

Ballot Results: Affirmative: 10

4-48 Log #444 NEC-P04
(230.56)

Final Action: Reject

Submitter: Dan Leaf Rancho Santa Margarita, CA

Comment on Proposal No: 4-82

Recommendation: Accept proposal as revised:

On a 4-wire delta-connected service where the midpoint of one phase is grounded only the service conductor having the higher voltage to ground shall be identified durably and permanently marked by a continuous outer finish that is orange in color or by other effective means.

Exception No. 1: Busbars shall only be required to be identified at termination points at equipment and where connections are made to different wiring methods. Such identification shall be made at each point on the system where a connection is made if the grounded conductor is also present.

Exception No. 2: Conductors larger than 6 AWG shall be permitted to be identified by a durable and permanent orange marking that shall encircle the conductor, or other effective means. Such identification shall be placed on each point on the system where a connection is made if the grounded conductor is also present.

Exception No. 3: Conductors which are part of a cable assembly shall be permitted to be identified as permitted in Exception No. 2.

Substantiation: Conductors 6 AWG and smaller are readily available with orange insulation. 517.60(A)(5) specifies orange brown and yellow identification for conductors regardless of size and since it doesn't limit identification to terminations, connections or access points the word "conductor" can be construed as applying to the entire length. Orange insulation has been widely used as a color to distinguish 120/208 and 480/277 volt systems. Insulated grounded and grounded conductors 6 AWG and smaller are required to have continuous color identification. What considerations exempt hi-leg conductors?

Panel Meeting Action: Reject

Panel Statement: Coloring the service conductor to be identified by a continuous orange color is too restrictive. Where a busbar, a busway, or an auxiliary gutter is used, color coding the busing continuously, as stated in the proposed section, or at all termination points at equipment as stated in proposed Exception No. 1, would not be feasible since most of this busing comes pre-manufactured. Color coding or other means of identification is permissible and desirable where changing from a bus system to individual conductors, but color coding is only one method of identification that is permissible. There has been no technical substantiation submitted with either the proposal or the comment that there is a problem with the methods of identifying the high leg as is presently being done.

Number Eligible to Vote: 10

Ballot Results: Affirmative: 10

4-49 Log #748 NEC-P04
(230.70)

Final Action: Accept

Submitter: Mark Shapiro Farmington Hills, MI

Comment on Proposal No: 4-26a

Recommendation: Reject the proposal.

Substantiation: The main problem with this proposal is no different from what it was in the last code cycle. If a service disconnect can be up to 50 ft.

from a building, how are the grounding electrode conductor and the equipment grounding conductor to be addressed?

If the grounding electrode conductor is connected to the service disconnect [250.24(A)(1)], it could be up to 50 ft. from a building. Not a great place to connect the building's grounding electrode conductor.

Since a neutral cannot be connected to ground on the load side of a service disconnect [250.142(B)], this proposal would seem to require separate neutrals and grounds from the service disconnect to the building. This would result in a more stringent grounding rule than the present one for feeders to second buildings [250.32(B)].

To pass this proposal without companion, coordinating proposals in Article 250 that would address and resolve these items is irresponsible.

Panel Meeting Action: Accept

Panel Statement: The panel understands this comment is in reference to Proposal 4-84a, not Proposal 4-26a.

In recent Code cycles, the panel has tried to develop a set distance at which a service disconnecting means can be located outside the building or structure. Based on architectural design of the building, problems with landscaping obscuring the disconnect, and issues with establishing a proper ground plane for a remote service, the panel has decided that the present text as written in the 2002 NEC provides a workable format. The present text as written in the 2002 NEC provides the flexibility to permit the service disconnecting means to be located where it is readily accessible under whatever design issues may be the case for a particular location. It gives the electrical design team, the electrician, the electrical contractor, the electrical utility, premises owner or operator, and the inspector the ability to determine the service location based on the particular site, utility power availability, and the best design for the installation.

Number Eligible to Vote: 10

Ballot Results: Affirmative: 10

4-50 Log #749 NEC-P04
(230.70)

Final Action: Accept

Submitter: Mark Shapiro Farmington Hills, MI

Comment on Proposal No: 4-84a

Recommendation: Reject the proposal.

Substantiation: The main problem with this proposal is no different from what it was in the last code cycle. If a service disconnect can be up to 50 ft. from a building, how are the grounding electrode conductor and the equipment grounding conductor to be addressed?

If the grounding electrode conductor is connected to the service disconnect [250.24(A)(1)], it could be up to 50 ft. from a building. Not a great place to connect the building's grounding electrode conductor.

Since a neutral cannot be connected to ground on the load side of a service disconnect [250.142(B)], this proposal would seem to require separate neutrals and grounds from the service disconnect to the building. This would result in a more stringent grounding rule than the present one for feeders to second buildings [250.32(B)].

To pass this proposal without companion, coordinating proposals in Article 250 that would address and resolve these items is irresponsible.

Panel Meeting Action: Accept

Panel Statement: In recent Code cycles, the panel has tried to develop a set distance at which a service disconnecting means can be located outside the building or structure. Based on architectural design of the building, problems with landscaping obscuring the disconnect, and issues with establishing a proper ground plane for a remote service, the panel has decided that the present text as written in the 2002 NEC provides a workable format. The present text as written in the 2002 NEC provides the flexibility to permit the service disconnecting means to be located where it is readily accessible under whatever design issues may be the case for a particular location. It gives the electrical design team, the electrician, the electrical contractor, the electrical utility, premises owner or operator, and the inspector the ability to determine the service location based on the particular site, utility power availability, and the best design for the installation.

Number Eligible to Vote: 10

Ballot Results: Affirmative: 10

4-51 Log #1080 NEC-P04
(230.70)

Final Action: Reject

Submitter: Neil F. LaBrake, Jr., Niagara Mohawk, a National Grid Company / Rep. Edison Electric Institute

Comment on Proposal No: 4-84a

Recommendation: Accept the Proposal.

Substantiation: This will clarify that service and distribution equipment shall not be considered a separate structure and thereby eliminate the need for redundant equipment.

Panel 4 received numerous proposals over the prior two code cycles relating to and attempting to address the concepts of "near" and "nearest". Also, the Panel became aware that the requirements for building disconnects has been incorrectly interpreted and applied in a manner that would result in multiple enclosures and disconnects being installed. For example, in some local jurisdictions, if a building disconnect is not placed immediately on the building (even

if, due to design and building issues, it is within 5 feet or 10 feet of the building being supplied) another disconnect is required to be installed. Current Code language does not make that a requirement and that was not the Panel's intent.

These two proposals were originally developed by CMP 4 members and approved by panel members in the 2002 Code cycle as a reasonable attempt to address these concepts and to resolve long-standing confusion. Other persons stated that they considered the proposals a good solution to an ongoing situation and were looking forward to the incorporation of the proposals into the Code. The Panel originally used the Code understanding and definition of "within sight" and the 50-foot limitation incorporated in that definition as a reasonable alternative to various distances being suggested. The phrase "not to exceed" was originally intended to be used for building disconnects. Regardless, all other distances being suggested had no technical substantiation why one distance was better than another; other than the fact it was just "liked better" by a particular person or interest.

It is interesting to note that Mobile Home Service equipment is permitted by 550.32 to be located 30 feet from the exterior wall of the home it serves and references grounding in accordance with 250.32 and meeting the requirements for services as contained in Article 230. At the NFPA Annual Meeting in Anaheim, the effort to adopt the changes was "clouded" by claims of Grounding and Bonding issues. However, the technical aspects of those issues have still not been made perfectly clear to the Panel or resolved. In addition, the requirements of Article 250, and specifically 250.32, 250.92 and 250.142, remain in effect regardless of what distance is specified. More to the point, even now the current Code language actually perpetuates the lack of clarity and reasonable requirements in the Code. With the current language, technically, there is no limitation on distance for building disconnects; it is open to interpretation and arbitrary.

These two proposals need to be accepted to place safe, reasonable requirements and limitations, as well as take the burden off the inspectors to make arbitrary judgment calls in the field, and to reduce confrontation in the field. For those who think 250.32, 250.92, 250.142 needs to be referenced for clarity, they can be incorporated. Yet that action may be challenged as unnecessary by the Technical Correlation Committee as those are already Code requirements and could be considered redundant text.

Panel Meeting Action: Reject

Panel Statement: In recent Code cycles, the panel has tried to develop a set distance at which a service disconnecting means can be located outside the building or structure. Based on architectural design of the building, problems with landscaping obscuring the disconnect, and issues with establishing a proper ground plane for a remote service, the panel has decided that the present text as written in the 2002 NEC provides a workable format. The present text as written in the 2002 NEC provides the flexibility to permit the service disconnecting means to be located where it is readily accessible under whatever design issues may be the case for a particular location. It gives the electrical design team, the electrician, the electrical contractor, the electrical utility, premises owner or operator, and the inspector the ability to determine the service location based on the particular site, utility power availability, and the best design for the installation.

Number Eligible to Vote: 10

Ballot Results: Affirmative: 10

Comment on Affirmative:

ROGERS: I voted in the affirmative on this comment for the same reasons as expressed in my statement on Comment 4-23 for Feeder Disconnects. My primary objection is the safety hazard of locating a service disconnect up to 50 feet from the building served. However, the issues encountered with applying proper grounding to an installation such as this are also critical in why I voted against this proposal and comment. There are many proposals and comments that deal with this issue, I chose to comment on this one, I feel the same way toward the associated proposals and comments. I also believe that in the next cycle the Panel should address the fact that in some instances service disconnects have to be installed adjacent to the buildings they serve and not necessarily be mounted on or in such buildings.

4-52 Log #1405 NEC-P04
(230.70)

Final Action: Reject

Submitter: Lanny G. McMahl Phoenix, AZ

Comment on Proposal No: 4-84a

Recommendation: Accept this proposal as submitted by Code Making Panel 4.

Substantiation: Panel 4 is commended for their work in submitting this code proposal. Being active in the enforcement community, I can assure you that this change is long overdue. Providing language to clarify the distance (50 feet) and location (within sight), the disconnecting means (feeder or branch circuit) can be from the building or structure provides the necessary guidance and clear understanding for the design and enforcement communities. Code Making Panel 4 member Mr. Beck's comments are absolutely correct. This proposal should have been implemented the last code cycle, but unfortunately was challenged on the floor at the NFPA meeting without reasonable justification. This was unfortunate. The jurisdiction that I work for currently allows the disconnecting means to be a distance of 25 feet from the building or structure. This is more than reasonable and I can assure you that 50 feet

would be more than reasonable too in many instances. As Mr. Beck noted in his comments, the current text implies that outside the building could be any distance. Adding the text "within sight" will clarify this distance. In addition, there should be no concern related to grounding at the building or structure disconnecting means. Regardless of whether the disconnecting means is located inside or outside the building, the grounding requirements are the same. Logically, the disconnecting means being located 50 feet from the building or structure is no different than if it were located on the roof of a 100-story building; or no different than if the disconnecting means were inside the building and 500 foot from the grounding electrode system. The distance the disconnecting means is located from the building or structure grounding electrode system should not be a concern. Therefore, to provide mandatory language and clear guidance, I encourage Panel 4 to accept this proposal. It can only enhance the intent of this code section, as the word "outside" is somewhat vague.

Panel Meeting Action: Reject**Panel Statement:** See panel action and statement on Comment 4-51.**Number Eligible to Vote:** 10**Ballot Results:** Affirmative: 104-53 Log #1947 NEC-P04
(230.70)**Final Action: Accept****Submitter:** Michael I. Callanan, IBEW**Comment on Proposal No:** 4-84a**Recommendation:** This proposal should continue to be rejected.

Substantiation: The proposed panel action to allow the service disconnect, when located outside, to be installed up to 50 ft away from the building or structure could, in fact, create a very serious hazard. The Code has refrained from sighting an exact location for the disconnecting means due to the variety of possible building/structure designs, but it has always intended, for safety reasons, that the disconnect be in an obvious location. If the disconnect could be located up to 50 ft away from the building, it could be difficult to locate it under circumstances of darkness, or if it was hidden by barriers that were installed after the final inspection. This would be a particular concern in a dwelling unit where there is no regulation or supervision. The situation would be more serious in the event of a fire when rapid location of the disconnect is essential. This comment represents the official position of the International Brotherhood of Electrical Workers Codes and Standards Committee.

Panel Meeting Action: Accept

Panel Statement: In recent Code cycles, the panel has tried to develop a set distance at which a service disconnecting means can be located outside the building or structure. Based on architectural design of the building, problems with landscaping obscuring the disconnect, and issues with establishing a proper ground plane for a remote service, the panel has decided that the present text as written in the 2002 NEC provides a workable format. The present text as written in the 2002 NEC provides the flexibility to permit the service disconnecting means to be located where it is readily accessible under whatever design issues may be the case for a particular location. It gives the electrical design team, the electrician, the electrical contractor, the electrical utility, premises owner or operator, and the inspector the ability to determine the service location based on the particular site, utility power availability, and the best design for the installation.

Number Eligible to Vote: 10**Ballot Results:** Affirmative: 104-54 Log #3312 NEC-P04
(230.70)**Final Action: Reject****Submitter:** Charles Mello, Electro-Test, Inc.**Comment on Proposal No:** 4-84a**Recommendation:** Revise the proposed text from the 2005 ROP as follow:

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 230.70(A)(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 sight from the building or structure served.

Where the service disconnecting means is not located on the building or structure served, grounding at the building or structure supplied from the service equipment by a feeder or branch circuit shall comply with 250.32.

(2) Where the service disconnecting means is located not within sight 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.

Substantiation: This comment is from CMP 5 as referred by the TCC and is only on the aspects of the grounding electrode and grounding and bonding requirements relative to the proposed Code text.

When the service disconnecting means is installed on the exterior or the interior of the building or structure served, the requirements for grounding and bonding are clearly specified from section 250.24. If the service disconnecting means is outside but not installed on the exterior of the building then it, by definition from Article 100, becomes its own structure similar to the service pedestal form mobile homes in sections 550.32(A) and 550.33. The missing part in the proposed language is the reference to section 250.32 for the feeder or branch circuit that goes from the remote service to the building or structure served. The revised text provides the clarification on the grounding and bonding requirements for the building or structure served by the feeder or branch circuit by providing the reference to 250.32.

Panel Meeting Action: Reject**Panel Statement:** See panel action and statement on Comment 4-51.**Number Eligible to Vote:** 10**Ballot Results:** Affirmative: 104-55 Log #3364 NEC-P04
(230.70)**Final Action: Reject****Submitter:** Mark R. Hilbert Wolfeboro, NH**Comment on Proposal No:** 4-84a**Recommendation:** Revise 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 230.70(A)(1), (2), and (3).

(1) Readily Accessible Location. The service disconnecting means shall be installed at a readily accessible location either outside of a building or structure or inside nearest the point of entrance of the service conductors in accordance with (a) or (b).

(a) Outside. ~~Service disconnecting means installed outside a building or structure shall comply with (1) or (2):~~

(+) The service disconnecting means shall be on the building or structure served or shall be located within sight from immediately adjacent to the building or structure served.

~~(2) Where the service disconnecting means is located not within sight 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.~~

FPN: For feeder or branch circuit disconnecting means requirements see Part II of Article 225.

(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.

Substantiation: The panel should accept the proposal in principle, revising the text as suggested and adding a FPN. No technical substantiation for locating the service disconnecting means up to 50 ft from the building or structure has been submitted. Locating the service disconnecting means 50 ft away from the building or structure also increases the possibility of an obstruction being placed in the line of sight. The proposed wording will make it clear that the disconnecting means does not have to be located on the building. The language referencing Part II of Article 225 has been deleted in favor of a fine print note referencing Section 225.31. Section 225.31 already requires a disconnecting means for a feeder supplying or passing through a building or structure. The FPN will direct the users to these requirements and address the concern that these requirements may be missed.

Panel Meeting Action: Reject**Panel Statement:** See panel action and statement on Comment 4-51.**Number Eligible to Vote:** 10**Ballot Results:** Affirmative: 10

4-56 Log #3389 NEC-P04 **Final Action: Reject**
(230.70(A)(1)(a))

Submitter: Bob Fahey Evansville, WI

Comment on Proposal No: 4-84a

Recommendation: Revise text as follows:

230.70(A)(1)(a). The service disconnecting means shall be on the building or structure served or shall be located within sight of the building or structure and not more than 10 feet from the building or structure served.

Substantiation: I have a real problem with the new language (within sight) this will allow the service disconnect up to 50 feet from the building. As the time of original inspection this may be obvious where this service disconnect is located, but after the bushes and trees are planted and grow up and around the service disconnect, the location will become less obvious. Therefore, I believe a disconnect located up to 50 feet away is a recipe for an unsafe situation when an emergency may arise and the power is required to be disconnected in a hurry. Think safer and reduce the 50 feet to 10 feet!!!

Panel Meeting Action: Reject

Panel Statement: See panel action and statement on Comment 4-51.

Number Eligible to Vote: 10

Ballot Results: Affirmative: 10

4-57 Log #2182 NEC-P04 **Final Action: Reject**
(230.70(A)(1)(a)(1))

Submitter: John H. Schwab, Jr., City of Wauwatosa, WI

Comment on Proposal No: 4-84a

Recommendation: Delete all language starting with "or shall be..." in 230.70(A)(1)(a)(V).

Delete sentence 230.70 A(1)(a)(2).

Substantiation: There is no reason to not have a main disconnect switch either on the outside of building or the nearest point of entry inside the building or structure. It serves no interest to have fire personnel or the public looking around the outside of the house to shut off power to the premises.

Panel Meeting Action: Reject

Panel Statement: See panel action and statement on Comment 4-51.

Number Eligible to Vote: 10

Ballot Results: Affirmative: 10

4-58 Log #968 NEC-P04 **Final Action: Reject**
(230.70(A)(3))

Submitter: Dorothy Kellogg, American Chemistry Council

Comment on Proposal No: 4-88

Recommendation: Revise as follows:

Remote Control. Where a remote control device(s) is used to actuate the service disconnecting means, the service disconnecting means the remote control device shall be located in accordance with 230.70(A)(1). The service disconnecting means shall only be allowed to be outside of the building.

Substantiation: The ACC believes that the intent of this proposal was to not require that the person operating the remote be within the safe arc flash boundary of the disconnecting device. The fact that when a remote control device is used, the disconnecting means is usually a breaker or motor operated switch in a substation or on a pole exterior to the building. This was the original intent of allowing a remote control device to operate the service disconnecting means. We believe the suggested wording meets the intent of the proposer, and does not require that the remote control device and the actual disconnecting means be located together.

Panel Meeting Action: Reject

Panel Statement: Requiring the remote control device to be at a readily accessible location, either outside or inside, nearest the point of entrance into the building or structure would defeat the purpose for permitting the remote control device. If the service conductors are installed in accordance with 230.6, the service disconnecting means could be located in an equipment room somewhere inside the building, requiring someone, in an emergency situation, to enter the building to disconnect power.

Permitting a remote control device to be located outside the building was an attempt to satisfy concerns about firemen and other emergency personnel being placed in jeopardy when attempting to disconnect power to the building or structure. The remote control device is not a substitute for the service disconnecting means but can be safely operated at a remote location to shut power down.

It is not feasible in many cases to locate the service disconnecting means on the outside of a building. For example, there are many commercial high-rise buildings in downtown areas where the building occupies the entire property footprint and locating a service disconnecting means would involve placing it on someone else's property, in a public right of way, or any number of other scenarios. A remote control device connected to the service disconnecting means installed at a location inside the building would provide a safe method of operating a shunt trip at the service location to disconnect power. For example, a shunt trip operating device could then be located anywhere outside the building.

Number Eligible to Vote: 10
Ballot Results: Affirmative: 10

4-59 Log #2958 NEC-P04 **Final Action: Reject**
(230.70(A)(3))

Submitter: Melvin K. Sanders, TECo., Inc.

Comment on Proposal No: 4-88

Recommendation: The panel should reconsider it's decision to reject this proposal for the very reasons given in the panel statement on the rejection.

I urge the panel to change their position and accept the proposal as originally submitted.

Substantiation: All are agreed the SERVICE ENTRANCE DISCONNECTING MEANS itself must be located as near to their point of entry to limit unprotected conductor lengths to the shortest practicable length. However, the remote operator under discussion does not have to be at that same point as well. There are many guidelines the personnel should be following, but which one? NFPA 70E provides some of the answer. IEEE 1584, some of the answer, and any number of vendor programs can track this also - where all give an answer for degree of hazard exposure, the PPE expected to be worn, and even provide some information as to where an arc flash boundary may be found. The problem is NONE OF THEM agree so which one is the operator to rely upon? Also, what is to be done when the cal/cm², value exceeds 40 and even above 100 in some cases. On this point, above 40 there seems to be disagreement: avoid having personnel in that area at all. If you stand outside the arc flash boundary (wherever THAT may be) of, say 80 cal/cm², how long of a broom handle would you want to have in order to reach this "remote" operator that is located per code within the arc flash location (wherever that may be).

Panel Meeting Action: Reject

Panel Statement: See panel action and statement on Comment 4-58.

Number Eligible to Vote: 10

Ballot Results: Affirmative: 10

4-60 Log #1581 NEC-P04 **Final Action: Accept**
(230.71(A))

Submitter: Alan Manche, Square D Co.

Comment on Proposal No: 4-90

Recommendation: Continue to accept the panel action for this proposal.

Substantiation: The affirmative comment by Mr. Ode points out an opportunity for this section along with 230.82 to be misinterpreted. The last phrase in 230.71 states "...shall not be considered a service disconnecting means." Does the panel intend the disconnect for the equipment to be rated for service use that disconnects the TVSS, or GFPE? The answer to this question had historically been understood for the GFPE disconnect which must be a disconnect that would be permitted to serve as a service disconnecting means as pointed out by Mr. Ode's comment. The phrase in 230.82(7) "...if suitable overcurrent protection and disconnecting means are provided" has always been understood by industry to drive the point that Mr. Ode has made in his affirmative comment.

Since the committee rejected proposal 4-108, it has placed in question the need for the TVSS disconnect and even the disconnect for the GFPE equipment to be a "suitable disconnecting means" – suitable for service entrance application. Can a UL 1077 supplemental protector or UL 508 manual motor controller be used as a disconnect for the TVSS? To Mr. Ode's point, acceptance of such devices could permit the welding of contacts and a device that is not suitable for a service environment. I urge the committee to correlate the action of this proposal with the requirements found in 230.82(7) by reconsidering and accepting proposal 4-108.

Panel Meeting Action: Accept

Panel Statement: Permitting a TVSS disconnecting means to not be counted as one of the six switches or circuit breakers does not relax the requirements for TVSS systems to be located on the load side of overcurrent protection. The listing of the control circuit for the GFP system, the TVSS system, or the disconnecting means for power monitoring equipment should incorporate adequate protection for these devices and their related circuits.

Number Eligible to Vote: 10

Ballot Results: Affirmative: 9 Negative: 1

Explanation of Negative:

ROGERS: I voted against this proposal and comment as I am opposed to allowing any more disconnecting means at the service location and then stating "oh, by the way, this disconnect doesn't count". The rule is up to six and it should remain so. The rationale that just because it is allowed for GFPE it should be allowed for TVSS is meaningless in my opinion. If we allow additional disconnects every time that a new technology is brought forward for installation at the service entrance location then the rule might as well be deleted.

4-61 Log #702 NEC-P04 **Final Action: Accept in Principle in Part**
(230.72(B))

Submitter: Dan Leaf Rancho Santa Margarita, CA

Comment on Proposal No: 4-94

Recommendation: Accept proposal.

Substantiation: Additional services (not covered in this section) are permitted by 230.2(B) and where provided under 230.2(B) are usually of large capacity where an "occurrence" such as a burndown could affect other services not sufficiently remote. 230.71(A) limits disconnects per service at any one location. The proposed reference to 230.71(A) limits disconnects per service at any one location. The proposed reference to 230.71(A) seems more appropriate since that section relates specifically to service disconnects. There are no optional standby services, only "systems" supplied by on-site power sources, per 702.2, which although not a rule appears to modify this section. I don't believe there is technical data to show "occurrences" on emergency, fire pump, or legally required systems are less likely than "normal" systems. 695.4(B)(2)(3) requires separation from other services, which includes disconnecting means. 700.12(D) and 701.12(D) require separation from other services, which includes disconnecting means. If a fire pump service, emergency service, and legally required standby system each have six disconnect there could be a total of 18 disconnects at one location. In an emergency or other crisis situation, this could be confusing to personnel and goes against the tenor of the code which generally limits building disconnects at one location to six. "Normal" supply is not defined. An optional standby system could be the normal supply while the utility source could be the alternate supply.

Panel Meeting Action: Accept in Principle in Part

The panel reaffirms the action taken in the panel action text on Proposal 4-94.

Panel Statement: The panel continues to accept the proposal in principle in part for all of the same reasons as stated in the proposal panel statement. The submitter of the comment has also brought into question, in his substantiation, the relative location to each other of each set of up to six disconnects for each system. Locating these emergency, legally required, and optional standby remote from the normal service disconnects provides a separation distance to reduce the possibility that power to these units would be inadvertently turned off when normal power disconnects are turned off. Separation of conductors, components, and disconnects should be in compliance with the appropriate articles covering these types of systems, such as Articles 700, 701, and 702, not in 230.72(B). Section 230.72(B) is simply addressing the location of one set of disconnects to another.

Number Eligible to Vote: 10

Ballot Results: Affirmative: 10

4-62 Log #2170 NEC-P04 **Final Action: Reject**
(230.72(B))

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

Comment on Proposal No: 4-94

Recommendation: Accept the panel action in principle. Delete "or" ahead of "optional" and add after "optional standby" the words "or redundant system".

Substantiation: This will correlate with the action on Proposal 4-44a.

Panel Meeting Action: Reject

Panel Statement: Since there wasn't a definition of redundant systems, the panel reevaluated the use of this phrase and decided to refer to these systems as systems designed for connection to multiple sources of supply for the purpose of enhanced reliability in accordance with Comments 4-19 and 4-33. The loads involved in these configurations are usually not as critical as the other loads included in 230.72(B), so separation from normal power would not be required.

Number Eligible to Vote: 10

Ballot Results: Affirmative: 10

4-63 Log #1944 NEC-P04 **Final Action: Accept**
(230.72(C) Exception No. 2)

Submitter: Michael I. Callanan, IBEW

Comment on Proposal No: 4-95

Recommendation: The proposal should continue to be rejected.

Substantiation: The panel is correct in its action to reject this proposal because, as the submitter cites in his own substantiation, relief from the requirement that each occupant have access to the main service disconnect can be accomplished by asking the authority having jurisdiction for special permission per 90.4. There may be situations where one would not want a tenant to have access to the main service disconnect but to create an exception for a limited situation is not practical. The authority having jurisdiction would most likely have more information upon which to make a determination as to whether or not a particular situation warrants relief from this requirement. This comment represents the official position of the International Brotherhood of Electrical Workers Codes and Standards Committee.

Panel Meeting Action: Accept

Number Eligible to Vote: 10

Ballot Results: Affirmative: 10

4-64 Log #3237 NEC-P04 **Final Action: Accept**
(230.72(C) Exception No. 2 (New))

Submitter: Michael I. Callanan, IBEW

Comment on Proposal No: 4-96

Recommendation: Reject Proposal 4-96.

Substantiation: Adequate substantiation has not been provided to allow restriction of the occupant's access to their service disconnecting means, where there is no continuous building management supervision. In the example submitted, the occupant would have the ability to disconnect the branch circuits and feeders originating in the occupant's panel. However, no disconnecting means would be available to disconnect the source of supply to the occupancy. This is unacceptable. In the event of a hazard involving the supply conductors, the occupant must be able to de-energize all ungrounded conductors within the occupancy. Without continuous building management supervision to disconnect the supply conductors, the hazard would continue to exist. This comment represents the official position of the International Brotherhood of Electrical Workers Codes and Standards Committee.

Panel Meeting Action: Accept

Number Eligible to Vote: 10

Ballot Results: Affirmative: 10

4-65 Log #1299 NEC-P04 **Final Action: Reject**
(230.82)

Submitter: Randy R. Hansen, Seattle Fire Department

Comment on Proposal No: 4-106

Recommendation: None provided.

Substantiation: I am a twenty-plus year career Battalion Chief with the Seattle Fire Department. As such, and speaking broadly for the Fire Service, I will briefly describe a safety issue facing firefighters across the country.

We inherently face numerous safety hazards on any structure fire - some obvious, and some not so obvious. One of the lesser visible hazards is that of electrocution. A necessary part of firefighting is cutting into walls, floors and ceilings to ensure that fire has not extended into these void spaces. Doing so using axes, chain saws and other means, typically exposes firefighters to live electrical circuits.

Our options to mitigate this hazard are: 1) kill power at the electrical panel via the main breaker, which is not a 100% guaranteed due to breaker failure or inability to timely locate the panel; 2) request the local power company respond and pull the meter or cut the power drop at the pole, both of which are a delay due to response time.

An ideal solution would be a fail-safe, exterior transfer switch that positively disconnects power at the meter base. Taking this concept one step further, the switch should be lockable to enable what we term "lock-out, tag out" - a positive, secure disconnect of service.

I recently saw a prototype of a device such as the one described. It was a transfer switch/disconnect with the ability to be padlocked in position, designed to be located externally between the meter and the meter base.

If such a device could be required in future electrical codes, including remodels, and made know to the public for voluntary retrofitting (assuming modest cost concerns), it would greatly enhance firefighter safety.

Panel Meeting Action: Reject

Panel Statement: The panel applauds the work of the fire fighter and understands the danger involved in a fire situation. Many of these safety issues have been addressed in the NEC and certainly in Articles 225 and 230. Electrical safety issues are at the heart of the NEC. However, to make changes to the NEC, it is necessary to provide the text to initiate the necessary changes or to provide a recommended action. Unfortunately, this comment does not comply with 4.4.5(C) for the Content of Comments in the NFPA Rules and Regulation, that requires each comment to include the proposed text of the comment, including the wording to be added, revised (and how revised), or deleted.

Sections 225.32 and 230.70 provide readily accessible disconnecting means requirements and methods at buildings to disconnect power during an emergency situation as described by the battalion chief. Requiring retrofitting of existing installations to provide any external disconnecting means would be a function of the local municipality.

Number Eligible to Vote: 10

Ballot Results: Affirmative: 10

Comment on Affirmative:

ROGERS: I understand the Chief's concern for removing power from the building, however, the product contemplated in this proposal and comment does not necessarily provide what the Chief is looking for. The product addressed in this proposal and comment is one to isolate the meter from the power source so that the utility company can service the meter or install a new meter. There are many safety related issues that need to be considered before such a switch could be accepted, including but not limited to, its ability to be safely opened under high loading or system faulting conditions. Either of which could be encountered during a structure fire. There is also no sound rationale for universally requiring a switch such as this.

4-66 Log #2172 NEC-P04
(230.82)

Final Action: Reject

Submitter: Frederic P. Hartwell, Hartwell Electrical Services, Inc. / Rep. Massachusetts Electrical Code Advisory Committee

Comment on Proposal No: 4-103

Recommendation: The proposal should be accepted in principle. Accept the proposal as written, but insert the words “permitted to be” after “shall be” and ahead of “connected” in the first sentence of the proposal. In addition, add the following sentence at the end of the proposed 230.82(B)(2): “It shall have a short-circuit current rating not less than the available short-circuit current.”

Substantiation: This wording clarifies that the intent is not to mandate the entire list be installed. The second sentence for (2) inserts the rating accepted by CMP 4 from Proposal 4-106. CMP 4 did not respond to the central issue addressed in the original proposal, that being that the switch described here, and with the short-circuit current rating described in Proposal 4-106, may and likely would otherwise qualify as a service disconnect as defined in Article 100, because it would be capable of constituting the main cutoff of supply. This proposal is essential to avoid extensive field controversies around the location of the real service disconnect, particularly as CMP 4 moves to make express allowances for service disconnects to be installed at some distance from the building or structure served. It is highly significant that the submitter of related Proposal 4-106 is the same person as the submitter of the successful Proposal 4-159 in the 1999 cycle that deleted the prior allowance for such switches ahead of a service disconnect, precisely because of the confusion and conflicts such provisions create. We respectfully invite CMP 4 to carefully reconsider the extensive substantiation provided with the original proposal.

Panel Meeting Action: Reject

Panel Statement: While the panel appreciates the amount of work the submitter did in his proposed rewrite of this section, the rewrite adds a degree of complexity to a section where the present wording is fairly straightforward and easy to use. In (B), the arrangement is very difficult to follow, since there are five subsections of which it is necessary to comply with items (2) through (4) to comply with an installation for (1) where a service disconnecting means is provided. Item (4) states the marking required is “Meter Disconnect-Not Service Disconnect” but yet the title to (1) is Service Disconnect Provided. This seems to say exactly the opposite of what the marking requirement states.

Item (5) for service equipment appears to be a stand alone subsection; however, (B)(1) also deals with a service disconnecting means located ahead of the utility company meter. It would not make any sense to locate a meter disconnecting means on the load side of the metering equipment, so it looks like (5) and (1) are really addressing the same disconnecting means. The old saying “if it’s not broke, don’t fix it” would seem to apply here.

Number Eligible to Vote: 10

Ballot Results: Affirmative: 10

4-67 Log #2857 NEC-P04 **Final Action: Accept in Principle in Part**
(230.82)

Submitter: Wes Hoppler, Global Power Technologies

Comment on Proposal No: 4-106

Recommendation: I recommend that the proposed item (3) in 230.82 be revised as follows:

Meter disconnect nominally rated not in excess of 600 volts where installed to be under the sole control of the serving utility. The switch shall have a short circuit current rating equal to or greater than the available short circuit current. The metal housing of the switch shall be grounded in accordance with 250.92.

Substantiation: I believe the effect of the current proposal would require all permissible meter disconnects to be under the sole control of the serving utility. The proposed change would still allow that circumstance, but would also allow for disconnects that are not under the sole control of the serving utility. A meter disconnect switch would eliminate the need for “pulling” a meter when a service panel replacement is undertaken and would allow for an exterior disconnect in the case of an emergency.

Panel Meeting Action: Accept in Principle in Part

Delete the phrase “or meter socket transfer switches” from the panel meeting action on Proposal 4-106. The panel reaffirms the remainder of the panel meeting action on Proposal 4-106.

Panel Statement: The panel action in the proposal addresses the submitter’s concerns about deleting the text on the sole control of the serving utility but the panel action on (3) also deleted the bonding reference to 250.92 since it is already a requirement.

The panel has deleted the phrase “or meter socket transfer switches” from the panel meeting action to be consistent with the action taken on Comment 4-73 for the reason given in the submitter’s substantiation of Comment 4-73.

Number Eligible to Vote: 10

Ballot Results: Affirmative: 10

4-68 Log #3444 NEC-P04
(230.82)

Final Action: Reject

Submitter: Randy R. Hansen, Seattle Fire Department

Comment on Proposal No: 4-106

Recommendation: None Provided.

Substantiation: I am a twenty-plus year career Battalion Chief with the Seattle Fire Department. As such, and speaking broadly for the Fire Service, I will briefly describe a safety issue facing firefighters across the country.

We inherently face numerous safety hazards on any structure fire - some obvious, and some not so obvious. One of the lesser visible hazards is that of electrocution. A necessary part of firefighting is cutting into walls, floors and ceilings to ensure that fire has not extended into these void spaces. Doing so using axes, chain saws and other means, typically exposes firefighters to live electrical circuits.

Our options to mitigate this hazard are: 1) kill power at the electrical panel via the main breaker, which is not a 100 percent guarantee due to breaker failure or inability to timely locate the panel; 2) request the local power company respond and pull the meter or cut the power drop at the pole, both of which are a delay due to response time.

An ideal solution would be a fail-safe, exterior transfer switch that positively disconnects power at the meter base. Taking this concept one step further, the switch should be lockable to enable what we term “lock-out, tag-out” - a positive, secure disconnect of service.

I recently saw a prototype of a device such as the one described. It was a transfer switch/disconnect with the ability to be padlocked in position, designed to be located externally between the meter and the meter base.

If such a device could be required in future electrical codes, including remodels, and made known to the public for voluntary retrofitting (assuming modest cost concerns), it would greatly enhance firefighter safety.

Panel Meeting Action: Reject

Panel Statement: See panel action and statement on Comment 4-65.

Number Eligible to Vote: 10

Ballot Results: Affirmative: 10

4-69 Log #559 NEC-P04
(230.82(2))

Final Action: Accept

Submitter: Technical Correlating Committee on National Electrical Code®
Comment on Proposal No: 4-105

Recommendation: It was the action of the Technical Correlating Committee that further consideration be given to the comments expressed in the voting. The Panel accepted inclusion of the term “meter socket transfer switch” that is not clearly defined or understood and deleted the appropriate reference to 250.92. 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 Meeting Action: Accept

The panel accepts the Technical Correlating Committee recommendation to give further consideration to the comments expressed in the voting. Refer to the panel action on Comment 4-73.

Panel Statement:

Number Eligible to Vote: 10

Ballot Results: Affirmative: 10

4-70 Log #560 NEC-P04
(230.82(2))

Final Action: Accept

Submitter: Technical Correlating Committee on National Electrical Code®
Comment on Proposal No: 4-106

Recommendation: It was the action of the Technical Correlating Committee that further consideration be given to the Panel action, as the Panel accepted inclusion of the term “meter socket transfer switch” that is not clearly defined or understood and deleted the appropriate reference to 250.92. 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 Meeting Action: Accept

The panel accepts the Technical Correlating Committee recommendation to give further consideration to the comments expressed in the voting. Refer to the panel action on Comment 4-67.

Number Eligible to Vote: 10

Ballot Results: Affirmative: 10

4-71 Log #739 NEC-P04
(230.82(2))

Final Action: Hold

Submitter: Joseph McCann, City of Coral Springs
Comment on Proposal No: 4-105

Recommendation: Add transfer switches (that are listed for service equipment) shall be permitted to be connected to the supply side of the service equipment. 230.82(1)-(7).

Substantiation: Transfer switches are available that are listed as service equipment and should be included in the equipment that are listed in 230.82(1)-(7).

Panel Meeting Action: Hold

Hold the comment for further study.

Panel Statement: This comment is introducing new information that has not had public review in a proposal. Hold this for the 2008 Code cycle.

Number Eligible to Vote: 10

Ballot Results: Affirmative: 10

4-72 Log #1300 NEC-P04
(230.82(2))

Final Action: Reject

Submitter: Randy R. Hansen, Seattle Fire Department

Comment on Proposal No: 4-105

Recommendation: In response to negative.

Substantiation: I am a twenty-plus year career Battalion Chief with the Seattle Fire Department. As such, and speaking broadly for the Fire Service, I will briefly describe a safety issue facing firefighters across the country.

We inherently face numerous safety hazards on any structure fire - some obvious, and some not so obvious. One of the lesser visible hazards is that of electrocution. A necessary part of firefighting is cutting into walls, floors and ceilings to ensure that fire has not extended into these void spaces. Doing so using axes, chain saws and other means, typically exposes firefighters to live electrical circuits.

Our options to mitigate this hazard are: 1) kill power at the electrical panel via the main breaker, which is not a 100% guaranteed due to breaker failure or inability to timely locate the panel; 2) request the local power company respond and pull the meter or cut the power drop at the pole, both of which are a delay due to response time.

An ideal solution would be a fail-safe, exterior transfer switch that positively disconnects power at the meter base. Taking this concept one step further, the switch should be lockable to enable what we term "lock-out, tag out" - a positive, secure disconnect of service.

I recently saw a prototype of a device such as the one described. It was a transfer switch/disconnect with the ability to be padlocked in position, designed to be located externally between the meter and the meter base.

If such a device could be required in future electrical codes, including remodels, and made know to the public for voluntary retrofitting (assuming modest cost concerns), it would greatly enhance firefighter safety.

Panel Meeting Action: Reject

Panel Statement: See panel action and statement on Comment 4-65.

Number Eligible to Vote: 10

Ballot Results: Affirmative: 10

4-73 Log #1372 NEC-P04
(230.82(2))

Final Action: Accept

Submitter: James W. Carpenter, International Association of Electrical Inspectors

Comment on Proposal No: 4-105

Recommendation: Reconsider and reject the proposal.

Substantiation: The proliferation of devices connected ahead of service disconnects is problematic. The acceptance of this proposal points out a number of those problems outlined in the following questions. What is a meter socket transfer switch? Is the product listed? Is there a standard? Does the product have a short circuit rating? How do I disconnect a transfer switch that is contained in a meter socket if a problem occurs?

There seems to be no logic in the panel allowing a "meter socket transfer switch" when, as pointed out during the last cycle, there are issues with having a regular non-service entrance rated transfer switch installed ahead of the service disconnect.

Panel Meeting Action: Accept

Number Eligible to Vote: 10

Ballot Results: Affirmative: 10

4-74 Log #1373 NEC-P04
(230.82(2))

Final Action: Reject

Submitter: Michael Allenbach, Global Power Product Development Inc.

Comment on Proposal No: 4-105

Recommendation: We have recently patented and have started the UL listing process to produce a transfer switch that is to be installed between the meter

and the meter base such as the item described in Proposal 4-105 and 4-106. We believe our design addresses the safety issues stated in Proposal 4-105. Our device employs common circuit breakers with an AIC rating of 10-22 K or greater if required. It has redundant grounding to the enclosure using both the paint piecing clamps, which retain the device to the meter base, and a ground wire connected to the preexisting neutral basis in the meter can. This can be done using an internally threaded set screw provided with the device which allows our additional wire to be added in a proper manner. Hardware to allow for other or additional bonding, if required, may also be included.

Substantiation: In response to the negative comments by "Mr. Young".

Our product "Genswitch" was designed by Mike Allenbach of Global Power Product Development Inc. in response to a request by Puget Sound Energy (PSE), a Washington State utility, after the death of several linemen due to improper generator installations causing back feeds. With the involvement of PSE department's refinements were made until all safety and practicality issues were addressed. We then had our device reviewed by the Washington State Department of Labor & Industries Chief Electrical Inspector, (name deleted), and her technical team in Olympia, Washington, followed by a detailed review by Underwriters Laboratories in Camas, Washington. Following our overwhelmingly favorable review we took a prototype to Cutler Hammer Corporation in Pittsburgh, PA, (and lately Milbank Corporation in Kansas City, MO) and had it reviewed by their engineering teams and again a positive response and offers of factory support. Metering, as well as codes and standards departments of several utilities have given preliminary approved of the design pending the presentation and testing of a production unit.

We are aware of several failed transfer switch designs which were installed in a similar manor, such as Pepco's Generalink and Onans roi switch in the early 70's. The switching means in these devices as well as several other means were investigated and rejected early in our design process. Our patented "simple" mechanically interlocked circuit breaker design using heavy, fully encapsulated silver-plated copper buss bars as conductors is the only proven safe way I am aware of to do a full system transfer at this location in the system. We presently offer both utility and backup ampacities to 200 amps as well as full system surge suppression and an automatic operation option.

Our device was to be owned and installed by utility metering crews or in cases of privatization, contractors working in the utilities behalf. All live components and mounting mechanisms are behind the utility sealed meter. "A new model may also include the meter as a built-in permanent component". An electrically isolated lever which operates the transfer and center position disconnect functions and an auxiliary power inlet for generator hookup are the only items accessible to the end user.

Our investigation to this point had led us to believe our device could only be recognized for approval through utility codes and standards entities due to where the line is drawn between utility and user responsibility. NFPA/NEC recognition and code inclusion of Genswitch would go a long way to improve safety levels for linemen, electricians, fire departments, as well as end users.

Panel Meeting Action: Reject

Panel Statement: While the panel appreciates the information provided by the submitter, to make changes to the NEC, it is necessary to provide the text to initiate the necessary changes or to provide a recommended action of some kind. Unfortunately, this comment does not comply with 4.4.5(C) for the Content of Comments in the NFPA Rules and Regulation that requires each comment to include the proposed text of the comment, including the wording to be added, revised (and how revised), or deleted.

Number Eligible to Vote: 10

Ballot Results: Affirmative: 10

4-75 Log #1374 NEC-P04
(230.82(2))

Final Action: Reject

Submitter: Michael Allenbach, Global Power Product Development Inc.

Comment on Proposal No: 4-106

Recommendation: We have recently patented and have started the UL listing process to produce a transfer switch that is to be installed between the meter and the meter base such as the item described in Proposal 4-105 and 4-106. We believe our design addresses the safety issues stated in Proposal 4-105. Our device employs common circuit breakers with an AIC rating of 10-22 K or greater if required. It has redundant grounding to the enclosure using both the paint piecing clamps, which retain the device to the meter base, and a ground wire connected to the preexisting neutral basis in the meter can. This can be done using an internally threaded set screw provided with the device which allows our additional wire to be added in a proper manner. Hardware to allow for other or additional bonding, if required, may also be included.

Substantiation: In response to the negative comments by "Mr. Young".

Our product "Genswitch" was designed by Mike Allenbach of Global Power Product Development Inc. in response to a request by Puget Sound Energy (PSE), a Washington State utility, after the death of several linemen due to improper generator installations causing back feeds. With the involvement of PSE department's refinements were made until all safety and practicality issues were addressed. We then had our device reviewed by the Washington State Department of Labor & Industries Chief Electrical Inspector, (name deleted), and her technical team in Olympia, Washington, followed by a detailed review by Underwriters Laboratories in Camas, Washington. Following our overwhelmingly favorable review we took a prototype to Cutler Hammer

Corporation in Pittsburgh, PA, (and lately Milbank Corporation in Kansas City, MO) and had it reviewed by their engineering teams and again a positive response and offers of factory support. Metering, as well as codes and standards departments of several utilities have given preliminary approved of the design pending the presentation and testing of a production unit.

We are aware of several failed transfer switch designs which were installed in a similar manor, such as Pepco's Generalink and Onans roi switch in the early 70's. The switching means in these devices as well as several other means were investigated and rejected early in our design process. Our patented "simple" mechanically interlocked circuit breaker design using heavy, fully encapsulated silver-plated copper buss bars as conductors is the only proven safe way I am aware of to do a full system transfer at this location in the system. We presently offer both utility and backup capacities to 200 amps as well as full system surge suppression and an automatic operation option.

Our device was to be owned and installed by utility metering crews or in cases of privatization, contractors working in the utilities behalf. All live components and mounting mechanisms are behind the utility sealed meter. "A new model may also include the meter as a built-in permanent component". An electrically isolated lever which operates the transfer and center position disconnect functions and an auxiliary power inlet for generator hookup are the only items accessible to the end user.

Our investigation to this point had led us to believe our device could only be recognized for approval through utility codes and standards entities due to where the line is drawn between utility and user responsibility. NFPA/NEC recognition and code inclusion of Genswitch would go a long way to improve safety levels for linemen, electricians, fire departments, as well as end users.

Panel Meeting Action: Reject

Panel Statement: See panel action and statement on Comment 4-74.

Number Eligible to Vote: 10

Ballot Results: Affirmative: 10

4-76 Log #2540 NEC-P04 **Final Action: Accept**
(230.82(2))

Submitter: Vince Baclawski, National Electrical Manufacturers Association (NEMA)

Comment on Proposal No: 4-105

Recommendation: Reconsider and reject the proposal.

Substantiation: The public needs a clear explanation of the product contemplated before any addition of this type is made.

In addition, the proposal lacks significant amounts of information to determine if this type of product would be acceptable. The listing information includes whether there are any listing or standards requirement, whether the product have a short-circuit current rating, whether the product function as a service disconnect, and whether the product has "manual" override capability.

Panel Meeting Action: Accept

Number Eligible to Vote: 10

Ballot Results: Affirmative: 10

4-77 Log #458 NEC-P04 **Final Action: Accept in Part**
(230.82(2) & (3))

Submitter: Timothy M. Croushore, Allegheny Power

Comment on Proposal No: 4-106

Recommendation: Accept the text as published in the Panel Meeting Action for Proposal 4-106, Log 2549.

Substantiation: Code-Making Panel 4 has accurately compiled the information on meter socket transfer switches from Proposal 4-105 and meter disconnect switches from Proposal 4-106 into 230.82(2) and (3). The inclusion of the subject meter socket transfer switch and the clause requiring adequate short-circuit current rating of the meter disconnect switch are wise additions to the equipment permitted to be connected to the supply side of the service disconnect.

Please continue to reject the concept of sole control of the serving utility in Proposal 4-106 for the reason as stated in the panel statement.

Panel Meeting Action: Accept in Part

Delete the phrase "or meter socket transfer switches" from the panel meeting action on Proposal 4-106. The panel reaffirms the remainder of the panel meeting action on Proposal 4-106.

Panel Statement: The panel does not accept the submitter's substantiation with regard to Proposal 4-105 and meter socket transfer statement.

The panel has deleted the phrase "or meter socket transfer switches" from the panel meeting action to be consistent with the action taken on Comment 4-73 for the reason given in the substantiation of Comment 4-73.

Number Eligible to Vote: 10

Ballot Results: Affirmative: 10

4-78 Log #1082 NEC-P04 **Final Action: Accept**
(230.82(5))

Submitter: Neil F. LaBrake, Jr., Niagara Mohawk, a National Grid Company / Rep. Edison Electric Institute

Comment on Proposal No: 4-105

Recommendation: Reject this Proposal.

Substantiation: This device is not under the exclusive control of the electric utility nor is it under the complete control of the user. This device is a part of the premise wiring system and is installed on the line side of the main disconnecting means and overcurrent protection. Should this device fail in the meter socket, there is no premise wiring overcurrent protection to isolate the failed piece of equipment from the utility source. Installation of these devices allows these switches to serve as a service disconnect. These devices, while they may be listed to UL Standards such as UL 1008, are not listed as suitable for use as service equipment nor do they have the appropriate requirements for service equipment including an appropriate rating for short circuit current or available fault current.

Panel Meeting Action: Accept

Number Eligible to Vote: 10

Ballot Results: Affirmative: 10

4-79 Log #1083 NEC-P04 **Final Action: Accept in Principle in Part**
(230.82(5))

Submitter: Neil F. LaBrake, Jr., Niagara Mohawk, a National Grid Company / Rep. Edison Electric Institute

Comment on Proposal No: 4-106

Recommendation: Reject the Proposal.

Substantiation: These are load-break type of disconnect switches and are intended for the exclusive use and control of utility power and service, and to provide for the safe maintenance of facilities, such as 480Y/277 volt metering equipment, by qualified utility persons. This meter disconnect like the meter socket (Sect 230.66) is not service equipment. See example in the illustration provided from Allegheny Power's electric service requirements.

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

Panel Meeting Action: Accept in Principle in Part

Delete the phrase "or meter socket transfer switches" from the panel meeting action on Proposal 4-106. The panel reaffirms the remainder of the panel meeting action on Proposal 4-106.

Panel Statement: The panel action in the proposal addresses the submitter's concerns about deleting the text on the sole control of the serving utility but the panel action on (3) also deleted the bonding reference to 250.92 since it is already a requirement.

The panel has deleted the phrase "or meter socket transfer switches" from the panel meeting action to be consistent with the action taken on Comment 4-73 for the reason given in the submitter's substantiation of Comment 4-73.

Number Eligible to Vote: 10

Ballot Results: Affirmative: 10

4-80 Log #2428 NEC-P04 **Final Action: Reject**
(230.82(5))

Submitter: J. Philip Simmons, Simmons Electrical Services / Rep. National Armored Cable Manufacturers Association

Comment on Proposal No: 4-104

Recommendation: Accept the proposal.

Substantiation: Please look at 690.3 for solar-photovoltaic systems which reads in part "if the system is operated in parallel with primary source(s) of electricity, the requirements in 705.14, 705.16, 705.32, and 705.43 shall apply." Also please see 692.3 for fuel cell systems which reads in part, "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."

Both of these articles recognized that if the system is to operate in parallel with the electric utility, they have to be considered as and comply with the rules for an Interconnected Power Production Source in Article 705.

So, both of these systems are permitted to be connected ahead of the service if they comply with the terms of Article 705. As a result, the inclusion of "solar photovoltaic system, fuel cell system" in 230.82(5) is not needed since this section contains the phrase, "Interconnected electric power production sources." Also, Section 90.3 gives the organization of the Code and tells us the rules in Chapter 6 can amend the rules in Chapter 2. So, since the rules in 690.3 and 692.3 properly cover the installation of these systems, why introduce an error in 230.82(5)?

Neither a solar photovoltaic system nor a fuel cell system are a service as defined by Article 100 unless it is supplied by the electric utility. If a solar photovoltaic system or a fuel cell system is on the premises and producing electrical energy, they either are a part of the premises wiring system or a separately derived system.

These solar photovoltaic systems and fuel cell systems should be connected ahead of the service disconnecting means only where they comply with the rules in Article 705 for interconnected electrical power production sources.

Deleting “Solar photovoltaic systems, fuel cell systems” from this section would not prevent their proper use in any way but would require their proper connection.

As presently worded, this section seems to imply that an installer can simply connect a solar photovoltaic system or a fuel cell system ahead of the service disconnecting means. This should be done only where the systems are connected in accordance with Article 705. To do otherwise may lead to a dangerous backfeed of electrical energy into electrical utility systems which could present dangerous shock or electrocution hazards for electrical utility personnel.

Panel Meeting Action: Reject

Panel Statement: Section 690.64(A) for solar photovoltaic systems and Section 692.65(A) for fuel cell systems permit connection of these systems to the supply side of the service disconnecting means. These two systems must remain in 230.82(5) until permission for supply side connection is removed from Articles 690 and 692. There aren't any proposals for the 2005 Code cycle to change or delete this permissive rule.

Number Eligible to Vote: 10

Ballot Results: Affirmative: 10

4-81 Log #2858 NEC-P04
(230.82(5))

Final Action: Reject

Submitter: Wes Hoppler, Global Power Technologies

Comment on Proposal No: 4-105

Recommendation: In 1999, as Director of Market Planning and Research for Puget Sound Energy, I reviewed a meter socket based transfer switch that was designed by Global Power Production Development. While it had not yet been listed, it did provide short circuit protection and could also function as a disconnect.

Although PSE declined to participate in the development and manufacture of the product, we thought it was very desirable in addressing the threats to the safety of our line crews and consumers who use back-up power during outages. That many back-up power connections are unsafe, with the potential to cause dangerous backfeeds or pose a threat to the user was well known to us and this device offered a safe, cost-effective solution to those problems.

We believed that the best logistical approach to utilizing this device to improve overall safety would have the utilities (or their service providers) performing the installation and inspections. I would be happy to see code recognition of these devices but would not want to see any action taken that would inhibit a utilities' ability to install these devices for its customers. Given that proper review of the installation requires meter removal and that the timely coordination of inspectors and field crews would be difficult in the field, service interruptions for customers would be limited by allowing utilities to be responsible for the installation of these devices.

Substantiation: Addresses negative vote concerns.

Panel Meeting Action: Reject

Panel Statement: While the panel appreciates the information provided by the submitter, to make changes to the NEC, it is necessary to provide the text to initiate the necessary changes or to provide a recommended action of some kind. Unfortunately, this comment does not comply with Section 4-4.5(C) for the Content of Comments in the NFPA Rules and Regulation that requires each comment to include the proposed text of the Comment, including the wording to be added, revised (and how revised), or deleted.

Number Eligible to Vote: 10

Ballot Results: Affirmative: 10

4-82 Log #561 NEC-P04
(230.82(7))

Final Action: Accept

TCC Action

Submitter: Technical Correlating Committee on National Electrical Code®

Comment on Proposal No: 4-108

Recommendation: It was the action of the Technical Correlating Committee that this Proposal be reconsidered and correlated with the action on Proposal 5-272. 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 Meeting Action: Accept

The panel accepts the recommendation of the Technical Correlating Committee to reconsider. Refer to the panel action on Comment 4-83.

Number Eligible to Vote: 10

Ballot Results: Affirmative: 10

4-83 Log #1582 NEC-P04
(230.82(7))

Final Action: Accept

Submitter: Alan Manche, Square D Co.

Comment on Proposal No: 4-108

Recommendation: Reconsider and accept this proposal.

Substantiation: The panel action and statement is in direct conflict with the affirmative comment by Mr. Ode in proposal 4-90. By not accepting this proposal and stating “There is no assurance based on the text found in 230.82(7) that the overcurrent protection device and service disconnect will be service rated” now places the once industry understood requirement for the GFPE disconnect in question since the code states it shall be a “suitable overcurrent protection and disconnecting means” - a disconnect meeting the performance requirements of a service disconnect. I would also ask the committee that if this statement provides no assurance for the disconnect being suitable in a service application, how does 230.71 address this issues as it states the disconnect is “not considered a service disconnect means?”

Now let's consider the absence of TVSS from 230.82(7). I am required in 285.21 to connect the device on the load side of a service rated disconnecting means. 230.71 permits the TVSS to be excluded as a service disconnect, but no where am I given permission to connect the TVSS and service rated disconnect, required in 285.21, ahead of the service disconnect since it is not included in 230.82(7). If the committee takes the position that it is not need for TVSS, then why is permission needed for GFPE?

The affirmative comment by Mr. Ode in proposal 4-90 points out an opportunity for this section along with 230.82 to be misinterpreted. The last phrase in 230.71 states “...shall not be considered a service disconnecting means.” Does the panel intend the disconnect for the equipment to be rated for service use that disconnects the TVSS, or GFPE? The answer to this question had historically been understood for the GFPE disconnect which must be a disconnect that would be permitted to serve as a service disconnecting means as pointed out by Mr. Ode's comment. The phrase in 230.82(7) “...if suitable overcurrent protection and disconnecting means are provided” has always been understood by industry to drive the point that Mr. Ode has made in his affirmative comment.

Since the committee rejected proposal 4-108, it has placed in question the need for the TVSS disconnect and even the disconnect for the GFPE equipment to be a “suitable disconnecting means” - suitable for service entrance application. Can a UL 1077 supplemental protector or UL 508 manual motor controller be used as a disconnect for the TVSS? To Mr. Ode's point, acceptance of such devices could permit the welding of contacts and a device that is not suitable for a service environment. I urge the committee to correlate the action taken on proposal 4-90 with this proposal by reconsidering and accepting this proposal (4-108).

Panel Meeting Action: Accept

Number Eligible to Vote: 10

Ballot Results: Affirmative: 10

4-84 Log #1081 NEC-P04
(230.83(2))

Final Action: Reject

Submitter: Neil F. LaBrake, Jr., Niagara Mohawk, a National Grid Company / Rep. Edison Electric Institute

Comment on Proposal No: 4-86

Recommendation: Accept the Proposal.

Substantiation: The substantiation for this Proposal is essentially the basis for the change proposed in Proposal 4-86a. These are similar actions as took place for Proposals 4-24 and 4-26a. This will clarify that service and distribution equipment shall not be considered a separate structure and thereby eliminate the need for redundant equipment.

Panel Meeting Action: Reject

Panel Statement: In recent Code cycles, the panel has tried to develop a set distance at which a service disconnecting means can be located outside the building or structure. Based on architectural design of the building, problems with landscaping obscuring the disconnect, and issues with establishing a proper ground plane for a remote service, the panel has decided that the present text as written in the 2002 NEC provides a workable format. The present text as written in the 2002 NEC provides the flexibility to permit the service disconnecting means to be located where it is readily accessible under whatever design issues may be the case for a particular location. It gives the electrical design team, the electrician, the electrical contractor, the electrical utility, premises owner or operator, and the inspector the ability to determine the service location based on the particular site, utility power availability, and the best design for the installation.

Number Eligible to Vote: 10

Ballot Results: Affirmative: 10

4-85 Log #528 NEC-P04
(230.90(B))

Final Action: Reject

Submitter: Richard L. Eley, Investigative Services Companies, LLC

Comment on Proposal No: 4-111

Recommendation: In my opinion, the panel erred to reject the proposal on the basis that it is flawed.

I base this on the following statements:

1. The proposal is not technically flawed since NEC 230.90(B) opens the neutrals of some systems and NEC 230.90(B) is not technically flawed.

2. This device cannot be installed by the electric utilities since it must be installed in the customer's service equipment, and, therefore, belongs in the National Electrical Code.

3. I have seen numerous fires caused by electric utility ground faults as described in the substantiation of the proposal, even though the customer's electrical system complied with the National Electric Code.

Substantiation: As a Fire Investigator currently employed by Investigative Services Companies, LLC, which has more than 25 years in the field of origin and cause in fire related cases. We have worked with electrical engineers on electrical and non-electrical caused fire.

In my opinion, the addition of this proposal to the National Electric Code would further enhance the safety of the utilities customer by preventing any type of electric utility ground fault.

Panel Meeting Action: Reject

Panel Statement: Proposal 4-111 covers proposed changes to 230.92, not 230.90(B) as indicated in both the section number in the title of the Comment and in the recommendation referencing the opening of "neutrals." There were no proposals to change 230.90(B). There also is no recommendation to make any changes to 230.92.

Number Eligible to Vote: 10

Ballot Results: Affirmative: 10

4-86 Log #1118 NEC-P04 **Final Action: Accept in Principle**
(230.95)

Submitter: Paul Dobrowsky Holley, NY

Comment on Proposal No: 4-116

Recommendation: Accept the proposal with the changes made by Code-Making Panel 1 on Proposal 1-136.

Substantiation: The definition belongs in Article 100. It is used in 200.2, 215.10, 230.95, 240.13, 240.60, 240.85, 250.184, 310.2, 490.71, 517.17, 690.7, 690.41, 690.71, 690.41, and 700.7 of the 2002 NEC.

Panel Meeting Action: Accept in Principle

Change the definition within 230.95 to a new last sentence to the first paragraph of 230-95 to read as follows:

230.95 Ground-Fault Protection of Equipment.

Ground-fault protection of equipment shall be provided for solidly grounded wye electrical services of more than 150 volts to ground but not exceeding 600 volts phase-to-phase for each service disconnect rated 1000 amperes or more. The grounded conductor for the solidly grounded wye system shall be connected directly to ground without inserting any resistor or impedance device. [The remainder of this section to remain as is.]

Panel Statement: Since the NEC TCC has determined that the definition belongs in Article 100, text was added to the first paragraph of 230.95 to ensure that the user of the Code understands that inserting any resistor or impedance device would not be acceptable. Adding this text in the first paragraph provides clarity within this section since any resistor or impedance device would either desensitize the system or totally defeat the reason for the GFP.

Number Eligible to Vote: 10

Ballot Results: Affirmative: 10

4-87 Log #3236 NEC-P04 **Final Action: Accept**
(230.95)

Submitter: Michael I. Callanan, IBEW

Comment on Proposal No: 4-115

Recommendation: Reject proposal 4-115.

Substantiation: There is no technical substantiation presented for expanding the GFPE requirement. The recommendation and the substantiation are in conflict. The submitter did not provide a strikethrough in the word "wye", or revised language to remove the reference to it, as the substantiation would indicate. This comment represents the official position of the International Brotherhood of Electrical Workers Codes and Standards Committee.

Panel Meeting Action: Accept

Number Eligible to Vote: 10

Ballot Results: Affirmative: 10

4-88 Log #562 NEC-P04 **Final Action: Accept**
(230.95.Solidly Grounded)

Submitter: Technical Correlating Committee on National Electrical Code®
Comment on Proposal No: 4-116

Recommendation: It was the action of the Technical Correlating Committee that this Proposal be reconsidered and correlated with the action on Proposal 1-136. 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 Meeting Action: Accept

The panel accepts the recommendation of the TCC to reconsider. Refer to the panel action on Comment 4-86.

Number Eligible to Vote: 10

Ballot Results: Affirmative: 10

4-89 Log #563 NEC-P04 **Final Action: Accept**
(230.95.Solidly Grounded)

Submitter: Technical Correlating Committee on 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 1-136. 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 Meeting Action: Accept

The panel accepts the recommendation of the TCC to reconsider. Refer to the panel action on Comment 4-86.

Number Eligible to Vote: 10

Ballot Results: Affirmative: 10

4-90 Log #204 NEC-P04 **Final Action: Reject**
(230.96)

Submitter: Scott J. Lancaster, Friday, Eldredge & Clark, LLC

Comment on Proposal No: 4-118

Recommendation: Accept proposed new text.

Substantiation: Fires have been caused by ground faults as described in the substantiation of the proposal, notwithstanding the fact that the customer's electrical system complied with the National Electrical Code. The subject device cannot be installed by the electrical utilities inasmuch as it must be installed on the customer's site of the electrical service as part of the customer's service equipment. Accordingly, this requirement belongs in the National Electrical Code.

Panel Meeting Action: Reject

Panel Statement: See panel action and statement on Comment 4-94.

Number Eligible to Vote: 10

Ballot Results: Affirmative: 10

4-91 Log #564 NEC-P04 **Final Action: Accept**
(230.96)

Submitter: Technical Correlating Committee on National Electrical Code®
Comment on Proposal No: 4-118

Recommendation: It was the action of the Technical Correlating Committee that this Proposal be reconsidered by the panel and that the panel act on the technical merits of the proposal, as it is within the Scope of Code-Making Panel 4. This action will be considered by the panel as a public comment. The Technical Correlating Committee refers this Proposal to Code-Making Panels 1, 5, and 10 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 Meeting Action: Accept

The panel accepts the recommendation of the TCC to reconsider. Refer to the panel action on Comment 4-94.

Number Eligible to Vote: 10

Ballot Results: Affirmative: 10

4-92 Log #394 NEC-P04 **Final Action: Reject**
(230.96)

Submitter: Len Tipton, Farm Bureau Insurance

Comment on Proposal No: 4-118

Recommendation: Accept proposed new text.

Substantiation: I have seen fires like this caused by electric utility ground faults, as described in the proposal even though the customer's electrical system complied with the National Electrical Code.

Panel Meeting Action: Reject

Panel Statement: See panel action and statement on Comment 4-94.

Number Eligible to Vote: 10

Ballot Results: Affirmative: 10

4-93 Log #436 NEC-P04
(230.96)**Final Action: Reject****Submitter:** Lonnie L. Buie, Jr., Pettit & Pettit, Consulting Engineers, Inc.**Comment on Proposal No:** 4-118**Recommendation:** Accept the proposal.**Substantiation:** No valid reasons were given for rejecting the proposal. The reasons given by Messrs. Beck and Ode are not legitimate for the following reasons:

a) Mr. Beck says: "This proposal is technically flawed and could lead to an open neutral condition should the device fail to properly operate". Close examination of Sketch C of the proposal clearly shows that the device will not open the neutral. The device disconnects the neutral bus from the equipment ground bus. All branch circuit neutrals remain connected to the neutral bus. The service entrance neutral remains connected to the neutral bus. Clearly, no open neutral condition could ever exist should this device fail to operate. The device simply disconnects the neutral bus from the grounding electrode to interrupt the utility company's fault return path to the neutral through the customer's grounding system. Since the neutral is grounded at the transformer as required by Article 215B(1) of the National Electrical Safety Code and by 250.24(A)(2) of the National Electrical Code, and should the device fail to close properly, the neutral is still grounded outside at the transformer.

b) Mr. Beck says that: "There was no technical substantiation to support the claims being made by the proponent." Sketches A and B of the proposal technically describe the claims being made. This phenomenon is widely known with the fire service, insurance and fire investigation circles. While speaking to the Tennessee chapter of the International Association of Arson Investigators (IAAI) at its annual convention in Gatlinburg, Tennessee on August 16, 2000, I asked how many within the group of approximately 400 had seen fires caused by this phenomenon, almost everyone in the group raised their hands. Again, while speaking to the Arkansas chapter of the IAAI at its annual convention in Hot Springs, Arkansas on April 4, 2003, I asked the same question and many responded that they had seen such occurrences. My personal knowledge of such occurrences is as follows:

1) A lineman with City Water and Light of Joenesboro, Arkansas in the late 1970's watched fire trucks respond to five residential fires in the neighborhood where he had just dropped a live 7200 volt distribution line to the ground. He was still in his bucket above the housetops. All five of the fires originated at a grounding electrode conductor.

2) In 1987, a Craighead Electric Cooperative Corporation line fell to the ground approximately 1/2 mile from the local (name deleted) Restaurant in Trumann, Arkansas. A teenage worker (name deleted) was electrocuted at the instant the line fell because she was partially within the fault current path as she touched the metallic food warmer bin within the restaurant.

3) On January 31, 1991, (names deleted) of Arkansas and a neighbor (name deleted) lost both their homes to fire when a Carroll County Electric Cooperative Corporations' distribution line fell to the ground. The line fell approximately 1/4 mile from the (name deleted) home and approximately 1/2 mile from (name deleted) home.

4) On June 19, 1997, (names deleted) of Arkansas lost their apartment to fire when a tree limb fell on a First Electric Cooperative Corporations' distribution line approximately 100 yards from the apartment.

5) On April 12, 1998, the (name deleted) dealership in Wisconsin burned down when a (name deleted) electric company line was blown into a metal lighting standard on the car sales lot.

6) On September 4, 1998 (name deleted) of (name deleted) excavating was installing a new water line to (name deleted) home in Arkansas, when he cut the neutral conductor of (name deleted) 240/120 volt, single phase, 3-wire underground service to (name deleted) home. He did not cut the two line conductors. He sat on his excavator and watched a bale of hay catch on fire next to the house. The bale of hay was against the No. 6 AWG copper grounding electrode conductor. Eventually the entire house was lost to fire.

7) During the recent wind storm this summer in Memphis, Tennessee, numerous structure fires were reported to have been caused when Memphis Gas Light & Water distribution lines fell during the storm.

c) Mr. Beck says: "There have been many instances whereby the condition alluded to have not resulted in the situation described by the proponent." Mr. Beck is correct that not every distribution line, which falls, creates a fire in a nearby building's electrical system; but many do create fires and cause loss of lives. Not every short circuit creates a fire, but many do. Thus, the National Electrical Code has hundreds of pages of requirements in an attempt to prevent fires from short circuits. The fires that occur from the conditions described within the proposal are preventable without creating any adverse conditions, if only the proposal is adopted. Ironically, it is the building grounding systems with the lowest resistance to ground that attract the largest portions of the utility's fault current.

d) Mr. Ode says: "The type of device covered in the proposed recommendations is part of the utility company distribution system and, based on 90.2(B)(5), is outside the scope of the NEC". The device of the proposal is an added circuit breaker pole to the main circuit breaker of the customer's service equipment obviously within the scope of the National Electrical Code. If Mr. Ode means that an overcurrent protection device on the utility's distribution line should prevent these fires from occurring, then he is correct in some situations where the utility company's neutral size is No. 6 copper, No. 4 aluminum,

or smaller; where the overcurrent device can be set low enough to protect the No. 6 AWG copper grounding electrode conductors of millions of residences and buildings. However, there are many utility distribution lines where the neutrals are larger and the overcurrent device cannot be set low enough to protect the overheating of a customer's No. 6 AWG copper grounding electrode conductor. The load currents on many of these electric utility neutrals are often too large to allow lowering the settings of the overcurrent devices to ampere levels that will prevent the overheating of a No. 6 AWG copper grounding electrode conductor or prevent the overheating of larger grounding electrode conductors.

If no valid reason can be given for rejecting the proposal, then the proposal should be accepted.

Panel Meeting Action: Reject**Panel Statement:** See panel action and statement on Comment 4-94.**Number Eligible to Vote:** 10**Ballot Results:** Affirmative: 104-94 Log #437 NEC-P04
(230.96)**Final Action: Reject****Submitter:** Wayne K. Bramlette, Shelter Ins. Co.**Comment on Proposal No:** 4-118**Recommendation:** Reconsider proposal.**Substantiation:** See my substantiation as shown in the Report on Proposals for Proposal 4-118.

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

Panel Meeting Action: Reject

Panel Statement: There is insufficient technical substantiation to support this comment. The sketches submitted do not constitute technical substantiation. They lack any data or equations by which the panel may evaluate the proposal for efficacy. Further, the sketches seem to assume a limited number of paths for the current flow, but do not indicate the level of current for each supposed likely path. Current flow in the ground is dependent on such factors as soil resistance, moisture content, and even the distance involved. None of these are accounted for in the sketches or any other documentation.

Additionally, the original proposal and several of the comments submitted state that "many fires occur" but all fail to submit any statistics or reports that officially or conclusively support that ground fault currents are the cause of these fires. Such statements are purely anecdotal. The descriptions of some of the incidents in Comment 4-93 could lead to other possible conclusions such as direct contact with electric lines (no voltage given) or voltage gradient problems and may have no relation to ground fault current.

Comment 4-93 further notes the size difference between the grounding electrode conductor and the utility neutral. While there may indeed be a difference in the sizes, the sketch submitted show that part of the path to be through the utility grounding electrode conductor. This conductor is generally smaller than the neutral and is often a #6 copper. Among the factors used to size the utility grounding electrode conductor is the possible fault current it may see.

In addition, the premise of the proposal seems to be that the ground fault current is large enough to heat the conductor sufficiently to cause a fire. However, no stated amount, or more appropriately no stated time-current curve is submitted to show that there is sufficient current in the conductor to cause the fire without operating any related premises or utility protective device. Also, since this may be, as shown in the sketch, a high impedance fault, some sort of relationship between the fault current at the fault and the current in the conductor needs to be shown in order to properly evaluate this device.

Comment 4-96 cites Section 230.90(B) as allowing the neutral to be opened. While true, this Section also requires that the circuit breaker performing that function, simultaneously open ALL the conductors of the circuit. The concern is that the device would open the neutral without opening the other conductors.

Based on the sketches included with the comment, a 3-pole main circuit breaker is being used to interrupt and control the two ungrounded conductors plus the main bonding jumper. The main bonding jumper is connected to the equipment ground bar and then run from the equipment grounding bar to the third pole on the circuit breaker. The line side of the third pole of the circuit breaker is then connected to the grounded conductor. This circuit breaker would open and close all three poles, thus opening the main bonding jumper within the circuit breaker.

Section 250.28 requires an unspliced main bonding jumper be installed between the equipment grounding conductors and the grounded conductors. Inserting a circuit breaker between the equipment grounding bar and the grounded conductor would involve splicing the main bonding jumper which is not permitted at this time. An actual product should be developed and a fact finding report should be done with all of the technical support data about tripping time curves, necessary voltage levels for the system, and the latching and unlatching mechanism of the circuit breaker, as well as feasible methods to use where the circuit breaker phase conductors require a much larger overcurrent protective device than the size overcurrent protective levels as suggested in the proposals for the grounding electrode conductors.

With large services, the grounding electrode conductor is often much smaller than the main bonding jumper since the grounding electrode conductor is not meant to carry fault currents, whereas the main bonding jumper must carry all ground fault currents back to the grounded conductor. More information is needed on this type of system then has been provided by the submitter.

Finally, No data was provided that showed any tests this device was subject to or to document its stated operation.

Number Eligible to Vote: 10

Ballot Results: Affirmative: 10

4-95 Log #500 NEC-P04 **Final Action: Reject**
(230.96)

Submitter: Christopher S. Baker, Investigative Services

Comment on Proposal No: 4-118

Recommendation: In my opinion, the panel erred to Reject the proposal on the basis that it is flawed.

I base this on the following statements:

1. The proposal is not technically flawed since 230.90(B) opens the neutrals of some systems and 230.90(B) is not technically flawed.

2. This device cannot be installed by the electric utilities since it must be installed in the customer's service equipment, and, therefore, belongs in the NEC.

3. I have seen numerous fires caused by electric utility ground faults as described in the substantiation of the proposal, even though the customer's electrical system complied with the NEC.

Substantiation: As a fire investigator currently employed by Investigative Services Companies, LLC, which has more than 25 years in the field of origin and cause in fire related cases. We have worked with electrical engineers on electrical and non-electrical caused fires.

In my opinion, the addition of this proposal to the NEC would further enhance the safety of the utilities' customer by preventing any type of electric utility ground fault.

Panel Meeting Action: Reject

Panel Statement: See panel action and statement on Comment 4-94.

Number Eligible to Vote: 10

Ballot Results: Affirmative: 10

4-96 Log #708 NEC-P04 **Final Action: Reject**
(230.96)

Submitter: Robby E. Landis, Investigative Services Co.

Comment on Proposal No: 4-118

Recommendation: In my opinion, the panel erred to reject the proposal on the basis that it is flawed.

I base this on the following statements:

1. The proposal is not technically flawed since 230.90(B) opens the neutrals of some systems and 230.90(B) is not technically flawed.

2. This device cannot be installed by the electric utilities since it must be installed in the customer's service equipment, and, therefore, belongs in the NEC.

3. I have seen numerous fires caused by electric utility ground faults as described in the substantiation of the proposal, even though the customer's electrical system complied with the NEC.

Substantiation: As a fire investigator currently employed by Investigative Services Companies, LLC, which has more than 25 years in the field of origin and cause in fire related cases. We have worked with electrical engineers on electrical and non-electrical caused fires.

In my opinion, the addition of this proposal to the NEC would further enhance the safety of the utilities customer by preventing any type of electric utility ground fault.

Panel Meeting Action: Reject

Panel Statement: See panel action and statement on Comment 4-94.

Number Eligible to Vote: 10

Ballot Results: Affirmative: 10

4-97 Log #1270 NEC-P04 **Final Action: Reject**
(230.96)

Submitter: Douglas C. Smith, Arkansas Farm Bureau Insurance

Comment on Proposal No: 4-118

Recommendation: I agree with the proposal and recommend its acceptance.

Substantiation: As a certified fire investigator for many years, I have seen several fires caused by electric utility ground faults on the line side of the meter. These occurred while repairs were being made by the utility company and during trenching for other utilities. In addition, some have been caused by sagging or fallen wires and a large number have occurred during ice storms.

Panel Meeting Action: Reject

Panel Statement: See panel action and statement on Comment 4-94.

Number Eligible to Vote: 10

Ballot Results: Affirmative: 10

4-98 Log #1333 NEC-P04 **Final Action: Reject**
(230.96)

Submitter: Rodger Smith, Arkansas Farm Bureau Ins. Co.

Comment on Proposal No: 4-118

Recommendation: Accept proposed new text.

Substantiation: We have experienced several million dollars in fire losses due to collapsed electric lines from ice storms in the past several years. Had this device been installed on the insured's service equipment, these losses would be avoided, as a ground fault would not have occurred.

Panel Meeting Action: Reject

Panel Statement: See panel action and statement on Comment 4-94.

Number Eligible to Vote: 10

Ballot Results: Affirmative: 10

ARTICLE 240 — OVERCURRENT PROTECTION

10-4 Log #2412 NEC-P10 **Final Action: Reject**
(240.2)

Submitter: Leif O. Pihl, IBEW LU 292

Comment on Proposal No: 10-10

Recommendation: Delete the FPN and change the proposal's new definition for Section 240.2 to read as follows:

“Trip Free Circuit Breaker - A circuit breaker designed so that the contacts can not be held in the closed position by the operating means during trip command conditions.”

Substantiation: The original Proposal's FPN reference to Section 240.80 should have indicated (or at least hinted as to) why the definition is needed. If the users of the code do not understand exactly what the phrase “Trip Free Circuit Breaker” means, there could be safety issues with an in-place circuit breaker that CAN be held in the closed position during trip command conditions. Inspectors, electricians, most engineers and certainly members of the public are NOT in the habit of carrying around a copy of UL 489, the source of the CMP's definition, the NEC however is widely available. This resource can then be cited for the elimination of an unsafe circuit breaker.

Panel Meeting Action: Reject

Panel Statement: The submitter did not provide any definitive substantiation that there is confusion in the industry because of the lack of a definition of “trip free” in the NEC.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

10-5 Log #863 NEC-P10 **Final Action: Hold**
(240.2.Industrial Installation)

Submitter: Jamie McNamara Hastings, MN

Comment on Proposal No: 10-8

Recommendation: The definition should read:

Industrial Installation. For the purposes of Part II, the industrial portions of a facility the premises wiring system has 300 kVA or greater of load used in industrial process(es), manufacturing activities, or both, as calculated in accordance with Article 220. 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, substation, or control center.

Substantiation: The comments from several of the panel members is clear there is a strong need for a definition of industrial installation.

I agree with the panel member comments that my original proposal was too restrictive.

Panel Meeting Action: Hold

The panel is holding the comment only. The proposal remains “Rejected”.

Panel Statement: See panel statement on Comment 10-6.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

10-6 Log #3592 NEC-P10 **Final Action: Hold**
(240.2 Industrial Installations)

Submitter: Stan Penrose, Oregon Building Codes Division

Comment on Proposal No: 10-8

Recommendation: Accept this proposal in principle modified by the suggested text in Mr. Frederick's affirmative comment in the ROP.

Substantiation: The term “Industrial Installation” must be defined for those who use the National Electrical Code every day for a living. As inspectors, we need clear guidelines for when the “Industrial Only” rules can be applied. When does a commercial occupancy become an industrial occupancy? Engineers, electricians and inspectors interpret that question very differently. We need help.

Panel Meeting Action: Hold

The panel is holding the comment only. The proposal remains "Rejected".
Panel Statement: This comment was held because it could have broad implications. A decision concerning an appropriate minimal kVA level could not be properly determined within the time frame for processing the Report on Comments.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

10-7 Log #610 NEC-P10
 (Table 240.3)

Final Action: Accept

Submitter: Technical Correlating Committee on National Electrical Code@
Comment on Proposal No: 10-13

Recommendation: It was the action of the Technical Correlating Committee that this Proposal be reconsidered and correlated with the action on Proposal 15-57. 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 Meeting Action: Accept

Panel Statement: The panel accepts the direction of the Technical Correlating Committee to reconsider and correlate action on Proposal 10-13 with the action taken on 15-57. Furthermore, Code-Making Panel 10 agrees with the action of Code-Making Panel 15 to accept Proposal 15-57.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

10-8 Log #2866 NEC-P10
 (240.4)

Final Action: Reject

Note: The Technical Correlating Committee directs that this comment be reported as "Reject". There is substantial engineering material that is used in system design that is not and should not be contained in the NEC. Also, this correlates with the action of CMP 6 on Comment 6-26.

Submitter: Brandon Wiltse Tampa, FL

Comment on Proposal No: 10-16

Recommendation: Accept this proposal in principle as revised below and create a new annex H.

240.4 Protection of Conductors. Conductors, other than flexible cords, flexible cables, and fixture wires shall be protected against overcurrent in accordance with their ampacities specified in 310.15 and in such a manner that their temperature limit is not exceeded, unless otherwise permitted or required in 240.4(A) through (G).

FPN: See Annex H for information on conductor heating and temperature limits under short-circuit conditions.

Move the remaining text of the proposal and the substantiations as revised into a new annex H.

Annex H Conductor Heating and Temperature Limits under Short-Circuit Conditions. This annex is not a part of the requirements of this code but is included for informational purposes only.

There are numerous locations throughout the NEC that remind or require the safe application of conductors so that their short-circuit (temperature ratings) are not exceeded. These locations include but are not limited to 110.10; 240.1 FPN; 240.92(B)(1)(3); 240.92(D); 240.100(A); 240.100(C); 250.4(A)(5); 250.4(B)(4); and Table 250.122 Note. The following physics formulas submitted with this proposal are provided as a guide for the performance of conductors under short circuits conditions. These formulas represent are the accepted basis for conductor short-circuit temperatures throughout the world. They are found in the ANSI/IEEE Red, Gray, Buff and Blue Books and in the Canadian Electrical Code. Similar versions of these formulas are found in IEC60204-1 (IEC Machinery Standard), SAE HS-1738 (Automotive Industry Machinery Standard), and IEC 60364-4-43 (Installation Standard). The NEC is only major installation guide throughout the world that does not supply its reader with these necessary physics formulas so that cables can be applied within their short-circuit (temperature) limitations. Let's catch up with the rest of the world and provide this information for the users of the NEC.

Conductor heating under short-circuit conditions is determined by (1) or (2):

(1) Short-Circuit Formula for Copper Conductors

$$(I_s/A_s)t = 0.0297 \log_{10} ((T_2 + 234)/(T_1 + 234))$$

where

I = short-circuit current in amperes

A = conductor area in circular mils

t = time of short-circuit in seconds

T₁ = initial conductor temperature in degrees Celsius

T₂ = final conductor temperature in degrees Celsius

Copper conductor with paper, rubber, varnished cloth insulation T₂ = 200

Copper conductor with thermoplastic insulation T₂ = 150

Copper conductor with crosslinked polyethylene insulation T₂ = 250

Copper conductor with ethylene propylene rubber insulation T₂ = 250

(2) Short-Circuit Formula for Aluminum Conductors

$$I_s/A_s t = 0.0125 \log_{10} ((T_2 + 228)/(T_1 + 228))$$

where

I = short circuit current in amperes

A = conductor area in circular mils

t = time of short-circuit in seconds

T₁ = initial conductor temperature in degrees Celsius

T₂ = final conductor temperature in degrees Celsius

Aluminum conductor with paper, rubber, varnished cloth insulation T₂ = 200

Aluminum conductor with thermoplastic Insulation T₂ = 150

Aluminum conductor with crosslinked polyethylene Insulation T₂ = 250

Aluminum conductor with ethylene propylene rubber insulation T₂ = 250

Substantiation: Recognizing the importance of this information and the desire of the panel not to place these formulas into the requirements of 240.4, the original proposal was revised as recommended in the panel statement and Mr. Dollard's and Mr. Ockuly's affirmative statements. The only revision still proposed to 240.4 is the inclusion of the requirement not to exceed the temperature limit of the conductor as this is important in reducing the risk of fire associated with an overheated conductor. The FPN was added to inform the user of the location of the new annex material.

The revisions provided in this comment should fulfill the option contained in the panel statement by moving the proposed equations into a new Annex H. The lead paragraph, in the proposed annex H, is a revised version of the substantiation provided in the original proposal and received public review. The title and lead statement for proposed Annex H was provided to comply with the NEC style manual.

Panel Meeting Action: Accept in Principle in Part

The panel accepts the placement of this material into an annex, revised to read as follows, and the remainder of the comment is rejected:

"Annex H. Conductor Heating and Temperature Limits under Short-Circuit Conditions.

This annex is not a part of the requirements of this Code but is included for informational purposes only.

There are numerous locations throughout the NEC that reference the safe application of conductors such that their temperature ratings are not exceeded under short-circuit conditions.

The following formulas are found in several technical references and can be used to help calculate the temperature rise of conductors under short circuit conditions. They are typically applied under engineering supervision.

Conductor heating under short-circuit conditions is determined by (1) or (2):

(1) Short-Circuit Formula for Copper Conductors

$$(I^2/A^2)t = 0.0297 \log_{10} ((T_2 + 234.5)/(T_1 + 234.5))$$

where

I = short-circuit current in amperes

A = conductor area in circular mils

t = time of short-circuit in seconds

T₁ = initial conductor temperature in degrees Celsius

T₂ = final conductor temperature in degrees Celsius

Copper conductor with paper, rubber, varnished cloth insulation T₂ = 200

Copper conductor with thermoplastic insulation T₂ = 150

Copper conductor with crosslinked polyethylene insulation T₂ = 250

Copper conductor with ethylene propylene rubber insulation T₂ = 250

(2) Short-Circuit Formula for Aluminum Conductors

$$(I^2/A^2) t = 0.0125 \log_{10} ((T_2 + 228.1)/(T_1 + 228.1))$$

where

I = short circuit current in amperes

A = conductor area in circular mils

t = time of short-circuit in seconds

T₁ = initial conductor temperature in degrees Celsius

T₂ = final conductor temperature in degrees Celsius

Aluminum conductor with paper, rubber, varnished cloth insulation T₂ = 200

Aluminum conductor with thermoplastic Insulation T₂ = 150

Aluminum conductor with crosslinked polyethylene Insulation T₂ = 250

Aluminum conductor with ethylene propylene rubber insulation T₂ = 250."

Panel Statement: The panel edited the proposed text to remove references to external documents and to emphasize that these formulas are typically applied under engineering supervision. The additional text proposed for 240.4 is unnecessary since this action has created an annex.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 11 Negative: 1

Explanation of Negative:

KIMBLIN: These formulas are not needed to use or interpret the NEC. These formulas are readily available in reference works including the ICEA bulletin where the application of the formulas is explained with information that is needed by the user.

10-9 Log #2883 NEC-P10
 (240.4)

Final Action: Reject

Submitter: Joel G. Solis, Air-Conditioning & Refrigeration Institute

Comment on Proposal No: 10-17

Recommendation: Panel 10 erred by not rejecting Proposal 10-17.

Substantiation: Removing the appliance cord from Section 240 will not improve the safety of these products. The code panel believes that the appliance cord is the purview of the product safety standard that is associated with a specific product. For example, a household refrigerator is tested to Underwriters laboratories Standard 250. This standard already has specific requirements for the cord and attachment plug to connect the refrigerator to the

permanent wiring system. The attachment cord and plug will further be evaluated using UL Standard 819.

The affect of removing the ability to “tap” an appliance cord and plug to the premise wiring system will require UL to determine if overcurrent protection must be added to the plug of the appliance cord. If, for example, the cord is made up of 16 AWG then it would need overcurrent protection to be able to connect it to a 15 ampere branch circuit premises wiring system. However a 14 or 12 AWG appliance cord would not require overcurrent protection to be connected to a 15 or 20-ampere branch circuit premises wiring system.

It is believed that by removing the permissive statement in 240-5 allowing appliance cords and extension cords to be connected to the premises wiring system, the product standards will be changed to require overcurrent, arc fault circuit interrupters or leak detection circuit interrupters or combinations of these devices to be part of the attachment plug.

Removing the permissive statement fails to acknowledge the real cause of fires attributed to cord connected equipment. While cord sets have failed by being abused, the larger, and very real problem is the interface with the premises wiring system, the receptacle. The receptacle is a clamping device that grips the blade of the plug. There are standards that define the dimension of both the plug and blades and the receptacle terminals and internal clamps. The standards will include insertion force and retention force. A new receptacle will meet these standards. Unfortunately, with time and use these forces decrease. With age and use the clamping action of the receptacle will continue to relax. A high amperage cyclic load, such as a space heater, will cause the receptacle to heat. If the receptacle is worn, then the heating will be excessive and this heat will cause the plug to overheat. In turn, this heat will also affect the appliance or extension cord insulation causing deterioration. If not replaced, in time, the system will fail. Fusing the plug will not guarantee that an arcing condition within the receptacle plug combination will cause the fuse to open. AFCI or LDCIs would not be able to detect the arcing condition, either, because they are located in the circuit after the point of the disturbance.

The GFCI that is currently used in hair care products takes up about 3 cubic inches. It is reasonable that a fuse, circuit breaker, AFCI, or LDCI would need similar space. This will add additional weight to the attachment plug. Unlike hair care products, that are used on an intermittent basis, unplugged and put away, TV’s, lamps, etc are left plugged in for longer periods. The additional weight of a plug with a “sensing device”, plugged into a weakened receptacle may not be fully retained. This condition will further increase the chance that the receptacle will overheat and produce an arcing condition.

Code Panel 10 needs to retain the provisions of 240.5 and encourage Code Panels 2, & 18 to look at providing AFCI or LDCI protection internal to receptacles.

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

Panel Meeting Action: Reject

Panel Statement: Protection of cords that are part of listed utilization equipment is more appropriately addressed in the product standard. Existing 240.5 requirements are unenforceable by the Authority Having Jurisdiction because equipment is installed after final inspection is complete.

Product standards currently address the appropriate requirements for these products. The continued acceptance of this concept will not require automatic revisions to these standards.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 10 Negative: 2

Explanation of Negative:

CLINE: No substantiation presented to me has shown that the gauge of the (copper) conductor itself has ever been demonstrated as the cause of cord problems. The vast predominance of evidence which I have seen has been that the structural integrity of the cord insulation has failed, or the cord has been pulled apart. This portion of the design, application, and testing for listing purposes has been the responsibility of the manufacturer and the listing company for a long time. Why do we think that they will make better decisions if we remove guidelines having to do with the gauge of the conductor? They will continue to allow the conductors to be stressed components of the cord instead of requiring the addition of tension structural components in the cord. They will continue to allow cords which lay on floors for years, suffering repeated damage by items such as chair legs, to be built and installed without special resistance to crushing and cutting. I cannot see how we will solve the problem this way.

Do I misunderstand the new text, or will the field-installed cord for my 6 amp disposal, and for my 10 amp dishwasher now have to be a #12 cord? Will I no longer be allowed to make a 16/3 SO extension cord for my 5 amp hedge trimmer? Am I now going to drag around a #12 cord! What are we doing?

But if the cord is supplied with the appliance, or if the extension cord is factory made, it may be as small as a manufacturer can get listing company to buy off on. I should soon be able to go to Home Depot and buy a 100 ft 18 gauge (maybe even 20 gauge!) extension cord as long as I promise not to exceed its listing requirements. How can we, in good conscience, abandon minimum standards?

Heavier gauge conductors alone will do very little, if anything at all, to protect against the kind of damage causing fires and death. I believe we are causing useless expense in many cases, we are not addressing the real cause of the problem with cords, and we are setting up a situation ripe for the kind of corporate greed which causes others to pay the price.

MUNSON: I believe that the submitter’s comment is correct and that the panel should reconsider its action.

10-10 Log #611 NEC-P10 **Final Action: Accept**
(240.4(B))

Submitter: Technical Correlating Committee on National Electrical Code®
Comment on Proposal No: 10-17

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 Meeting Action: Accept

Panel Statement: Code-Making Panel 10 accepts the Technical Correlating Committee direction for further consideration.

After reviewing the comments expressed in the voting, Code-Making Panel 10 continues to “Accept in Principle” Proposal 10-17 due to the panel action on Comment 10-21.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 10 Negative: 2

Explanation of Negative:

CLINE: I agree to “Accept” the TCC’s desire to reconsider, but I disagree with the Panel statement and effective action.

MUNSON: See my Explanation of Negative Vote on Comment 10-9.

10-11 Log #612 NEC-P10 **Final Action: Accept**
(240.4(B))

Submitter: Technical Correlating Committee on National Electrical Code®
Comment on Proposal No: 10-18

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 Meeting Action: Accept

Panel Statement: Code-Making Panel 10 accepts the Technical Correlating Committee direction for further consideration.

After reviewing the comments expressed in the voting, Code-Making Panel 10 continues to “Accept in Principle” Proposal 10-18 due to the panel action on Comment 10-21.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 10 Negative: 2

Explanation of Negative:

CLINE: See my Explanation of Negative Vote on Comment 10-10.

MUNSON: See my Explanation of Negative Vote on Comment 10-9.

10-12 Log #613 NEC-P10 **Final Action: Accept**
(240.4(B))

Submitter: Technical Correlating Committee on National Electrical Code®
Comment on Proposal No: 10-19

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 Meeting Action: Accept

Panel Statement: Code-Making Panel 10 accepts the Technical Correlating Committee direction for further consideration.

After reviewing the comments expressed in the voting, Code-Making Panel 10 continues to “Accept in Principle” Proposal 10-19 due to the panel action on Comment 10-21.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 10 Negative: 2

Explanation of Negative:

CLINE: See my Explanation of Negative Vote on Comment 10-10.

MUNSON: See my Explanation of Negative Vote on Comment 10-9.

10-13 Log #1371 NEC-P10
(240.4(C))

Final Action: Reject

Note: The Technical Correlating Committee directs that the action on Proposal 10-22 be reported as "Reject" because less than two-thirds of the members eligible to vote have voted in the affirmative on Comment 10-13.

Submitter: James W. Carpenter, International Association of Electrical Inspectors

Comment on Proposal No: 10-22

Recommendation: Reconsider and reject proposal 10-22

Substantiation: Reasons presented in the negative votes are valid. This proposed change would expand the concept of permitting smaller conductors being not protected at their ampacity without evaluation through testing to assure proper protection of conductors and does not consider full impact on safety.

Additional concern on proposal item #4 as to what the testing is intended to include.

Panel Meeting Action: Reject

Panel Statement: The panel agrees that the proposed change would expand the concept of protecting conductors with the next higher standard sized overcurrent protective device only after evaluation through testing to ensure proper protection of the conductors.

However, the panel has taken into consideration the impact on safety. Safety cannot be ensured without proper testing, listing, and application of the new rules. New devices will need to be made, tested, and listed. The panel realizes that additional engineering may need to be done to design new overcurrent devices as well as the enclosed equipment where they will be installed.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 6 Negative: 6

Explanation of Negative:

BLIZARD: See my explanation of negative vote on Comment 10-16.

BORTHICK: After careful consideration, I would like to change my vote to negative on this Comment.

Considering that the original proposal was concerned with being able to run parallel 500 kcmil conductors, it does seem more prudent to pursue revising the table ampacity of these conductors rather than expecting the creation of an OCPD to accommodate the existing ampacity. However, since this notion was rejected by CMP 6, it does seem that this would open a "back door" thus permitting what CMP 6 has rejected. Furthermore, I can foresee confusion and misapplication within the general electrical community. Perhaps this issue can be revisited after (and if) such a device is tested and listed for these applications.

DOLLARD: I am voting against the panel action to Reject Comment 10-13. My reasons are as follows:

I continue to believe that this concept has merit and deserves further consideration as stated in my "comment on affirmative" in the comment stage of the previous cycle. However this proposed change will encompass much more than four 500-kcmil conductors for a 1600-amp service. Additional technical substantiation as well as testing is needed to address the concern of additional heat created by a reduction in the circular mil area of the conductor. This substantiation and testing must include different size/type conductors and OCPD ratings. The product standards must first address the requirements for an OCPD for this purpose. Presently an OCPD listed for this application does not exist.

KIMBLIN: This change is a relaxation of a safety rule that has been in place for over 40 years. No testing has been done to support the change and no overcurrent protective devices are listed to support the application. The need for a special overcurrent protective device for this application may open opportunities for misapplication.

WILLIAMS: I vote negative on the panel action. This change would expand the concept of permitting smaller conductors that are not being protected at their ampacity. This would be accomplished without evaluation through testing to assure proper protection of conductors and does not consider full impact on safety. This is the official position of the International Association of Electrical Inspectors.

ZAPLATOSCH: The original Proposal 10-22, and the panel action on the proposal that added "(4) the overcurrent device has been listed for use with the smaller conductors" does not adequately address all concerns with making this change.

The panel action on Proposal 10-22 to add item (4) only requires that the overcurrent device be listed for use with the smaller conductors. The overall suitability of the overcurrent device when used with the receiving equipment is not addressed by the proposal.

The standards governing the overcurrent devices can be reviewed and amended to address this change. Additional testing of the overcurrent protective device would likely be required. However, if the overcurrent device passed the test, it cannot be assumed that the overcurrent device can be used in the receiving equipment wired with the smaller ampacity conductors. The combination of the overcurrent device and receiving equipment needs to be considered. The proposal makes no such consideration. Additional markings on an overcurrent device indicating its suitability, or lack thereof, to be wired as allowed by the proposal would be inadequate to assure proper use, and would cause confusion.

Comment on Affirmative:

CLINE: For ampacities above 25 amps, the existing text of 240.4(C) allows conductors to be protected by OCPDs at up to 20 percent larger than the conductor's ampacity, no higher. This seems to me to be proper recognition

that the conductor ampacity tables do not represent actual lines which mark an ampacity which will guarantee safety; they are simply good compromises.

The same blanket application to levels higher than 800 amps would allow steps of 25 percent and 33 percent. It is certainly prudent to consider these too high to allow. But, allowing the upgrade where it is limited 6 percent is just as certainly very safe. This 6 percent maximum is less than 1/3rd of the 20 percent jumps which are now allowed.

Many years of experience has shown that 500 kcmil is quite safe when protected by a 400 amp device. This is less than a 6 percent up-rating. We should allow this conservative and well-proven design, and any similar example, to be installed.

10-14 Log #614 NEC-P10
(240.4(C) Exception (New))

Final Action: Reject

Note: The Technical Correlating Committee directs that Comment 10-14 and Proposal 10-22 be reported as "Reject" because less than two-thirds of the members eligible to vote have voted in the affirmative.

Submitter: Technical Correlating Committee on National Electrical Code®

Comment on Proposal No: 10-22

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 Meeting Action: Accept

Panel Statement: The panel accepts the direction of the Technical Correlating Committee to consider the comments expressed in the voting.

However, the panel continues to "Accept in Principle" Proposal 10-22.

See also panel action and statement on Comment 10-16.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 6 Negative: 6

Explanation of Negative:

BLIZARD: See my explanation of negative vote on Comment 10-16.

BORTHICK: See my explanation of negative vote on Comment 10-13.

DOLLARD: See my Explanation of Negative Vote on Comment 10-13.

KIMBLIN: See my Explanation of Negative Vote on Comment 10-13.

WILLIAMS: See my explanation of negative vote on Comment 10-13.

ZAPLATOSCH: See my explanation of negative vote on Comment 10-13.

Comment on Affirmative:

CLINE: See my Affirmative with Comment on Comment 10-13.

10-15 Log #1992 NEC-P10
(240.4(C) Exception (New))

Final Action: Reject

Note: The Technical Correlating Committee directs that Comment 10-17 and Proposal 10-22 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: 10-22

Recommendation: Reject the proposal.

Substantiation: It is not worth breaking the 800A threshold, which has been in place for over 40 years, just because someone wants to use 500 kcmil conductors in parallel as if they were 600 kcmil conductors. If this language is changed, UL will have no choice but to subject the industry to a very costly file review and standards change, because overcurrent devices, conductors, and terminating devices are all a mechanical whole after everything gets installed. Both the device manufacturers and the manufacturers of overcurrent devices rely on this continuous system for thermal stability. The real reason 215.2(A)(1) requires conductor upsizing for continuous loads is not because the conductors might be damaged by those loads. It is because the larger conductors function as a heat sink under those conditions. If this proposal remains accepted, the larger devices will all require reengineering because the assumptions underlying the product standard will no longer be valid. The substantiation for this proposal is both true and beside the point.

Panel Meeting Action: Reject

Panel Statement: The panel disagrees that testing laboratories would have no choice but to force industry to change any standards. Any additional listings in response to this action would be optional.

See also panel action and statement on Comment 10-16.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 6 Negative: 6

Explanation of Negative:

BLIZARD: See my explanation of negative vote on Comment 10-16.

BORTHICK: See my explanation of negative vote on Comment 10-13.

DOLLARD: See my Explanation of Negative Vote on Comment 10-13.

KIMBLIN: See my Explanation of Negative Vote on Comment 10-13.

WILLIAMS: See my Explanation of Negative Vote on Comment 10-13.

ZAPLATOSCH: See my explanation of negative vote on Comment 10-13.

Comment on Affirmative:

CLINE: See my Affirmative with Comment on Comment 10-13.

10-16 Log #2565 NEC-P10
(240.4(C) Exception (New))

Final Action: Reject

Note: The Technical Correlating Committee directs that Comment 10-17 and Proposal 10-22 be reported as “Reject” because less than two-thirds of the members eligible to vote have voted in the affirmative.

Submitter: Vince Baclawski, National Electrical Manufacturers Association (NEMA)

Comment on Proposal No: 10-22

Recommendation: Reject the proposal.

Substantiation: The rule requiring conductors to be protected at their ampacity where the overcurrent protective device is rated over 800 amperes is a well-established rule. In fact, protecting the conductors is the reason for providing overcurrent protection. We have no basis for changing the ampacity and therefore no basis for a change in the protection. Thus CMP 6 has so far rejected Proposal 6-44, which would have increased the ampacity of 500 kcmil to 400 amperes. Here we note that adding 6 percent to the current adds 12 percent to the heat. We have no basis for accepting the additional heat.

It is true that the next higher standard overcurrent device (above the ampacity of the conductors being protected) is permitted for devices rated 800A or less. But successful experience with this 800A rule, established more than 30 years ago, does not justify doubling the range, with the proposed conditions, to 1600A. Again, the justification for this general rule change, including the 6 percent over-rating, seems to be motivated by a particular situation; the need to accommodate four sets of 500 kcmil for 1600A. But major changes to the code should not be motivated by particular situations. What is the justification for 6 percent versus 2 percent or 20 percent? Could problems be encountered at 1000A or 1200A with the newly suggested rules?

Finally, to our knowledge, there are no specially listed devices to satisfy the new item (4) added by the Panel Action. Even with listed overcurrent protective devices, the impact on equipment in which these devices are to be used has not been considered.

Panel Meeting Action: Reject

Panel Statement: The panel agrees that the proposed change would expand the concept of protecting conductors with the next higher standard sized overcurrent protective device only after evaluation through testing to ensure proper protection of the conductors.

However, the panel has taken into consideration the impact on safety. Safety cannot be ensured without proper testing, listing, and application of the new rules. New devices will need to be made, tested, and listed. The panel realizes that additional engineering may need to be done to design new overcurrent devices as well as the enclosed equipment where they will be installed.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 6 Negative: 6

Explanation of Negative:

BLIZARD: I vote negative to the panel action on Comment 10-16. The substantiation for Proposal 10-22 included discussions of thermal damage curves with respect to short circuit currents. I don't believe that this issue is about fault currents, but rather long sustained small overloads near the cable's ampacity. CMP-6 Rejected Proposal 6-44 to increase the ampacity of 500 kcmil copper cable to 400 amperes, which would have achieved the results that Proposal 10-22 is attempting to obtain; that is, allowing four sets of 500 kcmil conductors to be protected by a 1600 ampere protective device. I am not persuaded by the substantiation that this is the correct thing to do even with CMP-10's addition of a listing requirement.

BORTHICK: See my explanation of negative vote on Comment 10-13.

DOLLARD: See my Explanation of Negative Vote on Comment 10-13.

KIMBLIN: See my Explanation of Negative Vote on Comment 10-13.

WILLIAMS: See my Explanation of Negative Vote on Comment 10-13.

ZAPLATOSCH: See my explanation of negative vote on Comment 10-13.

Comment on Affirmative:

CLINE: See my Affirmative with Comment on Comment 10-13.

10-17 Log #3291 NEC-P10
(240.4(C) Exception)

Final Action: Reject

Note: The Technical Correlating Committee directs that Comment 10-17 and Proposal 10-22 be reported as “Reject” because less than two-thirds of the members eligible to vote have voted in the affirmative.

Submitter: Larry G. Watkins, Alcan Cable

Comment on Proposal No: 10-22

Recommendation: Delete Exception to 240.4(C).

Substantiation: No justification to relax protection of conductors for over 800 amperes.

Panel Meeting Action: Reject

Panel Statement: See panel action and statement on Comment 10-16.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 7 Negative: 5

Explanation of Negative:

BORTHICK: See my explanation of negative vote on Comment 10-13.

DOLLARD: See my Explanation of Negative Vote on Comment 10-13.

KIMBLIN: See my Explanation of Negative Vote on Comment 10-13.

WILLIAMS: See my Explanation of Negative Vote on Comment 10-13.

ZAPLATOSCH: See my explanation of negative vote on Comment 10-13.

Comment on Affirmative:

CLINE: See my Affirmative with Comment on Comment 10-13.

10-18 Log #1994 NEC-P10
(240.4(D))

Final Action: Reject

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

Comment on Proposal No: 10-27

Recommendation: Reject the proposal.

Substantiation: The substantiation assumes that the proximate cause of appliance supply cord fires is related to the capability of the cord to sustain overloads relative to the branch circuit size. I suspect the real reason has to do with cord deterioration through abusive handling or age. Lowering the overcurrent device in terms of size will do little to help this problem. Furthermore, even more troubling is the decision to remove the NEC Committee from any decision-making role over the use of these sizes of cord, and transfer it to the testing laboratories. This information should remain under the direct control of the NFPA consensus process.

Panel Meeting Action: Reject

Panel Statement: Protection of cords that are part of listed utilization equipment is more appropriately addressed in the product standard. Existing 240.5 requirements are unenforceable by the authority having jurisdiction because equipment is installed after final inspection is complete.

Product standards currently address the appropriate requirements for these products. The continued acceptance of this concept will not require automatic revisions to these standards.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 10 Negative: 2

Explanation of Negative:

CLINE: See my Explanation of Negative Vote on Comment 10-9.

MUNSON: I agree with the submitter's comments.

10-19 Log #615 NEC-P10
(240.5)

Final Action: Accept

Submitter: Technical Correlating Committee on National Electrical Code®

Comment on Proposal No: 10-27

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 Meeting Action: Accept

Panel Statement: Code-Making Panel 10 accepts the Technical Correlating Committee's direction for further consideration.

After reviewing the comments expressed in the voting, Code-Making Panel 10 continues to “Accept in Principle” Proposal 10-27 due to the panel action on Comment 10-21.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 10 Negative: 2

Explanation of Negative:

CLINE: See my Explanation of Negative Vote on Comment 10-9.

MUNSON: The panel has not given the Technical Correlating Committee's concern sufficient discussion. The Technical Correlating Committee has directed the panel to review its action because there is a direct conflict with Code-Making Panel 11. Code-Making Panel 11 has said that the appliance cord is not a product standard issue, but belongs to the NEC. Code-Making Panel 11 has developed a requirement that the appliance cord must have an AFCI device when applied to a room air conditioner (RAC) or a package terminal air conditioner (PTAC). Code-Making Panel 10 has said that the appliance cord is a product standard issue. We are left with a conflict.

The argument that Code-Making Panel 10 states is that the appliance cord cannot be inspected by the authority having jurisdiction.

Code-Making Panel 11 argues that the authority having jurisdiction will be able to inspect the appliance cord to determine that an appropriate AFCI device has been included as part of the construction.

This conflict needs to be addressed.

10-20 Log #3102 NEC-P10
(240.5)

Final Action: Reject

Submitter: Kenneth E. Vannice, Leviton/NSI-Colortran / Rep. United States Institute for Theatre Technology Engineering Comm.

Comment on Proposal No: 10-27

Recommendation: This proposal should be rejected.

Substantiation: The changes in (1) default to the listing agency requiring the proper plug configuration to match the appropriately rated receptacle. This might be fine in instances where NEMA configurations are involved. Where non-NEMA configurations are involved as they are in the entertainment industry, this idea does not work. The changes in (3) assume all extension cords are

listed assemblies. Most extension cords used in the entertainment industry are field fabricated from Listed cable and Listed connectors. These changes would require the entertainment industry to modify Chapter 5 articles for which there is no time in this code cycle. The existing language is quite adequate.

Panel Meeting Action: Reject

Panel Statement: Protection of cords that are part of listed utilization equipment is more appropriately addressed in the product standard. Existing 240.5 requirements are unenforceable by the authority having jurisdiction because equipment is installed after final inspection is complete.

Product standards currently address the appropriate requirements for these products. The continued acceptance of this concept will not require automatic revisions to these standards.

Proposal 10-27, as modified by the panel, does permit field assembled cord sets.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 11 Negative: 1

Explanation of Negative:

CLINE: See my Explanation of Negative Vote on Comment 10-9.

10-21 Log #3219 NEC-P10
(240.5)

Final Action: Accept

Submitter: Michael I. Callanan, IBEW

Comment on Proposal No: 10-27

Recommendation: Continue to accept in principle this proposal.

Substantiation: This safety driven action taken by CMP-10 is directly in line with the stated purpose of the National Electrical Code. The practical safeguarding of persons and property from hazards arising from the use of electricity includes appliances, portable lamps and extension cords. It is practical to require that together, the manufacturer and the listing agency evaluate appliances, portable lamps and extension cords with a focus on the product history, conditions of use as well as possible/typical abuse. The vast majority of products and manufacturers will not be affected in any way by this change. This change will not require full sized conductors. It may result in more durable cord insulation. Together the listing agency and manufacturer will determine what is required. This change will appropriately require that together, manufacturers and listing agencies evaluate products.

This comment represents the official position of the International Brotherhood of Electrical Workers Codes and Standards Committee.

Panel Meeting Action: Accept

Number Eligible to Vote: 12

Ballot Results: Affirmative: 10 Negative: 2

Explanation of Negative:

CLINE: See my Explanation of Negative Vote on Comment 10-9.

MUNSON: See my Explanation of Negative Vote on Comment 10-19.

10-22 Log #3902 NEC-P10
(240.5)

Final Action: Accept

Submitter: Ricky Massicott Higganum, CT

Comment on Proposal No: 10-27

Recommendation: Continue to accept in principle.

Substantiation: This change is absolutely necessary for the enforcement community. Inspectors do not, nor should they be required to inspect lamp and appliance cords. This type of requirement is for UL and other listing agencies to handle. The panel members are correct to accept this proposal. The panel members have also pointed out that this language should be handled by listing agencies and not inspectors. As stated in the negative comment of Mr. Munson, "This was not intended as an inspection point for the authority having jurisdiction, because it is not premises wiring." This statement clearly points out that this is primarily a product standards issue. This change will also allow for evaluation of individual products that may be a problem because the "carte blanche" permission in the NEC will be removed.

Panel Meeting Action: Accept

Number Eligible to Vote: 12

Ballot Results: Affirmative: 10 Negative: 2

Explanation of Negative:

CLINE: See my Explanation of Negative Vote on Comment 10-9.

MUNSON: The submitter of the comment assumes that all portions of the NEC must be "enforceable" by direct observation. Unfortunately, there are some things that are not observable and enforcement is by indirect means such as identification.

The allowance for appliance cords and extension cords is not in the code for direct enforcement but an allowance that a restrictive "tap" was permitted. This allows the product safety standards to determine what specific construction is needed for these products. For example, some appliances may require that the appliance cordset be of heavy-duty construction, while others may be of minimum construction. The submitter of the original proposal assumed that by denying the "tap" that overcurrent protection will be the default construction for any appliance or extension cord smaller than 14 AWG. This has been the thrust of these proposals for a number of years. What we know is that over-

current protection will not, for the most part, protect the appliance cord or an extension cord because they usually fail from abuse, not catastrophic shorting out.

Code-Making Panel 11 has determined that for some appliance application, such as room air-conditioners, an AFCI device will satisfy the need to protect the cordset from failure by abuse. This requirement went into the 2002 code. It was a surprise that no such proposal came to Code-Making Panel 10 for the 2005 cycle to become a general requirement for appliance cords and extension cords. It appears that arc fault signature detection is viable and is needed. With Code-Making Panel 10 removing appliance cords and extension cords from the code, the opportunity to fix the problem is gone. Products that Code-Making Panel 11 is mandating to include AFCI at the connection point will in most cases be supplied by an additional appliance extension cord that will not include the AFCI device. So, we wind up with the first 12 feet of the "soft connection" (CMP-10) without AFCI protection and the last 6 feet (CMP-11) with an AFCI device as part of its construction. And, at the end of the day, we will still have the same number of fires.

10-23 Log #701 NEC-P10
(240.5(A), 240-5(B) (New))

Final Action: Reject

Submitter: Dan Leaf Rancho Santa Margarita, CA

Comment on Proposal No: 10-28

Recommendation: Accept the proposed exception.

Substantiation: The provisions o 240.4(A), (B), and (G) do not apply to permanently connected cords used as ranch circuits or feeders, since the first paragraph of this section excludes them. For permanently connected cords and cables used for wiring of a material handling magnet, elevators, cranes or hoists, motors, floating buildings, marinas and boatyards, the provisions of (A), (B) and (G) do not apply and in many cases would require an increase in size above the ampacity required due to standard ratings of overcurrent devices normally used. For example; a portable power cable Type W 90 C 1/0 AWG under subheading F of Table 400.5(B) has a rated ampacity of 205 which would require a standard rated overcurrent device not over 200 amperes or a nonstandard rating of 205. In cases where the required ampacity is 205 the use of a standard rated OC device sufficient for the load is 225 amperes which then requires 2/0 AWG conductors. The same scenario can apply for other permanently connected cords and cables such as permitted in Articles 553, 555, 610, 620, not covered in Table 240.4(G), wherein flexible cords for motor conductors appear to be exempted from this section.

Panel Meeting Action: Reject

Panel Statement: No substantiation has been provided that a problem has occurred. This verbiage has been in the NEC for a long time with no problems being presented.

The removal of supplementary overcurrent protection as an option downstream of the final branch circuit overcurrent protective device limits application flexibility.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

Comment on Affirmative:

OCKULY: This comment should have been "Accepted in Part". The part not accepted is the removal of the sentence "Supplemental overcurrent protection, as in 240.10, shall be permitted to be an acceptable means for providing this protection." The panel statement accurately describes the reason for Rejecting this part of the proposal.

The part that should have been accepted was the addition of the "Exception". It appears that without this added Exception, the provisions for "Power Loss Hazard", "Devices Rated 800 Amperes or Less", or "Overcurrent Protection for Specific Conductor Applications" do not apply for flexible cords, flexible cables, and fixture wires.

10-24 Log #1978 NEC-P10
(240.5(B)(1))

Final Action: Accept

Submitter: James T. Dollard, Jr., IBEW Local 98

Comment on Proposal No: 10-30

Recommendation: Reject this proposal.

Substantiation: The submitter has pointed out a perceived problem with the present text of 240.5(B) in the application of 410.30(C)(1). The submitter's intent is met in the present text of 410.30. The second list item of this section clearly and specifically references connection to branch circuits of 50-amps or less by complying with 240.5. Note also that the reference made to section 240.5(B) in 410.30 is under the purview of CMP-18.

Furthermore the deletion of "appliance or portable lamp" and insertion of "utilization equipment" represents an extremely broad and global change. The definition of appliance in Article 100 is as follows:

Appliance. Utilization equipment, generally other than industrial, that is normally built in standardized sizes or types and is installed or connected as a unit to perform one or more functions such as clothes washing, air conditioning, food mixing, deep frying, and so forth.

Note that the definition basically excludes industrial equipment and provides guidance to the user and inspector by referencing standard sizes and types etc. The acceptance of this proposal will allow undersized conductors for all "utilization equipment." The term "utilization equipment" is overly broad and would allow the application of 240.5(B) to any equipment utilizing electric current.

Panel Meeting Action: Accept
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

10-25 Log #1996 NEC-P10 **Final Action: Reject**
 (240.5(B)(1))

Submitter: Frederic P. Hartwell, Hartwell Electrical Services, Inc.
Comment on Proposal No: 10-30

Recommendation: Continue to accept the proposal.
Substantiation: In response to the comments in the voting, it is true that this proposal could apply to industrial applications, and why shouldn't it? Remember that it only applies to "specific, listed utilization equipment." The listing process invariably includes an examination of the suitability of the supplied cord. Further, none of the comments in the voting addressed the fact that this provision directly conflicts with the allowance in 410.30(C)(1). The TCC should carefully review this record in the event this comment fails.

Panel Meeting Action: Reject
Panel Statement: The submitter's intent is met in the present text of the NEC. The fixture cords in question as applied per 410.30(C)(1) are not hard wired and are required to be terminated in a grounding-type plug. This allows the fixture to be easily moved, meaning that the fixture is of a portable nature.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

10-26 Log #616 NEC-P10 **Final Action: Accept**
 (240.5(B)(1) & 240.5(B)(3))

Submitter: Technical Correlating Committee on National Electrical Code®
Comment on Proposal No: 10-29

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 Meeting Action: Accept
Panel Statement: Code-Making Panel 10 accepts the Technical Correlating Committee direction for further consideration.
 After reviewing the comments expressed in the voting, Code-Making Panel 10 continues to "Accept in Principle" Proposal 10-29 due to the panel action on Comment 10-21.

Number Eligible to Vote: 12
Ballot Results: Affirmative: 11 Negative: 1
Explanation of Negative:

MUNSON: See my Explanation of Negative Vote on Comment 10-9.

10-27 Log #3104 NEC-P10 **Final Action: Reject**
 (240.5(B)(1), & 240.5(B)(3))

Submitter: Kenneth E. Vannice, Leviton/NSI-Colortran / Rep. United States Institute for Theatre Technology Engineering Comm.

Comment on Proposal No: 10-29
Recommendation: This proposal should be rejected.
Substantiation: The changes in (1) default to the listing agency requiring the proper plug configuration to match the appropriately rated receptacle. This might be fine in instances where NEMA configurations are involved. Where non-NEMA configurations are involved as they are in the entertainment industry this idea does not work. The changes in (3) assume all extension cords are listed assemblies. Most extension cords used in the entertainment industry are field fabricated from Listed cable and Listed connectors. These changes would require the entertainment industry to modify Chapter 5 articles for which there is no time in this code cycle. The existing language is quite adequate.

Panel Meeting Action: Reject
Panel Statement: Protection of cords that are part of listed utilization equipment is more appropriately addressed in the product standard. Existing 240.5 requirements are unenforceable by the authority having jurisdiction because equipment is installed after final inspection is complete.

Product standards currently address the appropriate requirements for these products. The continued acceptance of this concept will not require automatic revisions to these standards.

Proposal 10-27, as modified by the panel, does permit field-assembled cord sets.

Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

10-28 Log #2567 NEC-P10 **Final Action: Accept**
 (240.15)

Note: The Technical Correlating Committee directs that the action on Comment 10-28 be changed to "Accept" to reject Proposal 10-35 since disconnecting means are outside the Scope of Article 240.

Submitter: Vince Baclawski, National Electrical Manufacturers Association (NEMA)

Comment on Proposal No: 10-35

Recommendation: Reject the proposal and the Panel Action.
Substantiation: The proposer, Phil Simmons, intended moving 240.20(B) to a new Section 240.15. Here it is noted that the focus of 240.20(B) is "Circuit Breaker as Overcurrent Device." This is appropriate because the first part of 240(B) essentially describes the simultaneous separation of contacts when a circuit breaker acts as an overcurrent protective device. Parts (A), (B), and (C) then deal with exceptions to the simultaneous separation of contacts during overcurrent operation. However, the present creation of 240.16 with the title "Circuit Breaker as a Disconnecting Means" shifts the focus from overcurrent protection to disconnection. The code user will no longer be alerted to the fact that response to an overcurrent may not result in circuit isolation for (B) and (C). Rather, the code user will be alerted to the fact that the handle ties will provide disconnect (switching) function. NEMA considers that (A), (B), and (C) should remain focused on overcurrent protection, and that the new heading, with the focus on switching, is erroneous and reduces safety.

Panel Meeting Action: Reject
Panel Statement: Code-Making Panel 10 reaffirms its action and substantiation, as noted in Proposal 10-35.

The text has been split to clearly separate the permission to use handle-ties, which is a disconnection issue, from the general text.

Number Eligible to Vote: 12
Ballot Results: Affirmative: 10 Negative: 2
Explanation of Negative:

BLIZARD: See my explanation of negative vote on Comment 10-30.
 KIMBLIN: The panel action may completely change the requirement depending on the reader's point of view. As written, proposed 240.15 requires the circuit breaker to always open all ungrounded conductors of the circuit both manually and automatically when it is used as an overcurrent protective device. It does not allow application of items A, B and C except when the circuit breaker is used as a disconnecting means. Since the circuit breaker is virtually always used as an overcurrent protective device, this wording appears to exclude application of two single pole circuit breakers with a handle tie used as overcurrent protective devices on a multiwire branch circuit, for example. It then allows use of handle ties when the circuit breaker is used as a disconnecting means in proposed 240.16. To clarify the meaning, NEMA suggests replacing, "240.16 Circuit Breaker as a Disconnecting Means. Circuit breakers shall be permitted to be applied as follows for disconnecting purposes." with "240.16 Circuit Breaker Handle Ties. Identified handle ties for circuit breakers are permitted to be applied as follows." We also suggest adding, "FPN: Handle ties provide for common switching of circuit breakers that are tied but do not assure common trip operation."

10-29 Log #3669 NEC-P10 **Final Action: Accept in Part**
 (240.15)

Note: The Technical Correlating Committee directs that Comment 10-29 be reported as "Accept in Part" by accepting the recommendation to "Reject" Proposal 10-35 and continue to "Accept" Proposal 10-37. This correlates this comment with the Technical Correlating Committee direction on Comment 10-28.

Submitter: George D. Gregory, Square D Company
Comment on Proposal No: 10-35

Recommendation: Reject the Panel Meeting Action on Proposal 10-35. Accept the proposal as drafted by the submitter and as modified by Proposal 10-37.

Substantiation: The Panel Meeting Action completely changes the requirement. As written, proposed 240.15 requires the circuit breaker to always open all ungrounded conductors of the circuit both manually and automatically when it is used as an overcurrent protective device. It does not allow application of items A, B, and C except when the circuit breaker is used as a disconnecting means. This wording would exclude application of two single pole circuit breakers with a handle tie used as overcurrent protective devices on a multiwire branch circuit, for example. It then allows use of handle ties when the circuit breaker is used as a disconnecting means in proposed 240.16.

This action completely changes the meaning of the section as compared to the existing 2002 NEC and it goes far beyond the proposal as submitted.

The panel meeting action should be rejected. The proposal as originally submitted without modification by the panel is a clarification that appears worthwhile. The wording change of Proposal 10-37 to add the phrase, "both manually and automatically," instead of the word "simultaneously" should be accepted as a modification to Proposal 10-35.

Panel Meeting Action: Reject
Panel Statement: Code-Making Panel 10 reaffirms its action and substantiation as noted by the action on Proposal 10-35.

The text has been split to clearly separate the permission to use handle-ties, which is a disconnection issue, from the general text. This panel action does not require common-trip except as noted in 210.4.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 10 Negative: 2

Explanation of Negative:

BLIZARD: See my explanation of negative vote on Comment 10-30.
 KIMBLIN: See my Explanation of Negative Vote on Comment 10-28.

10-30 Log #2016 NEC-P10
 (240.15 and 240-16)

Note: The Technical Correlating Committee directs that Comment 10-30 be reported as “Accept in Part” by “Rejecting” Proposal 10-35, but accepts the Panel Action on Proposal 10-39. This action correlates this comment with the Technical Correlating Committee direction on Comment 10-28.

Submitter: Richard E. Lofton, II, IBEW Local 280

Comment on Proposal No: 10-35

Recommendation: Continue to accept in principle, revised as per the panel action to accept proposal 10-39. The revision is the deletion of the term “approved” replaced with the term “identified”. Note that the result of the panel action to accept proposal 10-37 is incorporated into the panel action on this proposal 10-35. This comment is written to address the TCC actions, requesting clarification and correlation for panel actions on 10-37 and 10-39 with the panel action on 10-35. See sister comments to proposals 10-37 and 10-39.

Substantiation: The panel action to relocate this material to “Part I General” is appropriate. The panel action to separate these requirements into two separate sections is primarily editorial in nature and is extremely user friendly. The intent of this section has not been altered in any way. The result of this change is user-friendly, practical code that is easy to read and understand. The requirement for circuit breakers as an overcurrent device will now exist in 240.15. The requirements for the use of handle ties are addressed in 240.16. These requirements must be separated into two sections for clarity. All circuit breakers must meet the requirements of 240.15. Where handle ties are used, the requirements of 240.16 must also be met. This editorial relocation and separation provides needed clarity for the user of this code. The TCC requests for action are met with this comment and comments to 10-37 and 10-39.

Panel Meeting Action: Accept

Number Eligible to Vote: 12

Ballot Results: Affirmative: 10 Negative: 2

Explanation of Negative:

BLIZARD: I vote negative to the panel action for Comment 10-30. I am concerned that there are substantial numbers of users of the NEC who do not understand the differences between common tripping and common disconnecting. Some think that two or more single pole breakers connected by a handle tie will all open when only one pole trips on overcurrent. Such is not necessarily the case. I agree with the panel’s decision to move this material from the “Part II, Location” to “Part I, General” of Article 240. However, I believe that the use of handle ties is not simply a disconnection issue. The Exceptions in 240.20(B) were apparently made recognizing that, for certain systems, not opening all ungrounded conductors for an overcurrent condition on only one pole was an acceptable risk. I am concerned that moving the Exceptions to their own section called “Circuit Breaker as a Disconnecting Means” will further disassociate the handle tie from the overcurrent tripping issue.

KIMBLIN: See my Explanation of Negative Vote on Comment 10-28.

10-31 Log #157 NEC-P10 **Final Action: Reject**
 (240.20(B))

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education

Comment on Proposal No: 10-38

Recommendation: Accept with the deletion of “or without”.

Substantiation: Many decades of experience bear out the fact that approved handle ties enhance safety; leaving them out does not. I don’t need to cite chapter and verse about people being “stung” or injured. Even if every single one of them was hurt in part simply because they didn’t take the best safety measures, shock due to work on non-obvious multiwire circuits is too common a hazard to dismiss by blaming the victims.

Panel Meeting Action: Reject

Panel Statement: It is not reasonable to assume a circuit is dead without testing for the presence of voltage.

The accepted wording by the panel meets safety expectations as long as all circuit conductors are de-energized prior to maintenance.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 11 Negative: 1

Explanation of Negative:

KIMBLIN: The submitter is correct that shock due to work on non-obvious multiwire circuits is a common hazard. The proposed deletion of 240-20(B)(2) and 240-20(B)(3) would reduce that hazard for line-to-line connected loads since common trip circuit breakers would be used. These would remove both current and voltage from all phases. With respect to 240-20(B)(1), here the multiwire branch circuits supply line to neutral loads. Opening of a single pole removes both current and voltage from the particular load and it is therefore

safe to use either single pole circuit breakers without handle ties, or single pole breakers with approved handle ties. The focus is not whether approved handle ties can be used relative to the use of unapproved handle ties. Perhaps the code language in 240-20 could be clearer by stating “without handle ties or with approved handle ties.” See also my comment on Comment 10-28.

Comment on Affirmative:

BLIZARD: I vote affirmative with Comment. I agree that Proposal 10-38 should be Accepted, but do not agree with the recommendation to delete “or without” from 240.20(B)(1). Therefore, I agree with the panel action to Reject.

BORTHICK: Although I recognize that individual handle-tied circuit breakers offer the convenience and assurance of common disconnection of a multiwire branch circuit I cannot support such a requirement because, however desirable, frequently these individual breakers are not located in adjacent spaces in a panel (commonly because of engineering restrictions against renumbering circuits on a drawing). Such a requirement would preclude the use of many multiwire branch circuits.

10-32 Log #627 NEC-P10 **Final Action: Accept**
 (240.20(B))

Submitter: Technical Correlating Committee on National Electrical Code®
Comment on Proposal No: 10-37

Recommendation: It was the action of the Technical Correlating Committee that this Proposal be reconsidered and correlated with the action on Proposal 10-35. 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 Meeting Action: Accept

Panel Statement: The panel accepts the direction of the Technical Correlating Committee to reconsider and correlate the action on Proposal 10-37 with the action on Proposal 10-35.

The panel points out that the language now appears in 240.15 due to the panel action on Proposal 10-35.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

10-33 Log #2017 NEC-P10 **Final Action: Accept**
 (240.20(B))

Submitter: Richard E. Lofton, II, IBEW Local 280

Comment on Proposal No: 10-37

Recommendation: Continue to accept.

Substantiation: This additional text is necessary to clearly illustrate that a circuit breaker as an overcurrent device must open all ungrounded conductors both manually and automatically unless applied as permitted in 240.16 as created in proposal 10-35. The additional text accepted in this proposal has been incorporated into proposal 10-35. The TCC request for correlation has been met with the panel action to “accept in principle” proposal 10-35.

Panel Meeting Action: Accept

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

10-34 Log #2018 NEC-P10 **Final Action: Accept**
 (240.20(B))

Submitter: Richard E. Lofton, II, IBEW Local 280

Comment on Proposal No: 10-39

Recommendation: Continue to accept.

Substantiation: Replacing the term “approved” with the term “identified” is necessary to prevent the use of nails, screws or wire as handle ties. The revision accepted in this proposal has been submitted in the form of a comment to proposal 10-35 for correlation as requested by the TCC.

Panel Meeting Action: Accept

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

10-35 Log #2568 NEC-P10 **Final Action: Reject**
 (240.20(B))

Submitter: Vince Baclawski, National Electrical Manufacturers Association (NEMA)

Comment on Proposal No: 10-38

Recommendation: Accept Proposal 10-38.

Substantiation: The panel should reconsider and accept Proposal 10-38. The focus of 240.20(B) is the operation of handle tied, individual single-pole circuit breakers operating as overcurrent protective devices. Under these automatic operations, the handle-tied breakers may not disconnect all phases serving line to line loads and this is hazardous. Deletion of 240(B)(2) and 240(B)(3) will ensure circuit disconnection, with removal of both current and voltage, by handle-tied individual pole circuit breakers under both manual and automatic circuit breaker operation.

Panel Meeting Action: Reject

Panel Statement: Handle tie requirements are suitable for disconnecting circuits using manual switching methods. Handle ties are not intended to be used to provide automatic opening of the circuit breaker under overcurrent conditions.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 10 Negative: 2

Explanation of Negative:

BLIZARD: I agree with the substantiation provided in Proposal 10-38 and vote negative to the panel action to Reject Comment 10-35. I believe that the results of accepting this proposal will be to reduce confusion and enhance safety with respect to circuit breakers used for line-to-line connected loads and multiphase loads.

KIMBLIN: Handle tied circuit breakers supplying line to line loads are encountered in both commercial and residential applications. Water heaters, range/ovens and clothes dryers are examples of typical residential applications. With handle tied circuit breakers supplying line to line loads, it is quite possible for the power to be interrupted to an appliance but with voltage remaining. This can pose a hazard to the consumer/user. Further, since only one phase may have opened, it is quite possible to continue to feed current to a fault. The permissive items (2) and (3) of 240.20(B) were written at a time that common trip circuit breakers were not as commonly available as they are at the present time. Deletion of these two items would require that circuit breakers on line-to-line loads open all ungrounded conductors of the circuit when operation is either manual or automatic. Many users incorrectly believe that this is the operation mode even when handle ties are used instead of requiring common trip. Accepting this comment and Proposal 10-38 would potentially enhance user safety related to these circuits and bring these circuits under the fundamental circuit breaker requirement of common trip operation.

10-36 Log #3645 NEC-P10 **Final Action: Accept**
(240.20(B))

Submitter: John D. McClay Jr., East Greenwich Township, Borough of Glassboro

Comment on Proposal No: 10-38

Recommendation: Continue to Reject

Substantiation: The submitter's substantiation for this proposal addresses "consumer expectations" and circuit breakers. The term "consumer" would include bus drivers, mailmen, painters, salesmen and secretaries, etc. The submitter then suggests the deletion of the use of handle ties in "grounded 2 & 3-wire DC circuits" and "two and three-phase" systems. "Consumers" are not purchasing circuit breakers for these systems. Nor are they servicing and maintaining these systems. Persons installing and maintaining these systems are required to be qualified, as defined in Article 100.

Qualified Person. One who has skills and knowledge related to the construction and operation of the electrical equipment and installations and has received safety training on the hazards involved.

Skills and knowledge of the construction, along with skills and knowledge of the operation of the equipment including safety training, mean the qualified person understands the use of individual circuit breakers as well as circuit breakers with handle ties. We have used handle ties in numerous commercial and industrial installations in the state of New Jersey forever without problems. This is not a safety issue.

Panel Meeting Action: Accept

Number Eligible to Vote: 12

Ballot Results: Affirmative: 10 Negative: 2

Explanation of Negative:

BLIZARD: See my explanation of negative vote on Comment 10-35.

KIMBLIN: See my Explanation of Negative Vote on Comment 10-35.

10-37 Log #3670 NEC-P10 **Final Action: Reject**
(240.20(B))

Submitter: George D. Gregory, Square D Company

Comment on Proposal No: 10-38

Recommendation: Reconsider and Accept Proposal 10-38.

Substantiation: The fundamental requirement of 240.20(B) since at least the 1975 NEC has been that circuit breakers shall open all ungrounded conductors of the circuit. This fundamental requirement has always been for circuit breakers and has never impacted fuse application. It is and always has been different than for fuses.

This proposal is to acknowledge that many users believe that all poles of a circuit breaker open together whether the operation is manual or automatic and whether the circuit breaker is a common-trip, multi-pole unit or is multiple poles with handle ties. That belief is untrue because automatic operation of a single pole circuit breaker does not mean that a pole handle tied to it will also open.

Since multi-pole, common-trip circuit breakers are readily available; requiring them on circuits with line-to-line loads avoids the potential hazards associated with misunderstanding of the operation of circuit breakers.

The technical substantiation has been provided in the past and is clear. Having one pole open and the remainder of the circuit conductors energized leaves an unnecessary hazard, especially when someone may believe incorrectly that all are de-energized.

If the fundamental requirement of 240.20(B) is not a requirement, why not have discussion about removing it altogether? We do not because removing it would be a decrease in available safety.

The proposal seems to have an unnecessary burden of history attached to it. It is really a simple change to require common-trip circuit breakers on line-to-line loads in accord with the fundamental requirement. By accepting the proposal, single pole circuit breakers with handle ties would still be permitted on multi-wire branch circuits as they have been.

Panel Meeting Action: Reject

Panel Statement: Handle tie requirements are suitable for disconnecting circuits using manual switching methods. Handle ties are not intended to be used to provide automatic opening of the circuit breaker under overcurrent conditions.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 10 Negative: 2

Explanation of Negative:

BLIZARD: See my explanation of negative vote on Comment 10-35.

KIMBLIN: See my Explanation of Negative Vote on Comment 10-35.

10-38 Log #617 NEC-P10 **Final Action: Accept**
(240.20(B)(1), (2), (3))

Submitter: Technical Correlating Committee on National Electrical Code®
Comment on Proposal No: 10-39

Recommendation: It was the action of the Technical Correlating Committee that this Proposal be reconsidered and correlated with the action on Proposal 10-35. 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 Meeting Action: Accept

Panel Statement: The panel accepts the direction of the Technical Correlating Committee to reconsider Proposal 10-39 and correlate with the action on Proposal 10-35.

See panel action and statement on Comment 10-30.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

10-39 Log #1138 NEC-P10 **Final Action: Accept in Part**
(240.21(B))

Submitter: Paul Dobrowsky Holley, NY

Comment on Proposal No: 10-40

Recommendation: Accept the proposal in principle. Add a new last sentence to the first paragraph of 240.21 as follows:

The next higher standard overcurrent device shall be permitted to be used in accordance with 240.4(B)

Substantiation: This issue needs to be addressed. The last sentence of the first paragraph of 240.21 indicates that 240.4 applies.

Section 240.21(B)(2)(2) uses the words "ampacity of the tap conductors". This is a conflict. If a given installation results in a conductor having an ampacity of 99 amperes, a 100 amp overcurrent device should be acceptable for protection of the tap conductors.

Panel Meeting Action: Accept in Part

The panel accepts the submitter's recommendation to accept in principle Proposal 10-40.

The panel rejects the last sentence in the recommendation.

Panel Statement: See panel action and statement on Comment 10-40.

The panel advises the submitter that the provisions of 240.4(B) are not permitted for tap conductors.

For example, 240.21(B)(1)(1)(b) requires that the ampacity of the tap conductors is...**not less than** the rating of the overcurrent-protective device at the termination of the tap conductors.

The next higher standard size would reduce the level of protection and could result in a reduction of the level of safety.

The last sentence of the first paragraph of 240.21 applies to overcurrent provisions for conductors supplied from the tap.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

10-40 Log #1972 NEC-P10 **Final Action: Accept in Principle**
(240.21(B))

Submitter: James T. Dollard, Jr., IBEW Local 98

Comment on Proposal No: 10-40

Recommendation: Accept this Proposal.

Substantiation: After reviewing proposals 10-40 & 10-53 along with our panel actions and statements, my position on this issue has changed as I believe the submitter is correct. I agree with the panel statement in that the intent of both 240.21(B) and (C) is not to permit the application of 240.4(B). However after careful review of these sections and after receiving input from installers and inspectors I believe that the clarification provided by the proposed text is necessary. The present text is not user friendly as it does not specifically point out to the user that the provisions of 240.4(B) may not be applied when using 240.21(B) or (C).

The acceptance of this text is needed to clarify the existing requirement and is editorial in nature. The result however is user friendly text, resulting in easier compliance with the present requirements.

Panel Meeting Action: Accept in Principle

In Proposal 10-40, revise the last sentence of the submitter's recommendation to read as follows:

"The provisions of 240.4(B) shall not be permitted for tap conductors."

Panel Statement: The revised wording meets the intent of the submitter, provides clarity, and increases usability.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

10-41 Log #2431 NEC-P10
(240-21(B)(1)(3))

Final Action: Reject

Submitter: J. Philip Simmons, Simmons Electrical Services / Rep. National Armored Cable Manufacturers Association

Comment on Proposal No: 10-42

Recommendation: Accept the Proposal.

Substantiation: This Proposal should have been accepted as Type MC cable is equal to or greater in physical protection than other wiring methods that are permitted by the existing Code language.

For example, the existing language permits flexible metal conduit and liquidtight flexible metal conduit to be used as the wiring method as they are included in the definition of "raceway" in Article 100. However, Section 348.12(7) states flexible metal conduit is not permitted to be used "Where subject to physical damage." A similar restriction is placed on liquidtight flexible metal conduit in 350.12(1). Type MC cable is equal to or more robust a wiring method than flexible metal conduit or liquidtight flexible metal conduit so its use should be permitted for the 10-ft tap run.

Section 230.43 gives the wiring methods permitted for service conductors. Note that Type MC cable is permitted without restriction or limitation in 230.43(13) while fairly severe restrictions are placed on the use of flexible metal conduit and liquidtight flexible metal conduit in 230.43(15). As we know, service conductors do not have overcurrent protection on their supply side and only overload protection on their load side. For 10 ft tap conductors, overcurrent protection is required on the supply side of the conductors that is not more than 10 times the ampacity of the tap conductor. This provides short-circuit protection of the tap conductors.

The Proposal should be accepted.

Panel Meeting Action: Reject

Panel Statement: The purpose for the raceway requirement in 240.21(B)(1)(3) is to protect the undersized conductor from physical damage. See the appropriate raceway article for requirements for protection from physical damage.

MC cable is not permitted where subject to physical damage per 330.10(A).

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

10-42 Log #618 NEC-P10
(240.21(B)(2)(3).)

Final Action: Accept

Submitter: Technical Correlating Committee on National Electrical Code®
Comment on Proposal No: 10-44

Recommendation: The Technical Correlating Committee directs the panel to reconsider the proposal and the revise the wording to be in compliance with 3.3.4 of the NEC Style Manual relative to the use of "such as." 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 Meeting Action: Accept

Revise the wording in the panel action of Proposal 10-44 to read as follows:

"(3) The tap conductors are protected from physical damage by being enclosed in an approved raceway or by other approved means."

Panel Statement: Code-Making Panel 10 accepts the Technical Correlating Committee direction to reconsider the proposal and has revised the wording, in compliance with the NEC Style Manual.

The panel notes that not all raceways are appropriate for this application.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

10-43 Log #1017 NEC-P10
(240-21(B)(3)(2))

Final Action: Reject

Submitter: Noel Williams, Noel Williams Consulting

Comment on Proposal No: 10-47

Recommendation: This proposal should be held and coordinated with similar language in other sections of the NEC.

Substantiation: The proposed language is easier to follow than the existing language of this section. However, at least the present language ("multiply by secondary to primary" or "output to input") is consistent throughout the NEC. If this section is to be changed, the other sections that use the same language should be changed so the change decreases rather than increases confusion. The other sections that use similar language include: 240.21(C)(6) (covered by Proposal 10-62); 240.21(C)(1); 240.4(F); 240.92(B)(1); 430.72(B), EXC. 2; 725.24(D); 725.24(E); 760.24, EXC. 2; and 760.24, EXC 3. There may be others.

Panel Meeting Action: Reject

Panel Statement: As the submitter mentions in his comment, the wording proposed and accepted at the Report on Proposal stage is clearer than at present.

A public proposal can be made to clarify the wording for all similar sections in the next cycle rather than hold this improvement.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

10-44 Log #619 NEC-P10
(240.21(B)(3)(4).)

Final Action: Accept

Submitter: Technical Correlating Committee on National Electrical Code®
Comment on Proposal No: 10-48

Recommendation: The Technical Correlating Committee directs the panel to reconsider the proposal and the revise the wording to be in compliance with 3.3.4 of the NEC Style Manual relative to the use of "such as." 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 Meeting Action: Accept

Revise the wording in the panel action of Proposal 10-48 to read as follows:
"(4) The primary and secondary conductors are protected from physical damage by being enclosed in an approved raceway or by other approved means."

Panel Statement: Code-Making Panel 10 accepts the Technical Correlating Committee direction to reconsider the proposal and has revised the wording in compliance with the NEC Style Manual.

The panel notes that not all raceways are appropriate for this application.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

10-45 Log #1243 NEC-P10
(240-21(B)(4)(1))

Final Action: Reject

Submitter: Charles M. Trout, Maron Electric Co. Inc.

Comment on Proposal No: 10-49

Recommendation: This proposal should be Accepted in Principle. Do not delete as the proposal suggests but rather add a second and third paragraph to the exception to read:

"The name(s) of the qualified person(s) shall be kept in a permanent record at the office of the establishment in charge of the completed installation and at the office of the Authority Having Jurisdiction. Notification of any changes in the employment of the designated qualified person(s) shall be made to the office of the Authority Having Jurisdiction.

A person designated as a qualified person shall possess the skills and knowledge related to the construction and operation of the electrical equipment and installation and shall have received documented safety training on the hazards involved. Documentation of their qualifications shall be on file with the office of the Authority Having Jurisdiction and the office of the establishment in charge of the completed installation.

Substantiation: It was not necessarily my desire to have the wording deleted. If the wording could be changed to include prescriptive requirements that could ensure that qualified persons are actually performing the maintenance and supervision as requested by the exception. The National Electrical Code is a prescriptive code and it is the technical committees' responsibility to ensure that prescriptive requirements are present for the Authority Having Jurisdiction to use.

It is difficult to understand how it is possible to relax requirements for safety in a Code that tells us in 90.1(B), "this Code contains provisions that are considered NECESSARY for safety." This section further states that "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." It appears to me that this tells us that these requirements are the MINIMUM

requirements for safety and anything less will result in an installation that is NOT FREE FROM HAZARD.

Proponents of this travesty, knowing the truth in this, attempt to circumvent the obvious degradation of safety by using phraseology such as “the installation is under engineering supervision” or “a qualified person will monitor the system.” What is monitoring the installation? What does engineering supervision mean?

I have submitted several proposals to delete these exceptions to requirements for safety but they were all rejected. Perhaps in the comment stage, enough persons will comment in favor of accepting these proposals or at least accepting them in a manner where some prescriptive requirements will be added to accurately describe what “engineering supervision” entails. What does “monitoring” the installation mean, what type of record keeping is necessary to assure compliance, what is a “monitor” or what is a “qualified person?” How is documentation of the qualifications and presence of a “qualified person” accomplished by the Authority Having Jurisdiction?

Without these prescriptive requirements, these exceptions to the requirements for safety appear to be “just another subterfuge to avoid compliance with the safety requirements of the National Electrical Code without regard to putting persons and equipment at risk.”

Panel Meeting Action: Reject

Panel Statement: Addition of the proposed wording would not improve the safety of the installation, while it would add to bureaucracy for the facility and the authority having jurisdiction, and may be unenforceable.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 11 Negative: 1

Explanation of Negative:

BORTHICK: The submitter’s substantiation in his comment merits review. The public was not afforded the opportunity to see his proposal, as he intended it to be submitted, and he tried to rectify this with his comment. Although his recommendation is overly restrictive and possibly unenforceable some requirement for documentation of the conditions set forth in 240.21(B)(4)(1) should be addressed. Since it is assumed that only qualified persons service any system, what are the particular conditions of maintenance and supervision, for this special tap rule, that better ensure the safety of this installation and all involved?

Wherever the qualifying phrase (where, when, et al) “Conditions of maintenance and supervision ensure that only qualified persons service the systems” appears in the Code, these conditions beg to be defined for the AHJ.

The submitter’s second paragraph in the substantiation bears out his concern with the safety of an individual who might suffer more exposure to harm (than another person in a similar environment not afforded the latitude of the offending phrase) or that property may be unduly subject to damage, both under the assurances of this Code.

Although secondary to the safety of a human life the issue of enforceability comes to light. How does an AHJ deem that an installation meets the criteria set forth in the phrase? Is it the responsibility of the Authority to establish the “conditions” required? Is the responsibility that of the property owner? Perhaps the responsibility belongs to the designer of the system who took advantage of the variance offered by the phrase. It appears that all parties could be culpable in our litigious society. In the event of legal action it could fall to a layperson serving on a jury to interpret the phrase, as it appears in the NEC, and determine if the “conditions” were adequate to provide the necessary protection of persons and property and if, in fact, the “conditions” were enforced.

Comment on Affirmative:

DOLLARD: I agree with the concerns expressed in the explanation of negative vote on this comment by Ms. Borthick.

240.21(B)(4) addresses a feeder tap limited to 25-feet in length located in a high bay “manufacturing building.” Is a “manufacturing building” the same as or different from an “Industrial Installation?” What is an “Industrial Installation?”

There are nine list items to be complied with for proper application of this tap rule, 240.21(B)(4). List item number one requires that “Conditions of maintenance and supervision ensure that only qualified persons service the systems.” This is a prescriptive requirement that is difficult to substantiate for both the installer and the enforcement community.

This issue is further complicated by the lack of a definition for “Industrial Installation.” Users of this code need clear lines of separation between “industrial locations” and “other than industrial locations.” Furthermore, where the NEC requires that: “Conditions of maintenance and supervision ensure that only qualified persons service the systems,” this requirement must be outlined for the installer and the enforcement community.

It is my opinion that this issue is further complicated by the lack of a definition of “Industrial Installations.” The term “Supervised Industrial Installation” is clearly defined in 240.2 and provides clear lines of separation between installations that may and may not apply Part VIII of Article 240. CMP-10 struggled with comments 10-5 & 10-6. These comments proposed a new definition in 240.2 for “Industrial Installation.” The action taken by CMP-10 on these comments was to “Hold.” The consensus was to add a definition of “Industrial Installation.” The reason for the action to hold was a lack of substantiation for a minimum kVA threshold.

The lack of a definition of “Industrial Installation” and the prescriptive requirements on “conditions of maintenance” together create confusion for the user of this code. It is my opinion that these issues must be dealt with together

to provide a user friendly outcome. It is suggested that the TCC review this issue and possibly appoint a task group to develop proposals with user friendly changes for the 2008 cycle.

10-46 Log #620 NEC-P10
(240.21(B)(4)(5))

Final Action: Accept

Submitter: Technical Correlating Committee on National Electrical Code®
Comment on Proposal No: 10-50

Recommendation: The Technical Correlating Committee directs the panel to reconsider the proposal and the revise the wording to be in compliance with 3.3.4 of the NEC Style Manual relative to the use of “such as.” 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 Meeting Action: Accept

Revise the wording in the panel action of Proposal 10-50 to read as follows:
“(5) The tap conductors are protected from physical damage by being enclosed in an approved raceway or by other approved means.”

Panel Statement: Code-Making Panel 10 accepts the Technical Correlating Committee direction to reconsider the proposal and has revised the wording in compliance with the NEC Style Manual.

The panel notes that not all raceways are appropriate for this application.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

10-47 Log #621 NEC-P10
(240.21(B)(5)(1))

Final Action: Accept

Submitter: Technical Correlating Committee on National Electrical Code®
Comment on Proposal No: 10-51

Recommendation: The Technical Correlating Committee directs the panel to reconsider the proposal and the revise the wording to be in compliance with 3.3.4 of the NEC Style Manual relative to the use of “such as.” 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 Meeting Action: Accept

Panel Statement: Code-Making Panel10 accepts the Technical Correlating Committee direction. The term “such as” was not part of the Panel Action on Proposal 10-51.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

10-48 Log #1093 NEC-P10
(240-21(B)(5)(2))

Final Action: Reject

Note: The Technical Correlating Committee directs that Comment 10-48 be reported as “Reject” because less than two-thirds of the members eligible to vote have voted in the affirmative.

Submitter: Neil F. LaBrake, Jr., Niagara Mohawk, a National Grid Company / Rep. Edison Electric Institute

Comment on Proposal No: 10-52

Recommendation: Accept this Proposal to include:

“The sum of the overcurrent devices at the conductor termination limits the load to the conductor ampacity. The overcurrent devices shall consist of not more than six circuit breakers or sets of fuses, mounted in a single enclosure, or in or on a switchboard. There shall be no more than six overcurrent devices grouped in any one location.”

Substantiation: This is not a safety issue but a business issue that is being defended with the argument of safety. The above text has removed the reference that would permit separate enclosures.

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. Overload, 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.

Panel Meeting Action: Accept

Number Eligible to Vote: 12

Ballot Results: Affirmative: 7 Negative: 5

Explanation of Negative:

BORTHICK: Acceptance of Proposal 10-52 with the modifications made in Comment 10-48 will violate the mandate of 240.21 that "a tap conductor can't be tapped". Of course, allowing the (proposed) tap conductor to terminate on the busbars of a panel or switchboard and then be tapped to terminate in multiple OCPD's is a violation of 240.21. Such installations, outside the purview of a supervised industrial installation, could and would be subject to modifications that would present safety concerns.

The panel statement for the original rejection of this proposal cited that these conductors be protected at their ampacity through the use of a single overload protective device unless the conductors (tap or secondary) fall under the requirements of supervised industrial installations.

CLINE: I wish to Reject the comment and reaffirm the panel's original rejection of Proposal 10-52.

I agree that the risk of abuse which the latitude this change would allow is too great. Designs could be purposefully altered in order to avoid high-level safety items such as ground fault protection.

DOLLARD: I am voting against the panel action to Accept Comment 10-48. My reasons are as follows:

The submitter claims that this is a "business issue" that is being denied with "the argument of safety."

This is not a business issue. This is a SAFETY issue.

The last sentence of the substantiation for this comment clearly points out that this is a business issue only for the submitter, as the reason for this proposed change is to allow existing services to become outside feeders.

This issue is even more compounded by the fact that the conductors in question would be defined in the NEC as "tap conductors" (as they are not protected at their rated ampacity at the point they are supplied), not feeders. The conductors addressed by 240.21(B)(5)(2) are tap conductors. The safety of persons maintaining this equipment as well as overload protection for the tap conductors must both be considered.

The safety of persons maintaining this equipment will be drastically compromised if the requirement for a single OCPD is removed. All Installer/Maintainers, Electrical Contractors will be required to do energized work in this equipment as it will be infeasible to deenergize a feeder supplying these tap conductors because the feeder serves multiple buildings/structures and other loads.

The present text of 240.21(B)(5)(2) requires that the tap conductors terminate in a single OCPD, in the form of a single circuit breaker or single set of fuses. This requirement is absolutely necessary for the protection of persons required to install and maintain these electrical systems. A single feeder could serve several structures through multiple taps in accordance with 240.21(B)(5)(2). The single disconnect presently required would allow an electrical contractor or maintenance personnel to deenergize the equipment to safely perform new work or maintenance. Without a single disconnecting means it will be deemed infeasible to deenergize this equipment. The electrical contractor or maintenance personnel will then be forced to expose persons to energized parts protected by a much larger OCPD supplying the feeder.

A fault in the Main Lug Only, single enclosure suggested by this proposed change will rely on a much larger and distant OCPD to clear the fault. This larger OCPD which is sized only to protect the feeder will be called upon to open instead of a smaller, properly sized OCPD located in the enclosure. The result will be a dramatic increase in the available incident energy, resulting in a very serious Arc Flash & Arc Blast exposure for electrical contractors, installers, maintainers and inspectors.

The single OCPD presently required is absolutely necessary for electricians, maintenance personnel, inspectors, electrical contractors and their families.

KIMBLIN: There are multiple safety issues associated with a general rule permitting termination in up to six overcurrent devices. Here it is noted that this is already permitted for supervised industrial installations, where supervision provides the needed safety factor. First, this tap is of unlimited length and is not protected at its ampacity over that length. Although overload protection may be provided by up to six overcurrent devices, opportunities exist for the load to exceed the conductor ampacity by the addition of circuits. Further, a single disconnect is not provided to de-energize the circuit should work need to be done on one or more of the load circuits. The need for this last point arises in examining arc flash incidents and it applies to all circuits that do not provide a means of de-energizing for maintenance and service work. The text revision of the comment to require a single enclosure is an improvement. However, it does not overcome the multiple issues associated with the overall proposed text to make this a general rule.

WILLIAMS: I agree with all the explanations of negative votes.

10-49 Log #1970 NEC-P10 **Final Action: Accept**
(240.21(C))

Submitter: James T. Dollard, Jr., IBEW Local 98

Comment on Proposal No: 10-53

Recommendation: Accept this Proposal.

Substantiation: After reviewing proposals 10-40 & 10-53 along with our panel actions and statements, my position on this issue has changed as I believe the submitter is correct. I agree with the panel statement in that the intent of both 240.21(B) and (C) is not to permit the application of 240.4(B). However after careful review of these sections and after receiving input from

installers and inspectors I believe that the clarification provided by the proposed text is necessary. The present text is not user friendly as it does not specifically point out to the user that the provisions of 240.4(B) may not be applied when using 240.21(B) or (C).

The acceptance of this text is needed to clarify the existing requirement and is editorial in nature. The result however is user friendly text, resulting in easier compliance with the present requirements.

Panel Meeting Action: Accept

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

10-50 Log #986 NEC-P10 **Final Action: Accept**
(240.21(C)(2)(1)(c))

Submitter: Dorothy Kellogg, American Chemistry Council

Comment on Proposal No: 10-55

Recommendation: As stated in the comment on affirmative by Mr. Fredericks in the Report on Proposals, Proposal 10-55 should have been accepted in principle, with the following new paragraph added for 240.21(C)(2)(1)(c):

c. Not less than one-tenth of the rating of the overcurrent device protecting the primary of the transformer, multiplied by the primary to secondary transformer voltage ratio.

Also, "and" should be added at the end of 240.21(C)(2)(1)(b).

Substantiation: The proposed text correctly implements the submitter's idea. It is beneficial to provide some minimum size consistent with other NEC requirements for 10 foot conductors connected to a transformer secondary. Without a minimum size limit, it is possible for someone in a nonengineered installation to apply conductors which are not suitable for the short circuit duty available. The limitation proposed corrected for the transformer ratio) would help reduce possible misapplications of this type.

Panel Meeting Action: Accept

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

10-51 Log #2019 NEC-P10 **Final Action: Accept in Principle**
(240-21(C)(2)(1)(c.))

Note: The Technical Correlating Committee directs that Comment 10-51 be reported as "Accept in Principle" to correlate with the action taken on Comment 10-50.

Submitter: Richard E. Lofton, II, IBEW Local 280

Comment on Proposal No: 10-55

Recommendation: This proposal should be accepted in principle by adding the text suggested in the comment on affirmative by Mr. Fredericks as follows:

c. Not less than one-tenth of the rating of the overcurrent device protecting the primary of the transformer, multiplied by the primary to secondary transformer voltage ratio.

Substantiation: As recognized by Mr. Dollard and Mr. Fredericks the submitter has pointed out that without text providing for minimum size conductors, transformer secondary conductors (which are in essence tap conductors unless applied under the provisions of 240.21(C)(1)) may be applied to conductor sizes which are not at all suitable for the short circuit duty available.

The proposed text as revised by Mr. Fredericks provides user friendly text which ensures that transformer secondary conductors (which are in essence tap conductors unless applied under the provisions of 240.21(C)(1)) are not undersized with respect to the available short circuit current. This is similar in intent to the present requirement in 240.21(B)(1)(4) for ten ft feeder taps.

Panel Meeting Action: Accept

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

10-52 Log #409 NEC-P10 **Final Action: Reject**
(240.21(C)(3)(1))

Submitter: T. David Mills, Bechtel Savannah River, Inc.

Comment on Proposal No: 10-57

Recommendation: In addition to the Panel Action to revise the text of 240.21(C), in 240.21(C)(3)(1), revise the text as follows:

"(1) The ampacity of the secondary conductors is not less than the secondary current rating of the transformer and the sum of the ratings of the overcurrent devices does not exceed the ampacity of the secondary conductors that is permitted by 310.15."

Substantiation: This wording already appears in 240.21(B)(3)(5) and (C)(6)(2) and should be used in all appropriate parts of 240.21 to provide clear direction and consistency. This would also apply to 240.21(B)(1)(1), (B)(2)(2), (B)(4)(4), (B)(5)(2), & (C)(4)(2).

Panel Meeting Action: Reject

Panel Statement: The panel reaffirms the modifications made by its action on Proposal 10-57.

The proposed additional text is not necessary and does not improve or further clarify this requirement.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

(Note: The sequence nos. 10-54 and 10-55 were not used)

10-53 Log #47 NEC-P10 **Final Action: Accept**
(240-21(C)(3)(1))

Submitter: Eric G. Schneier, Bechtel Savannah River Inc. (BSRI)
Comment on Proposal No: 10-57
Recommendation: The submitter accepts the panel's revised text.
Substantiation: The panel's revised text encompasses the intent of the original proposal and clarifies other sections of this paragraph as well.
Panel Meeting Action: Accept
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

10-56 Log #622 NEC-P10 **Final Action: Accept**
(240.21(C)(3)(3))

Submitter: Technical Correlating Committee on National Electrical Code®
Comment on Proposal No: 10-58
Recommendation: The Technical Correlating Committee directs the panel to reconsider the proposal and the revise the wording to be in compliance with 3.3.4 of the NEC Style Manual relative to the use of "such as." 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 Meeting Action: Accept
Revise the wording in the panel action of Proposal 10-58 to read as follows:
"(3) The secondary conductors are protected from physical damage by being enclosed in an approved raceway or by other approved means."
Panel Statement: Code-Making Panel 10 accepts the Technical Correlating Committee direction to reconsider the proposal and has revised the wording in compliance with the NEC Style Manual.
The panel notes that not all raceways are appropriate for this application.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

10-57 Log #623 NEC-P10 **Final Action: Accept**
(240.21(C)(4)(1))

Submitter: Technical Correlating Committee on National Electrical Code®
Comment on Proposal No: 10-60
Recommendation: The Technical Correlating Committee directs the panel to reconsider the proposal and the revise the wording to be in compliance with 3.3.4 of the NEC Style Manual relative to the use of "such as." 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 Meeting Action: Accept
Panel Statement: Code-Making Panel 10 accepts the Technical Correlating Committee direction. The term "such as" was not part of the Panel Action on Proposal 10-60.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

10-58 Log #1094 NEC-P10 **Final Action: Reject**
(240-21(C)(4)(2))

Note: The Technical Correlating Committee directs that Comment 10-58 be reported as "Reject" because less than two-thirds of the members eligible to vote have voted in the affirmative.

Submitter: Neil F. LaBrake, Jr., Niagara Mohawk, a National Grid Company / Rep. Edison Electric Institute
Comment on Proposal No: 10-61
Recommendation: Accept this Proposal with the following:

"The sum of the overcurrent devices at the conductor termination limits the load to the conductor ampacity. The overcurrent devices shall consist of not more than six circuit breakers or sets of fuses, mounted in a single enclosure, or in or on a switchboard. There shall be no more than six overcurrent devices grouped in any one location."

Substantiation: This is not a safety issue but a business issue that is being defended with the argument of safety. The above text has removed the reference that would permit separate enclosures.

Addressing the panel statement, the outside 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. Overload, 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.

Panel Meeting Action: Accept

Number Eligible to Vote: 12

Ballot Results: Affirmative: 7 Negative: 5

Explanation of Negative:

BORTHICK: Acceptance of Proposal 10-61 with the modifications made in Comment 10-58 will violate the mandate of 240.21 that "a tap conductor can't be tapped". Of course, allowing the (proposed) tap conductor to terminate on the busbars of a panel or switchboard and then be tapped to terminate in multiple OCPD's is a violation of 240.21. Such installations, outside the purview of a supervised industrial installation, could and would be subject to modifications that would present safety concerns.

The panel statement for the original rejection of this proposal cited that these conductors be protected at their ampacity through the use of a single overload protective device unless the conductors (tap or secondary) fall under the requirements of supervised industrial installations.

CLINE: I wish to Reject the comment and reaffirm the panel's original rejection of Proposal 10-61.

I agree that the risk of abuse which the latitude this change would allow is too great. Designs could be purposefully altered in order to avoid high-level safety items such as ground fault protection.

DOLLARD: I am voting against the panel action to Accept Comment 10-58. My reasons are as follows:

The submitter claims that this is a "business issue" that is being denied with "the argument of safety."

This is not a business issue. This is a SAFETY issue.

The last sentence of the substantiation for this comment clearly points out that this is a business issue only for the submitter, as the reason for this proposed change is to allow existing services to become outside feeders.

This issue is even more compounded by the fact that the conductors in question would be definition in the NEC be "tap conductors" (as they are not protected at their rated ampacity at the point they are supplied), not feeders. The conductors addressed by 240.21(C)(4)(2) are transformer secondary conductors, which are tap conductors as defined in 240.2. Transformer secondary conductors which do not meet or exceed the provisions of 240.21(C)(1) are not considered to be protected by the transformer primary OCPD and are "tap conductors, see also section 240.4(F). The safety of persons maintaining this equipment as well as overload protection for the tap conductors must both be considered.

The safety of persons maintaining this equipment will be drastically compromised if the requirement for a single OCPD is removed. All Installer/Maintainers, Electrical Contractors will be required to do energized work in this equipment as it will be infeasible to deenergize a transformer supplying these tap conductors because the transformer serves multiple buildings/structures and other loads.

The present text of 240.21(C)(4)(2) requires that the transformer secondary conductors, which in this case are tap conductors, terminate in a single OCPD, in the form of a single circuit breaker or single set of fuses. This requirement is absolutely necessary for the protection of persons required to install and maintain these electrical systems. A single transformer could serve several structures through multiple sets of secondary conductors, in accordance with 240.21(C)(4)(2). The single disconnect presently required would allow an electrical contractor or maintenance personnel to deenergize the equipment to safely perform new work or maintenance. Without a single disconnecting means it will be deemed infeasible to deenergize this equipment. The electrical contractor or maintenance personnel will then be forced to expose persons to energized parts protected by a much larger OCPD on the primary of the supplying transformer.

A fault in the Main Lug Only, single enclosure suggested by this proposed change will rely on a much larger and distant OCPD located on the primary of the transformer to clear the fault. This larger OCPD which is sized only to protect the transformer will be called upon to open instead of a smaller, properly sized OCPD located in the enclosure. The result will be a dramatic increase in the available incident energy, resulting in a very serious Arc Flash & Arc Blast exposure for electrical contractors, installers, maintainers and inspectors.

The single OCPD presently required is absolutely necessary for electricians, maintenance personnel, inspectors, electrical contractors and their families.

KIMBLIN: There are multiple safety issues associated with a general rule permitting termination in up to six overcurrent devices. Here it is noted that this is already permitted for supervised industrial installations, where supervision provides the needed safety factor. First, this tap is of unlimited length and is not protected at its ampacity over that length. Although overload protection may be provided by up to six overcurrent devices, opportunities exist for the load to exceed the conductor ampacity by the addition of circuits. Further, a single disconnect is not provided to de-energize the circuit should work need to be done on one or more of the load circuits. The need for this last point arises in examining arc flash incidents and it applies to all circuits that do not provide a means of de-energizing for maintenance and service work. The text revision

of the comment to require a single enclosure is an improvement. However, it does not overcome the multiple issues associated with the overall proposed text to make this a general rule.

WILLIAMS: I agree with all the explanations of negative votes.

10-59 Log #1018 NEC-P10 **Final Action: Reject**
(240-21(C)(6)(1))

Submitter: Noel Williams, Noel Williams Consulting

Comment on Proposal No: 10-62

Recommendation: This proposal should be held and coordinated with similar language in other sections of the NEC.

Substantiation: The proposed language is easier to follow than the existing language of this section. However, at least the present language (“multiply by secondary to primary” or “output to input”) is consistent throughout the NEC. If this section is to be changed, the other sections that use the same language should be changed so the change decreases rather than increases confusion. The other sections that use similar language include: 240.21(B)(3) (covered by Proposal 10-47); 240.21(C)(1); 240.4(F); 240.92(B)(1); 430.72(B), EXC. 2; 725.24(D); 725.24(E); 760.24, EXC. 2; and 760.24, EXC. 3. There may be others.

Panel Meeting Action: Reject

Panel Statement: As the submitter mentions in his comment, the wording proposed and accepted at the Report on Proposal stage is clearer than at present.

A public proposal can be made to clarify the wording for all similar sections in the next cycle rather than hold this improvement.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

10-60 Log #624 NEC-P10 **Final Action: Accept**
(240.21(C)(6)(3))

Submitter: Technical Correlating Committee on National Electrical Code@
Comment on Proposal No: 10-63

Recommendation: The Technical Correlating Committee directs the panel to reconsider the proposal and the revise the wording to be in compliance with 3.3.4 of the NEC Style Manual relative to the use of “such as.” 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 Meeting Action: Accept

Revise the wording in the panel action of Proposal 10-63 to read as follows: “(3) The secondary conductors are protected from physical damage by being enclosed in an approved raceway or by other approved means.”

Panel Statement: Code-Making Panel 10 accepts the Technical Correlating Committee direction to reconsider the proposal and has revised the wording in compliance with the NEC Style Manual.

The panel notes that not all raceways are appropriate for this application.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

10-61 Log #987 NEC-P10 **Final Action: Accept**
(240.24)

Submitter: Dorothy Kellogg, American Chemistry Council

Comment on Proposal No: 10-67

Recommendation: Proposal 10-67 should be accepted.

Substantiation: Proposal 10-67 gives a reasonable requirement for accessibility related to handle height that is consistent with NEC requirements for switches and also with present equipment construction and installation standards and norms.

Panel Meeting Action: Accept

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

10-62 Log #1019 NEC-P10 **Final Action: Accept in Part**
(240.24)

Submitter: Noel Williams, Noel Williams Consulting

Comment on Proposal No: 10-67

Recommendation: This proposal should have been accepted in principal and revised to include a Fine Print Note directing the reader to Section 404.8(A).

Substantiation: I agree with the comment on Affirmative by Ms. Borthick. This rule is hard to find for many people even though they may know there is a rule somewhere. Most circuit breakers and fusible switches are used or designed to be used as switches.

Panel Meeting Action: Accept in Part

The panel rejects the inclusion of the fine print note, and accepts Proposal 10-67.

Panel Statement: The intent of the submitter has been met by the panel action on Comment 10-61.

Fine print notes are not encouraged to be used as cross-references to other sections of the Code.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

10-63 Log #1976 NEC-P10 **Final Action: Accept**
(240.24)

Submitter: James T. Dollard, Jr., IBEW Local 98

Comment on Proposal No: 10-67

Recommendation: Accept this Proposal.

Substantiation: As written in the substantiation to this proposal this proposed change would provide the user of this code with clear language defining how high a switch or circuit breaker handle can be mounted and still be considered as “readily accessible.” This text is necessary for installers and the enforcement community. The term “readily accessible” as defined in Article 100 reads as follows:

Accessible, Readily (Readily Accessible). Capable of being reached quickly for operation, renewal, or inspections without requiring those to whom ready access is requisite to climb over or remove obstacles or to resort to portable ladders, and so forth.

Note that a height for overcurrent devices, switches or circuit breakers is not given. A readily accessible height with respect to operating a switch or circuit breaker can vary greatly. It is user-friendly and practical to clearly define the upper limit for an overcurrent device to be recognized as “readily accessible.” This text as written in 404.8(A) applies only to switches or circuit breakers “used as switches.” This additional text is necessary to include all overcurrent devices not just those which will be used as switches for lighting and other loads.

Panel Meeting Action: Accept

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

10-64 Log #1998 NEC-P10 **Final Action: Reject**
(240.24)

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

Comment on Proposal No: 10-67

Recommendation: Continue to reject the proposal.

Substantiation: This issue is addressed in 404.8(A). Every circuit breaker must be assumed to also be a switch. In the case of a service disconnect in the form of a main circuit breaker, it is also a switch, a disconnecting means. The same is true for motor circuit disconnects in 430.109(A)(2). CMP 10 should review the definition in Article 100, which provides in relevant part, “a device designed to open and close a circuit by nonautomatic means ...” In turn, “nonautomatic” (also defined in Article 100) must involve an action “requiring personal intervention for its control.” Inspection authorities for generations have consistently used the height limit in 404.8(A) to control the placement of circuit breakers in panelboards. The submitter, who is exactly 6 ft tall, routinely inspects panelboard main breaker heights by standing next to the panel, extending his hand from the top of his head to the panel, and then assessing whether the breaker handle is higher than 7 in. above that point (and measuring if necessary). This proposal is unnecessary and creates the unfortunate and erroneous impression that somehow circuit breaker heights were formerly uncontrolled by 404.8(A).

Panel Meeting Action: Reject

Panel Statement: Proposal 10-67 is accepted to improve the clarity of the present Code text.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

10-65 Log #765 NEC-P10 **Final Action: Accept**
(240.24(A))

Submitter: Michael J. Johnston Plano, TX

Comment on Proposal No: 10-67

Recommendation: Panel 10 is respectfully encouraged to reconsider the initial action on this proposal.

Substantiation: This proposal was intended only to provide consistency between the height provisions of 404.8(A) and the “readily accessible” wording of this section. Inspectors are generally using 404.8(A) to limit the height of center grip of circuit breakers to not more than 2.0 m (6 ft 7 in.) above the floor or working platform. It appears to be a stretch to use 404.8(A) where the circuit breaker is functioning as the overcurrent device for the circuit and not being used as a switch. Section 404.8(A) addresses heights of circuit breakers “used as switches” only. The proposal was intended to provide consistency between the two rules and provide more specific parameters for inspectors

when determining installations meet the intent of “readily accessible” as used in this section.

Panel Meeting Action: Accept

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

10-66 Log #2012 NEC-P10
(240.24(B) Exception No. 1)

Final Action: Accept

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

Comment on Proposal No: 10-71

Recommendation: Continue to reject the proposal.

Substantiation: Although well intended, the proposal is not needed. We have consistently interpreted these requirements, as well as many others, in the context of hotel usage when applied to dormitories (of which there are many in my jurisdiction). For example, we consistently apply 210.60 to the receptacle placements, we use the hotel row in Table 220.3(A) for branch circuit loading for lighting, we use the hotel row in Table 220.11 for feeder demand factors, etc. Although it is true that a semester stay is longer than usual at a hotel, it is also more inherently transient in comparison to an apartment tenancy, and it does not encompass provisions for cooking by tenants. The NEC at some point may well need to comprehensively address dormitories, but it should involve both CMP 2 and CMP 10.

Panel Meeting Action: Accept

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

10-67 Log #1139 NEC-P10
(240.85)

Final Action: Reject

Submitter: Paul Dobrowsky Holley, NY

Comment on Proposal No: 10-81

Recommendation: Accept the proposal.

Substantiation: The existing sentence contains 65 words. Changing that into a list improves the readability. Using a 480/277 V circuit breaker on a 240 V ungrounded circuit would still be permitted with the proposed language based on the definition of Voltage to Ground in Article 100.

Panel Meeting Action: Reject

Panel Statement: The comment adds no new information regarding the advantage of creating a list. The addition of the word “only” in the original proposal would restrict application of the circuit breaker to solidly grounded systems, when there are circumstances in which it may be appropriate for other systems as noted in the panel statement on Proposal 10-81.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

(Note: The sequence no. 10-68 was not used)

10-69 Log #2373 NEC-P10
(240.86)

Final Action: Accept in Principle

Submitter: James M. Daly, General Cable

Comment on Proposal No: 10-82

Recommendation: If the Panel accepts this Proposal, the intent in the first sentence must be clarified to read either:

“...shall meet the requirements of (A) only or both (B) and (C).”

“...shall meet the requirements of (A) and (C) or (B) and (C).”

Substantiation: The text proposed in the Proposal and the Panel Action is not clear in the intent of the requirements. Is it required that the circuit breaker meet the following alternate requirements:

A only.

B and C only.

If A is used, does it also have to comply with C?

Panel Meeting Action: Accept in Principle

Panel Statement: See panel action on Comment 10-72.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 11 Negative: 1

Explanation of Negative:

ZAPLATOSCH: See my explanation of negative vote on Comment 10-72.

10-70 Log #2569 NEC-P10
(240.86)

Final Action: Reject

Submitter: Vince Baclawski, National Electrical Manufacturers Association (NEMA)

Comment on Proposal No: 10-82

Recommendation: Continue to reject this proposal.

Substantiation: Section 240.86 accurately describes series ratings as involving the application of circuit breakers at circuit locations where the available

fault current exceeds the breaker’s marked interrupting rating. In order to function safely at maximum fault currents, these circuit breakers are located downstream from fully rated overcurrent protective devices and both devices operate simultaneously. The selection of the circuit breaker/circuit breaker or fuse/circuit breaker combinations is critical, and these combinations are presently determined by a strict third party test program with follow-up. In addition, there is a third party evaluation of the assembly that houses the evaluated combinations, and there are strict equipment-marking requirements. This equipment testing cannot be done by calculation.

Proposal 10-82 seeks to expand the rules by permitting the selection of series ratings under engineering supervision. Here it is noted that there is widespread use of series rated systems in thousands of different applications, and expansion of the rule for the selection of series ratings could tempt many users to satisfy those applications through engineered solutions. This would be unsafe. Evaluation methods have not been proposed, uniformity of engineering supervision would not be guaranteed, and the inspector’s task would be more demanding. Even the panel statement shows that the panel did not accept the sweeping change that would allow the widespread use of this method. Furthermore, the panel has not accepted the Panel Meeting Action to permit series ratings to be selected under engineering supervision in Supervised Industrial Installations. Here the same safety issues have to be addressed. Series rating between dynamic arcing devices need uniform evaluation, and that uniformity is associated with strict testing and marking requirements by third parties. Series ratings presently represent a safe application of overcurrent protective devices and that safety must not be compromised by rules permitting selection under engineering supervision.

Panel Meeting Action: Reject

Panel Statement: The IEEE Blue Book provides consensus requirements for engineering series rated systems. No evidence has been provided to indicate safety issues have occurred as a result of such appropriately engineered series rated systems.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 10 Negative: 2

Explanation of Negative:

KIMBLIN: See my Explanation of Negative Vote on Comment 10-72.

ZAPLATOSCH: See my explanation of negative vote on Comment 10-72.

Comment on Affirmative:

CLINE: Nothing in life is perfect or guaranteed, not even tested systems. I believe that the proposed allowance is limited, reasonable, and practical under the circumstances which the action on Comment 10-72 would allow.

DARLING: See my Explanation of Affirmative Vote on Comment 10-72.

10-71 Log #2868 NEC-P10
(240.86)

Final Action: Accept in Principle

Submitter: Brandon Wiltse Tampa, FL

Comment on Proposal No: 10-82

Recommendation: Proposal 10-82 should be accepted as modified by the code panel but should be limited to existing installations, accomplished by adding the phrase “in existing equipment” after “Selected Under Engineering Supervision” in the title so that it would read:

“(A) Selected Under Engineering Supervision in Existing Equipment.”

Substantiation: Proper application of series rated systems have long been an option for safe and cost effective design. This is a valuable tool when retrofitting commercial and industrial power systems when existing overcurrent devices do not meet the increased interrupting requirements due to increased short circuit currents.

Series rated applications designed under engineering supervision provide a sound approach to meeting 110.9 requirements.

See IEEE Recommended Practice for Applying Low-Voltage Circuit Breakers used in Industrial and Commercial Power Systems.

The “selected under engineering supervision” approach is limited to existing equipment in this comment because numerous series rated combinations are available for new equipment. There is, therefore, no need to utilize an engineered approach for new equipment.

Panel Meeting Action: Accept in Principle

Panel Statement: See panel action on Comment 10-72.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 10 Negative: 2

Explanation of Negative:

KIMBLIN: See my Explanation of Negative Vote on Comment 10-72.

ZAPLATOSCH: See my explanation of negative vote on Comment 10-72.

Comment on Affirmative:

CLINE: See my Affirmative with Comment on Comment 10-70.

DARLING: See my Explanation of Affirmative Vote on Comment 10-72.

10-72 Log #3218 NEC-P10
(240.86)**Final Action: Accept****Submitter:** Michael I. Callanan, IBEW**Comment on Proposal No:** 10-82**Recommendation:** Accept this proposal in principle revised as follows:

240.86 Series ratings. Where a circuit breaker is used on a circuit having an available fault current higher than the marked interrupting rating by being connected on the load side of an acceptable overcurrent protective device having a higher rating, 240.86(A) and (B) shall apply.

it shall meet the requirements specified in (A) or (B), and (C).

(A) Selected Under Engineering Supervision in Existing Installations. The series rated combination devices shall be selected by a licensed professional engineer engaged primarily in the design or maintenance of electrical installations. The selection shall be documented and stamped by the professional engineer. This documentation shall be available to those authorized to design, install, inspect, maintain and operate the system. This series combination rating, including identification of the upstream device, shall be field marked on the end use equipment.

(B) Tested Combinations. The combination of line-side overcurrent device and load-side circuit breaker(s) is tested and marked on the end use equipment, such as switchboards and panelboards.

(C) Motor contribution. [no change from existing (B)].

Substantiation: This proposal should be accepted in principle as revised in this comment. The issue at hand is directly within the scope of the NEC, it is the practical safeguarding of persons and property. This comment clarifies that the use of engineering supervision is limited to "existing installations." We agree with the negative comments of Ms. Borthic, Mr. Williams and Mr. Blizard. We also agree with the affirmative comments of Mr. Cline and Mr. Eldridge.

Mr. Blizard is correct that this change is needed in all existing installations, not just "Supervised Industrial Installations." This comment, as does the original proposal, directs this change to 240.86 in part VII.

Ms. Borthic's concern with the proposed text that any engineer would be permitted to make this determination without documenting experience must be addressed. The additional text proposed by this comment will require: "The series rated combination devices shall be selected by a licensed professional engineer engaged primarily in the design or maintenance of electrical installations. The selection shall be documented and stamped by the professional engineer. This documentation shall be available to those authorized to design, install, inspect maintain and operate the system." This specific language that requires the professional engineer to put his or her license on the line addresses Ms. Borthic's concern. No engineer in their right mind would risk revocation of their stamp for the design an unsafe series rated system.

Mr. Williams is correct in that safety is the primary concern of the NEC. Where the interrupting rating of existing installations is subjected to larger values of available short circuit current than their rating, a very dangerous situation exists. This change is necessary to allow an owner to correct this situation. The alternative, which is completely replacing distribution equipment, is cost prohibitive and the result is no change, creating hazardous conditions for installers, maintainers and inspectors. Mr. Williams is also correct in that rated combinations are readily available for new installations and that a listed combination provides the authority having jurisdiction with documentation of the system employed. The proposed text in the title of subsection (A) limits the use of engineered systems to existing installations only. New installations could not use the proposed provisions allowing for engineered systems. This concept of engineering supervision is directed singularly at existing installations in which the available short circuit current level has increased to a level that exceeds the interrupting rating of an existing OCPD, creating an extremely dangerous situation for installers, maintainers and inspectors of the equipment. Mr. Williams' concerns from the enforcement community are recognized as engineering supervision without documentation from a "licensed professional engineer engaged primarily in the design or maintenance of electrical installations" would leave the AHJ without adequate system documentation. Proposed text in this comment will address the concerns of the enforcement community as follows: "The series rated combination devices shall be selected by a licensed professional engineer engaged primarily in the design or maintenance of electrical installations. The selection shall be documented and stamped by the professional engineer. This documentation shall be available to those authorized to design, install, inspect, maintain and operate the system."

Where the available short circuit current in an existing installation increases to a value in excess of the interrupting rating of an OCPD a tremendously dangerous situation exists. The present text requires that where the available short-circuit current now exceeds the interrupting rating of service or distribution equipment, an owner must completely replace the electrical distribution equipment with new series rated equipment. This represents a tremendous cost and downtime for the owner. The result is that no change is made and persons and property are put at a tremendous risk. This proposed change would provide a cost-effective method allowing for existing installations to achieve adequate protection for persons and property in the event of a fault that could exceed the interrupting rating of an existing OCPD.

This comment represents the official position of the International Brotherhood of Electrical Workers Codes and Standards Committee.

Panel Meeting Action: Accept**Number Eligible to Vote:** 12**Ballot Results:** Affirmative: 9 Negative: 3**Explanation of Negative:**

FREDERICKS: I agree with the submitter's comment in principle, but the American Chemistry Council's position is that the following language from the comment is too restrictive:

"... The series rated combination devices shall be selected by a licensed professional engineer engaged primarily in the design or maintenance of electrical installations. The selection shall be documented and stamped by the professional engineer. This documentation shall be available to those authorized to design, install, inspect, maintain, and operate the system..."

There are many electrical design activities under the scope of the Code that are of similar complexity but do not have similar code text about the design and documentation. It should be sufficient here to require that the calculations be performed by a qualified individual. Local and state laws governing electrical design and engineering already cover issues such as certification (document stamping) requirements for engineering work, and the NEC should not attempt to duplicate or rewrite these regulations.

I recommend the following wording be accepted in place of the text quoted above:

"... The series rated combination devices shall be selected by a qualified person engaged primarily in the design or maintenance of electrical installations. The design shall be documented and shall be available to those authorized to design, install, inspect, maintain, and operate the system..."

KIMBLIN: NEMA wants to emphasize that the action taken by the code panel is technically counter to the experience and expertise of the manufacturers of the affected downstream products (circuit breakers). It is important for the panel to keep the history of series ratings in mind. Years ago, systems were "engineered" to try to accomplish exactly what is being proposed. Manufacturers learned through field and laboratory experience that the "engineering" methods employed were flawed and could result in problems with the application of products in the field. Since learning of those issues, extensive testing programs under strict third party supervision have been developed to determine appropriate safe combinations of overcurrent devices. That testing program is the only accepted means available to the industry today.

The panel is assuming that a "licensed professional engineer" can determine what is needed to engineer a safe system. Circuit breaker manufacturers have licensed engineers that are engaged every day in circuit breaker design and application and those engineers have not been able to establish and acceptable "engineering" method that can consistently and coherently be applied. If an acceptable safe method were available, circuit breaker manufacturers would use it to avoid expensive testing associated with establishing series ratings between circuit breaker combinations and fuse/circuit breaker combinations.

The bottom line is that the code panel is establishing a code rule to permit a product to be used in a manner that is directly counter to the instructions issued by the manufacturer and the listing of the product.

Some additional points can be made regarding the specific discussions during the panel meeting:

1) "Engineering of the rating can be done with "passive" power circuit breakers."

This in itself creates a problem. First, ANSI/IEEE C37.13 states in clause 10.8 "Application of circuit breakers above their short circuit ratings in cascade is not recommended." Second, and in particular, the statement also fails to recognize that case breakers are not "passive" and are typically present downstream of the power circuit breaker. This ignores the fact that the total system needs to be considered.

2) "The IEEE Blue Book provides support for engineering series ratings."

In fact the Blue Book is ambiguous on this matter. For instance on pages 62 and 63 engineered systems are called into question.

3) "There needs to be a simple way to "upgrade" systems."

Everyone would agree that a "simple" method to upgrade is desirable. However placing a single device ahead of a system that is underrated for that available fault current has the potential to create additional problems and to provide the user with a false sense of security that the system is completely safe.

Finally, we believe that CMP 10 has stepped outside of its scope in attempting to redefine the safety performance of a product in a manner that is above and beyond its rating and directly counter to the product standard and counter to NEC 110.3(B).

ZAPLATOSCH: The premise of the proposal (as modified by Comment 10-72) is that calculations can be made to determine the suitability of using overcurrent devices in series, when the downstream circuit breaker is used on a system where the available fault current exceeds the marked interrupting rating of the breaker.

The proposal assumes that the engineer who is making the evaluation is able to determine the exact operating characteristics of the overcurrent protective devices being used. The variety of operating mechanisms becoming available makes this determination more difficult if not impossible without testing.

The determination of a suitable series combination of overcurrent devices must include an evaluation of the host equipment, not only a calculation based on 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:

CLINE: See my Affirmative with Comment on Comment 10-70.
 DARLING: Since some states license their professional engineers and others register them, the wording should read “licensed or registered professional engineer”.

Field selection of series combinations for existing breakers can only be done on breakers classified as passive devices, i.e., devices that will not attempt to open instantly on high fault currents. All engineers who are field selecting series combinations for existing installations should be aware that all molded case circuit breakers and almost all power breakers not shipped with current limiting devices are active devices that attempt to interrupt the circuit instantly. This introduces dynamic arc impedance which will tend to lower fault available at the current limiting fuse. This is true even if the breakers do not have an instantaneous setting, and, therefore, should not be used in a series combination that is not tested as a combination device with a current limiting fuse. Many of these circuit breakers without an external adjustable instantaneous setting actually have a default instantaneous internal setting around 10-13X to protect the breakers from prolonged exposure to high fault currents. Engineers who are field selecting series combinations should be very cautious and contact breaker manufacturers to ensure breakers can withstand the high fault current prior to operation of current limiting fuse. The engineers should follow the manufacturer’s directions and recommended practice as explained in the IEEE Blue Book.

10-73 Log #625 NEC-P10 **Final Action: Accept**
 (240.92(B)(3))

TCC Action

Submitter: Technical Correlating Committee on National Electrical Code®
Comment on Proposal No: 10-85

Recommendation: The Technical Correlating Committee directs the panel to reconsider the proposal and the revise the wording to be in compliance with 3.3.4 of the NEC Style Manual relative to the use of “such as.” 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 Meeting Action: Accept

Revise the wording in the panel action of Proposal 10-85 to read as follows:
 “(3) Physical Protection. The secondary conductors are protected from physical damage by being enclosed in an approved raceway or by other approved means.”

Panel Statement: Code-Making Panel 10 accepts the Technical Correlating Committee direction to reconsider the proposal and has revised the wording in compliance with the NEC Style Manual.

The panel notes that not all raceways are appropriate for this application.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

10-74 Log #626 NEC-P10 **Final Action: Accept**
 (240.92(C)(1))

Submitter: Technical Correlating Committee on National Electrical Code®
Comment on Proposal No: 10-86

Recommendation: The Technical Correlating Committee directs the panel to reconsider the proposal and the revise the wording to be in compliance with 3.3.4 of the NEC Style Manual relative to the use of “such as.” 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 Meeting Action: Accept

Panel Statement: Code-Making Panel 10 accepts the Technical Correlating Committee direction. The term “such as” was not part of the panel action on Proposal 10-86.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 12

10-75 Log #3671 NEC-P10 **Final Action: Reject**
 (240.93)

Submitter: George D. Gregory, Square D Company

Comment on Proposal No: 10-82

Recommendation: Reject the proposal.

Substantiation: 1. No method of calculation has been specified for engineering supervision to determine acceptability of a series rating and no method exists except by test.

2. The up-over-down procedure has been shown to not be acceptable for determining series ratings when the downstream circuit breaker has dynamic performance. All circuit breakers have dynamic performance.

3. The testing method requires testing of the series performance in equipment as well as demonstrating the series performance of the overcurrent protective devices together. Equipment evaluation cannot be done by engineering evaluation.

Technically it is not feasible to determine series ratings except by test with methods that are known today. It makes no sense to put this revision in the NEC without a means of accomplishing it. Such action would lead to misuse.

One problem that has been mentioned related to this proposal is the reality that utilities have made changes that create higher available fault current potential than installed systems were designed for. This leaves the installed system exposed. A suggested solution is to install a current limiting device rated for the available fault ahead of the system to protect it. Such an action would not produce the desired protection. First, it would not necessarily protect a main circuit breaker because it is not known to be coordinated protection. Even if it does protect the main circuit breaker, it would be highly unlikely to protect the system downstream of the main. Further, a current limiting device at the main, unless it were carefully designed to function with the circuit breaker, would sacrifice selective coordination needed by most facilities which use a power circuit breaker with a short time delay for that application. The advantage of adding such a current limiting device is that it may help to reduce destruction of the installation in the event of a massive fault. If a current limiting device were used for such purposes, it would not bring the installation into compliance with 110.9 and 110.10 of the NEC. It would not be a series rating and should not be considered as such.

If a proposal such as this one were to be placed in the NEC, it would put manufacturers of circuit breakers, switchboards, switchgear and similar equipment in a potential ethical bind. A designer could engineer a series rating that the manufacturer had already tested and found to be in noncompliance with industry standards. However, the engineer would not know that it had been tested. Is the manufacturer liable for these installations? Does he have to examine specifications to search for such misapplications? Can he serve these installations relying only on the ability of the engineer?

Panel Meeting Action: Reject

Panel Statement: See the IEEE Blue Book for an accepted consensus standard method of engineering a series rated system.

Number Eligible to Vote: 12

Ballot Results: Affirmative: 10 Negative: 2

Explanation of Negative:

KIMBLIN: See my Explanation of Negative Vote on Comment 10-72.

ZAPLATOSCH: See my explanaton of negative vote on Comment 10-72.

Comment on Affirmative:

CLINE: See my Affirmative with Comment on Comment 10-70.

DARLING: See my Explanation of Affirmative Vote on Comment 10-72.

ARTICLE 250 — GROUNDING

5-22 Log #743 NEC-P05 **Final Action: Reject**
 (250)

Submitter: Mark Shapiro Farmington Hills, MI

Comment on Proposal No: 5-44

Recommendation: Reject the proposal.

Substantiation: The adoption of this proposal would create more confusion than it corrected. Those who do not understand how to apply Article 250 will not be enlightened by this change. The most likely result would be to add to the misunderstandings and sense of alienation from the code on the part of those whom this proposal is intended to help.

This is not to deny that the proposal is technically correct. I am sure that I am not the only person who intends to start explaining grounding and bonding, using this term. But, the code is not a text book. It also doesn’t work well as an engineering manual.

But, for code purposes, the result would be an example of what is known as “the law of unintended consequences”; the principle that a change that is intended to make things easier, often results in making things harder and more complex.

Panel Meeting Action: Reject

Panel Statement: The panel has determined that the concepts in Proposal 5-44 require further study. See the panel action and statement on Comment 5-1.

Number Eligible to Vote: 16

Ballot Results: Affirmative: 16

Comment on Affirmative:

BOKSINER: See my comment on affirmative on Comment 5-1.

5-23 Log #744 NEC-P05 **Final Action: Reject**
(250)

Submitter: Mark Shapiro Farmington Hills, MI
Comment on Proposal No: 5-45

Recommendation: Reject the proposal.

Substantiation: The adoption of this proposal would create more confusion than it corrected. Those who do not understand how to apply Article 250 will not be enlightened by this change. The most likely result would be to add to the misunderstandings and sense of alienation from the code on the part of those whom this proposal is intended to help.

This is not to deny that the proposal is technically correct. I am sure that I am not the only person who intends to start explaining grounding and bonding, using this term. But, the code is not a text book. It also doesn't work well as an engineering manual.

But, for code purposes, the result would be an example of what is known as "the law of unintended consequences"; the principle that a change that is intended to make things easier, often results in making things harder and more complex.

Panel Meeting Action: Reject

Panel Statement: The panel has determined that the concepts in Proposal 5-45 require further study. See the panel action and statement on Comment 5-1.

Number Eligible to Vote: 16

Ballot Results: Affirmative: 16

Comment on Affirmative:

BOKSINER: See my comment on affirmative on Comment 5-1.

5-24 Log #745 NEC-P05 **Final Action: Reject**
(250)

Submitter: Mark Shapiro Farmington Hills, MI

Comment on Proposal No: 5-41

Recommendation: Reject the proposal.

Substantiation: The adoption of this proposal would create more confusion than it corrected. Those who do not understand how to apply Article 250 will not be enlightened by this change. The most likely result would be to add to the misunderstandings and sense of alienation from the code on the part of those whom this proposal is intended to help.

This is not to deny that the proposal is technically correct. I am sure that I am not the only person who intends to start explaining grounding and bonding, using this term. But, the code is not a text book. It also doesn't work well as an engineering manual.

But, for code purposes, the result would be an example of what is known as "the law of unintended consequences"; the principle that a change that is intended to make things easier, often results in making things harder and more complex.

Panel Meeting Action: Reject

Panel Statement: The panel has determined that the concepts in Proposal 5-41 require further study. See the panel action and statement on Comment 5-1.

Number Eligible to Vote: 16

Ballot Results: Affirmative: 16

Comment on Affirmative:

BOKSINER: See my comment on affirmative on Comment 5-1.

5-25 Log #1145 NEC-P05 **Final Action: Reject**
(250)

Submitter: John H. Stricklin Mtn. Home, ID

Comment on Proposal No: 5-45

Recommendation: Equipment Grounding Conductor to be changed to Equipment Bonding Conductor.

Substantiation: Eustace Soares stated in his book "Grounding Electrical Distribution Systems for Safety", if I were asked to describe what it is that is responsible for the mystery in "Grounding" my answer could be given in ONE word. That word would be TRADITION. Tradition has been the nemesis of the progress of civilization for centuries. The only way we can fight the enemy of tradition is to view the facts with an open mind and not let tradition close our eyes to the truth.

TRADITION says we did something fifty years or more ago so we became hide-bound (having an inflexible character) and continue to do it despite the changes over the years, which dictate otherwise.

Eustace Soares states in the preface of his book on grounding, "The effectiveness and safety of any system finally rests on the methods of installations. The book covers pitfalls that must be avoided in order to comply with the rules as set down in the Code."

One of these pitfalls is to separate the differences between "Ground, grounded and grounding" and "Bond, bonded, and bonding."

Ground, grounded and grounding relate to "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." Is it not the power supplier that needs, "line surges, or unintentional contact with higher-voltage lines and that will stabilize the voltage to earth during their normal operations?"

Bond, bonded, and bonding relate to "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 fault current path."

Until the users of the National Electrical Code, change grounding and bonding to what they really are and mean, nearly everyone that tries to use the present NEC is always confused. Ground, grounded and grounding relate to lightning protection. Bond, bonded, bonding relates to fault current protection. When grounding and bonding are separated, that could be the first step in making grounding workable.

Panel Meeting Action: Reject

Panel Statement: The panel has determined that the concepts in Proposal 5-45 require further study. See the panel action and statement on Comment 5-1.

Number Eligible to Vote: 16

Ballot Results: Affirmative: 16

Comment on Affirmative:

BOKSINER: See my comment on affirmative on Comment 5-1.

5-26 Log #1146 NEC-P05 **Final Action: Reject**
(250)

Submitter: John H. Stricklin Mtn. Home, ID

Comment on Proposal No: 5-37

Recommendation: There should be Article 250 and Article XXX Bonding

Substantiation: Eustace Soares stated in his book "Grounding Electrical Distribution Systems for Safety", if I were asked to describe what it is that is responsible for the mystery in "Grounding" my answer could be given in ONE word. That word would be TRADITION. Tradition has been the nemesis of the progress of civilization for centuries. The only way we can fight the enemy of tradition is to view the facts with an open mind and not let tradition close our eyes to the truth.

TRADITION says we did something fifty years or more ago so we became hide-bound (having an inflexible character) and continue to do it despite the changes over the years, which dictate otherwise.

Eustace Soares states in the preface of his book on grounding, "The effectiveness and safety of any system finally rests on the methods of installations. The book covers pitfalls that must be avoided in order to comply with the rules as set down in the Code."

One of these pitfalls is to separate the differences between "Ground, grounded and grounding" and "Bond, bonded, and bonding."

Ground, grounded and grounding relate to "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." Is it not the power supplier that needs, "line surges, or unintentional contact with higher-voltage lines and that will stabilize the voltage to earth during their normal operations?"

Bond, bonded, and bonding relate to "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 fault current path."

Until the users of the National Electrical Code, change grounding and bonding to what they really are and mean, nearly everyone that tries to use the present NEC is always confused. Ground, grounded and grounding relate to lightning protection. Bond, bonded, bonding relates to fault current protection. When grounding and bonding are separated, that could be the first step in making grounding workable.

Panel Meeting Action: Reject

Panel Statement: CMP 5 concludes that separating grounding and bonding in two articles would not improve clarity.

Number Eligible to Vote: 16

Ballot Results: Affirmative: 16

5-27 Log #1216 NEC-P05 **Final Action: Reject**
(250)

Submitter: Jeffrey Boksiner, Telcordia Technologies

Comment on Proposal No: 5-1

Recommendation: CMP 5 is urged to continue to reject this proposal.

Substantiation: The Submitter has failed to provide a specific technical substantiation for this proposed change. Numerous other reasons for rejecting this proposal have been detailed in the negative votes of CMP members. Companion comments directed to Proposal 5-44 suggest specific limited changes to address a few areas in Article 250 where misinterpretation of the terms "grounded" and "grounding" might occur.

Panel Meeting Action: Reject

Panel Statement: The panel has determined that the concepts in Proposal 5-1 require further study. See the panel action and statement on Comment 5-1.

Number Eligible to Vote: 16

Ballot Results: Affirmative: 16

Comment on Affirmative:

BOKSINER: See my comment on affirmative on Comment 5-1.

5-28 Log #1225 NEC-P05
(250)

Final Action: Reject

Submitter: Donald A. Ganiere Ottawa, IL

Comment on Proposal No: 5-41

Recommendation: Panel should accept this change.

Substantiation: The Canadian Electrical Code made this same change a number of years ago with good results. The understanding of grounding and bonding has increased and there are fewer violations of the code rules related to grounding and bonding. The NFPA has a goal of harmonizing the North American codes. This proposal is a step in that direction and would provide a better and more easily understood NEC.

This is a continuing problem in the NEC. I don't believe that it can be solved just by better education. The term "grounding" means to be connected to earth. The term itself is misleading and needs to be changed. That is not the purpose of the conductor that is currently called "equipment grounding conductor." The function of that conductor is to bond the noncurrent carrying parts of the electrical system to the grounded conductor to provide a fault clearing path. This fault clearing path does not involve a connection to earth. Yes, this is a big step for the NEC to take, but it is a needed step to improve the understanding of grounding and bonding by the code users.

Panel Meeting Action: Reject

Panel Statement: The panel has determined that the concepts in Proposal 5-41 require further study. See the panel action and statement on Comment 5-1.

Number Eligible to Vote: 16

Ballot Results: Affirmative: 16

Comment on Affirmative:

BOKSINER: See my comment on affirmative on Comment 5-1.

5-29 Log #2544 NEC-P05
(250)

Final Action: Reject

Submitter: Vince Baclawski, National Electrical Manufacturers Association (NEMA)

Comment on Proposal No: 5-44

Recommendation: The panel should reject this proposal.

Substantiation: The stated purpose of this proposal is to correct the "misuse" and "misunderstanding" related to the terms grounding and bonding. These terms have a long history of use in the electrical industry and are well understood by those familiar with the concepts of grounding and bonding. There is no evidence provided that the misunderstanding and misuse is widespread or that the misunderstanding of these terms has resulted in unsafe installations. If there is any misunderstanding or misuse of these terms, a more appropriate solution may be an improved educational effort instead of an extensive revision of the NEC.

If this proposal is adopted, there will be a high cost for implementation of the proposed revisions to the NEC. Manufacturers will be required to revise product markings, product labeling, product instructions, product literature and catalogs. There is also the concern of incorrect installations due to the change in terminology. Confusion will be created by labels and markings on equipment in the existing infrastructure being different than the new products modified to comply with the new terminology.

The submitter has shown no safety hazard and no benefit. There is no substantiation as to what safety improvements will result, how shock accidents or fires will be prevented or reduced, how installations will improve or what will be done differently and better.

Panel Meeting Action: Reject

Panel Statement: The panel has determined that the concepts in Proposal 5-44 require further study. See the panel action and statement on Comment 5-1.

Number Eligible to Vote: 16

Ballot Results: Affirmative: 16

Comment on Affirmative:

BOKSINER: See my comment on affirmative on Comment 5-1.

5-30 Log #3546 NEC-P05
(250)

Final Action: Reject

Submitter: David Williams, Delta Township

Comment on Proposal No: 5-45

Recommendation: Please consider changing "equipment grounding conductor" to "equipment bonding conductor".

Substantiation: This change will help people to understand the difference between grounding and bonding.

Panel Meeting Action: Reject

Panel Statement: The panel has determined that the concepts in Proposal 5-45 require further study. See the panel action and statement on Comment 5-1.

Number Eligible to Vote: 16

Ballot Results: Affirmative: 16

Comment on Affirmative:

BOKSINER: See my comment on affirmative on Comment 5-1.

5-31 Log #3550 NEC-P05
(250)

Final Action: Reject

Submitter: Percy E. Pool, Verizon NS

Comment on Proposal No: 5-1

Recommendation: CMP 5 is urged to continue to reject this proposal.

Substantiation: The submitter's substantiation is rather vague and it does not address a specific safety problem. No specific technical reason has been offered for this proposed change. CMP members have presented several reasons for rejecting this proposal. Although the proposed change appears to be simple, its consequences are a tremendous unnecessary economic burden to the industry which will have to change all sorts of documentation to accommodate the proposed change.

Panel Meeting Action: Reject

Panel Statement: The panel has determined that the concepts in Proposal 5-1 require further study. See the panel action and statement on Comment 5-1.

Number Eligible to Vote: 16

Ballot Results: Affirmative: 16

Comment on Affirmative:

BOKSINER: See my comment on affirmative on Comment 5-1.

5-32 Log #1144 NEC-P05
(250.2.Effective Ground Fault Current Path)

Final Action: Reject

Submitter: John H. Stricklin Mtn. Home, ID

Comment on Proposal No: 5-47

Recommendation: Do not make a change to the definition of Effective Ground Fault Current Path.

Substantiation: The proposed new wording makes an action and not a definition, which would be in violation of the National Electrical Code Style Manual.

Panel Meeting Action: Reject

Panel Statement: The definition is related to the performance language in 250.4, and the proposed change in wording helps clarify what is intended by this term as defined. The action is consistent with the NEC Style Manual because the added language is not a requirement.

Number Eligible to Vote: 16

Ballot Results: Affirmative: 15 Negative: 1

Explanation of Negative:

BRENDER: The panel has voted to insert a purpose within a definition. The last seven words in the proposal do not belong within a definition.

5-33 Log #1020 NEC-P05
(250.2.Effective Ground-Fault Current Path)

Final Action: Accept in Principle

Submitter: Noel Williams, Noel Williams Consulting

Comment on Proposal No: 5-48

Recommendation: This proposal should remain accepted or accepted in principal as modified by Panel 5.

Substantiation: The language about facilitating the operation of an over-current device was removed in the 2002 NEC for no apparent reason. This language is critical to the understanding of the purpose of an effective ground fault path. Prior to the 1999 NEC it had been in 250-51 or the equivalent location since at least 1940, but there is nothing out-of-date about this language and it should be restored.

Panel Meeting Action: Accept in Principle

Panel Statement: See the panel action on Comment 5-34.

Number Eligible to Vote: 16

Ballot Results: Affirmative: 15 Negative: 1

Explanation of Negative:

BRENDER: See my explanation of negative vote on Comment 5-32.

5-34 Log #2426 NEC-P05
(250.2.Effective Ground-Fault Current Path)

Final Action: Accept

Submitter: J. Philip Simmons, Simmons Electrical Services / Rep. National Armored Cable Manufacturers Association

Comment on Proposal No: 5-48

Recommendation: Revise the definition as follows:

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 and that facilitates the operation of the overcurrent protective device or ground fault detectors on high-impedance grounded systems.

Substantiation: Editorial improvements.

Panel Meeting Action: Accept

Number Eligible to Vote: 16

Ballot Results: Affirmative: 15 Negative: 1

Explanation of Negative:

BRENDER: See my explanation of negative vote on Comment 5-32.

5-35 Log #2546 NEC-P05
(250.2.Ground Fault.)

Final Action: Hold

Note: The Technical Correlating Committee directs that Proposal 5-49 and Comment 5-35 be reported as "Hold".

The Technical Correlating Committee has recognized that the use of the term "ground fault" in other Articles such as 230 and 430 is inconsistent with the definition of "ground fault" proposed by Panel 5.

The Technical Correlating Committee will establish a Task Group to study this issue.

Submitter: Vince Baclawski, National Electrical Manufacturers Association (NEMA)

Comment on Proposal No: 5-49

Recommendation: Accept the proposal in principle, but consider the following suggested wording:

Ground Fault. An unintentional, electrically conducting connection between an ungrounded or grounded a normally current carrying conductor of an electrical circuit, and the normally non-current-carrying conductors, metallic enclosures, metallic raceways, metallic equipment, or earth.

Substantiation: The previously proposed words "an ungrounded or grounded conductor" are technically all inclusive. Everything is either ungrounded or grounded. It would be clearer and more specific to state between "normally current carrying" and "normally non-current carrying" conductors.

Panel Meeting Action: Reject

Panel Statement: While the panel agrees that all conductors are either normally current-carrying or normally not current-carrying, the proposed change may cause confusion in the definition when considering whether a grounded conductor is to be considered current-carrying or not current-carrying.

The panel intends to emphasize the fact that an unintentional connection between the grounded circuit conductor and grounding conductors, enclosures, raceways, etc. also constitutes a ground fault.

Number Eligible to Vote: 16

Ballot Results: Affirmative: 16

5-36 Log #119 NEC-P05
(250.8)

Final Action: Reject

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education

Comment on Proposal No: 5-57

Recommendation: Revise text to read as follows:

Sheet metal thread-forming screws.

Substantiation: To accomplish the proposer's intent, we want to eliminate all screws whose threads are too coarse to create sufficient area of contact to ensure good electrical continuity. "Screws other than machine screws" might be another more general way to phrase the prohibition.

Panel Meeting Action: Reject

Panel Statement: Thread-forming screws are currently a method of attachment of grounding terminal bar accessory kits in panelboards and other enclosures. Replacing the term "sheet metal screws" with "thread-forming screws" would eliminate products currently available and suitable for such use.

Number Eligible to Vote: 16

Ballot Results: Affirmative: 16

5-37 Log #885 NEC-P05
(250.8)

Final Action: Reject

Submitter: Wayne H. Robinson, Prince George County Government

Comment on Proposal No: 5-56

Recommendation: Clarification of text: Grounding Electrode Conductor

Substantiation: The panel recognizes grounding electrode conductor through grounding conductors definition. The NEC is now being interpreted by non-electrical officials in many areas throughout the country, with minimal or no electrical training involving material and method (apprenticeship or OJT). This is the result of budgetary problems many inspection organizations are facing. Hiring of trained electrical officials is becoming extinct or a thing of the past. It's now become necessary to help clarify the NEC to these officials, one should not have to seek out definitions, to determine whether a grounding electrode conductor connection is in compliance with 250.8. All three terms bonding, grounding and grounding electrode conductor are definitive by Article 100. That being said, you can see the confusion it may have on these officials and possibly young electricians in the industry.

Panel Meeting Action: Reject

Panel Statement: The term "grounding electrode conductor" is included in

the broader definition of the term "grounding conductor" in Article 100 and therefore it is not necessary to add the proposed term to this section.

Number Eligible to Vote: 16

Ballot Results: Affirmative: 16

5-38 Log #1119 NEC-P05
(250.8)

Final Action: Reject

Submitter: Paul Dobrowsky Holley, NY

Comment on Proposal No: 5-57

Recommendation: Revise Section 250.8 as follows:

250.8 Connection of Grounding and Bonding Equipment.

Grounding conductors and bonding jumpers shall be connected by exothermic welding, listed pressure connectors, listed clamps, or other listed means or devices listed as grounding and bonding equipment. Connection devices or fittings that depend solely on solder shall not be used. Sheet metal screws shall not be used to connect grounding conductors, bonding jumpers or connection devices to enclosures.

Substantiation: Products that are designed and evaluated for grounding and bonding in accordance with the appropriate product standard (UL 467) are all that is necessary. Bonding jumpers was added to be consistent with the first sentence. Sheet metal screws are not acceptable for these either.

Panel Meeting Action: Reject

Panel Statement: The revised text imposes an extreme restriction on the connectors that can be used. UL 467 is a product standard that covers connectors used in underground and concrete-encased applications, so there are provisions for corrosion protection that would not be applicable to connectors, used in non-corrosive conditions. UL 467 also covers connectors used in the effective fault current path, so there is a fault current withstand test that is not applicable to connectors for grounding electrode conductors since this conductor is not intended to carry-ground fault current. The present standards for dead front switchboards, motor control centers, and panelboards suitable for use a service equipment do not require the terminal for the grounding electrode conductor to be listed to UL 467 but listed only under UL 486A, UL 486B, or UL 486E as a wire connector. Since 250.8 applies to grounding and bonding conductors to carry fault current and also to grounding electrode conductors subject to corrosion, the present wording is needed to cover all cases and not add extra restrictions.

Number Eligible to Vote: 16

Ballot Results: Affirmative: 16

5-39 Log #1143 NEC-P05
(250.8)

Final Action: Reject

Submitter: John H. Stricklin Mtn. Home, ID

Comment on Proposal No: 5-57

Recommendation: Revise to read as follows:

Sheet metal screws, connection devices, or fittings that depend solely on solder shall not be used.

Substantiation: This statement would do the same in one sentence.

Panel Meeting Action: Reject

Panel Statement: The sentence suggested does not accurately reflect the prohibition of the use of sheet metal screws to connect grounding conductors or connection devices to enclosures.

Number Eligible to Vote: 16

Ballot Results: Affirmative: 16

5-40 Log #2137 NEC-P05
(250.8)

Final Action: Hold

Note: The Technical Correlating Committee directs that the Panel Action on Comment 5-40 only be reported as "Hold" consistent with Section 4-4.6.2.2 of the NFPA Regulations Governing Committee Projects. The comment adds new material that has not had adequate public review. The action on Proposal 5-57 stands as shown in the Report on Proposals.

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

Comment on Proposal No: 5-57

Recommendation: Accept the proposal in principle. Revise the last sentence to read as follows:

"Where screws are used to make field connections of grounding conductors or grounding terminals to enclosures, machine screws or thread-forming screws with machine threads shall be used."

Substantiation: The disallowance of sheet metal screws for this purpose is appropriate, but the wording has raised three questions: what about metal-to-metal connections in listed enclosures, where the continuity has been evaluated by the testing laboratory (presumably OK), and on field connections, what about other screws, such as wood screws that are even less suitable than sheet-metal screws? What about "teck" thread forming screws that result in machine threads, but that are often referred to as a type of sheet metal screw? This comment answers those questions. The real technical issue addressed in this requirement is the poor mechanical advantage offered by a conventional sheet metal screw with its very coarse threads. The submitter is aware that this comment may need to be held in accordance with 4-4.6.2.2(a) of the Regulations, but wanted to bring the issues to the attention of CMP 5.

Panel Meeting Action: Accept

Number Eligible to Vote: 16

Ballot Results: Affirmative: 16

5-41 Log #2153 NEC-P05 **Final Action: Accept in Principle**
(250.11(8)(6) (d) and (7) (e))

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

Comment on Proposal No: 5-206

Recommendation: Accept the proposal.

Substantiation: The submitter has been arguing this point and submitting comparable language over the last four cycles. See, for example Comment 5-135 in the 1999 cycle, when the proposed phrasing was "installed for the purpose of providing flexibility during use." If the flexible wiring method will be held steady after installation, the supplemental equipment grounding conductor accomplishes nothing. For example, this submitter wired a wood-framed room in EMT. Because of the way the roof and wall were framed at one point, it was impossible to get the EMT around the corner. The solution was a 12-in. length of $\frac{1}{2}$ -in. FMC connected by changeover fittings at each end to EMT. The maximum overcurrent device was 20A. Was flexibility required? Yes. Is it (supplemental grounding conductor) now required after the completion of construction, when it is embedded in the wall framing and cannot move at all? Arguably yes, because flexibility was required, even if for only about 5 minutes. The current wording in 250.118, even after the action on Proposal 5-216, keeps the mystery in play in spite of this submitter's prior efforts. Positive code language is needed to settle this question.

Panel Meeting Action: Accept in Principle

Revise 250.118(6)(d) and (7)(e) to read as follows:

250.118(6)(d). Where used to connect equipment where flexibility is necessary after installation, an equipment grounding conductor shall be installed.

250.118(7)(e). Where used to connect equipment where flexibility is necessary after installation, an equipment grounding conductor shall be installed.

Panel Statement: The panel recognizes that the Code section reported in Comment 5-41 should have been 250.118(6)(d) and (7)(e). The revised text correlates with 348.60 and 350.60 and clarifies the restrictions on the use of FMC and LFMC as an equipment grounding conductor. This action is also consistent with the panel action taken on Proposals 5-216 and 5-218 as modified by the action in Comments 5-192 and 5-194.

Number Eligible to Vote: 16

Ballot Results: Affirmative: 16

5-42 Log #3235 NEC-P05 **Final Action: Accept**
(250.21)

Submitter: Michael I. Callanan, IBEW

Comment on Proposal No: 5-60

Recommendation: This Panel should have accepted this proposal.

Substantiation: We agree with the Negative Comment of Mr. Hammel and the submitter's substantiation that this Proposal involves a safety issue for persons and property. The safety of persons working on ungrounded systems with an undetected fault is compromised. Ground detectors should be required on ungrounded systems. This is a small price to pay for safety.

This Comment represents the official position of the International Brotherhood of Electrical Workers Codes & Standards committee.

Panel Meeting Action: Accept

Number Eligible to Vote: 16

Ballot Results: Affirmative: 12 Negative: 4

Explanation of Negative:

BOKSINER: The panel statement that accompanied the rejection of this proposal during the ROP stage is still applicable. The statement said "submitter has provided no substantiation or existing problems that would make this requirement necessary to mandate." No additional substantiation was provided by the submitter during comment stage to warrant imposing this requirement.

DOBROWSKY: This comment should be Rejected. The existing requirements have been in place for many years and no evidence of a safety problem has been provided in the proposal or comment. It is true that industry recognizes the value of ground detection, but the reason ground detectors are not required for the two specific cases is because it is not practical to do so. The proposal indicates that this change would be consistent with industry practice when, in fact, industry practice does not use ground detection for industrial electrical furnaces and the line side of rectifier supplied adjustable speed drives. We need to recognize that these are special cases and the existing language limits the application to where these systems are used only (exclusively) for these types of loads.

During the discussions at the ROC meeting, individuals commented that they had tried to utilize ground detection, but could not get the systems to operate. The industries utilizing these systems recognize the value of ground detection and would desire to use them if they could. Adding this requirement will cause inconsistent applications and will not be enforceable.

RAPPAPORT: This addition, if accepted, will require ground detectors to be installed on systems covered in 250.21(1) and 250.21(2) i.e. systems used exclusively for supplying industrial electrical furnaces and separately derived systems used exclusively for rectifiers that supply only adjustable speed drives. Systems covered under 250.21(3) and 250.21(4) already require ground fault alarms. Adding an exception for less than 120 volt systems is in contradiction to requirements contained in 250.21(3) which require ground fault alarms for

all voltages above 50 volts. The exception will allow the operation of below 120 V nominal (115 volt) volt secondary systems without any ground fault detection.

It is neither practical nor feasible to install ground detectors on systems supplying industrial electrical furnaces and adjustable speed drive systems. These systems employ electronic controls that are self protected down stream of the electronics for any ground fault. Due to reduced ripple and harmonics considerations, systems higher than 6 pulse system are specified and supplied by multi-winding secondary transformer windings. For example, an 18 pulse system may have a transformer with one primary winding and three secondary windings separated by a 120 degree phase shift. By accepting this new wording, three ground fault detection systems will be required for an 18 pulse system.

Even three phase electronic systems operate on single phase sequences. Any ground fault downstream of the electronics system will be detected by the electronic control causing it to shut down the system.

This addition will require ground detectors on all three windings upstream of the electronic controls which is neither feasible nor practical or even necessary. All ungrounded system ground fault detectors operate on detecting voltage unbalance in three phases. Operation of electronics on single phase will result in a momentary voltage drop in one phase falsely activating the ground fault detection system. This will require a delay of the ground fault activation system. Any ground fault downstream of the electronic control system will cause the system to shut down thereby negating this alarm. The supply from the transformer to the electronic control cubicle is normally well protected and, in most cases, is within or very near to the enclosure containing the electronic controls thereby reducing the potential of ground faults upstream of the electronic controls.

During the ROP stage, CMP 5 rejected this addition by a 15-1 vote with a statement: "There are many ungrounded systems installed around the country. The submitter has provided no substantiation of existing problems that would make this requirement necessary to mandate. Designers and building owners are not restricted from this option."

The existing NEC provisions, without ground detection, has existed since at least 1984. No additional substantiation was provided by the submitter during the comment stage of any safety incidents that would require reversal of action taken during the ROP stage. CMP 5 should reject this additional requirement for ground detection and the exception.

WHITE: The panel has accepted this proposal with no substantiation or documentation of any problems. The NEC does not preclude the use of ground fault detectors for an ungrounded system. Mandating such systems will not mandate their use once installed. Designers, owners and operators of premise wiring systems are free to install this supplementary operating tool if they choose and are more likely to use it if installed on that basis. The result of this panel action will be the installation of a many ground fault detection systems that will never be utilized. This is a design issue and should not be mandated.

5-43 Log #1121 NEC-P05 **Final Action: Reject**
(250.21(6) (New))

Submitter: Paul Dobrowsky Holley, NY

Comment on Proposal No: 5-62

Recommendation: Accept the proposal.

Substantiation: The generator frame does not serve in place of the earth. In fact it may be at a different potential. Many generators are mounted on isolators or rubber tires and have no "connection" to the earth. A comment has been submitted to modify the definition of Grounded as follows:

Grounded. Connected directly to earth or through to some conducting means body that serves in place of the earth.

Panel Meeting Action: Reject

Panel Statement: "Ground" can be the earth, a chassis, a machine frame on wheels, etc. The definition of "ground" includes things other than earth.

Number Eligible to Vote: 16

Ballot Results: Affirmative: 16

5-44 Log #3361 NEC-P05 **Final Action: Reject**
(250.24(A)(4))

Submitter: Lonnie L. Buie, Jr., Pettit & Pettit, Consulting Engineers, Inc.

Comment on Proposal No: 5-66

Recommendation: Accept proposal to save lives and property.

Substantiation: The panel statement says "the submitter has provided no technical substantiation documenting the need for this change."

Sketches A & B of the proposal technically describe the claims being made. This phenomenon is widely known within the fire service, insurance and fire investigation circles. While speaking to the Tennessee chapter of the International Association of Arson Investigators (IAAI) at it's annual convention in Gatlinburg, Tennessee on August 16, 2000, I asked how many within the group of approximately 400 had seen fires caused by this phenomenon, almost everyone in the group raised their hands. Again while speaking to the Arkansas chapter of the IAAI at it's annual convention in Hot Springs, Arkansas on April 4, 2003, I asked the same question and many responded that they had seen such

occurrences. My personal knowledge of such occurrences is as follows:

1) A lineman with City Water and Light of Jonesboro, Arkansas in the late 1970's watched fire trucks respond to five residential fires in the neighborhood where he had just dropped a live 7200 volt distribution line to the ground. He was still in his bucket above the house tops. All five of the fires originated at a grounding electrode conductor.

2) In 1987 a Craighead Electric Cooperative Corporation line fell to the ground approximately 1/2 mile from the local McDonalds Restaurant in Trumann, Arkansas. A teenage worker named (name deleted) was electrocuted at the instant the line fell because she was partially within the fault current path as she touched the metallic food warmer bin within the McDonald's Restaurant.

3) On January 31, 1991, (name deleted) of Rogers, Arkansas and a neighbor (name deleted) lost both their homes to fire when a Carroll County Electric Cooperative Corporation's distribution line fell to the ground. The line fell approximately 1/4 mile from the home and approximately 1/2 mile from (name deleted) home.

4) On June 19, 1997, (name deleted) of Austin, Arkansas lost their apartment to fire when a tree limb fell on a First Electric Cooperative Corporation's distribution line approximately 100 yards from the apartment.

5) On April 12, 1998, the (name deleted) of Madison, Wisconsin burned down when a Madison Gas & Electric Company line was blown into a metal lighting standard on the car sales lot.

6) On September 4, 1998, (name deleted) was installing a new water line to (name deleted) a house in Arkansas, when he cut the neutral conductor of Entergy-Arkansas's 240/120, 3-wire underground service to (name deleted) home. He did not cut the two line conductors. He sat on his excavator and watched a bale of hay catch on fire next to the house. The bale of hay was against the No. 6 AWG copper grounding electrode conductor. Eventually, the entire house was lost to fire.

7) During the recent wind storm this summer in Memphis, Tennessee, numerous structure fires were reported to have been caused when Memphis Gas Light & Water distribution lines fell during the storm.

The utility ground fault protector does not open the neutral and poses no possibility of producing an open neutral condition. To the contrary, the utility ground fault protector will provide protection from an open neutral condition by sensing the neutral current returning to the source via the grounding electrode conductor. Presently under the NEC the neutral is grounded through the main bonding jumper (1) to prevent the neutral from floating and possibly damaging equipment from over voltages or under voltages and (2) to provide a low impedance path so that circuit breakers will trip when a fault occurs. Since the utility ground fault protector of the proposal is mechanically tied to the main circuit breaker, when the protector trips, it trips the main circuit breaker preventing any possible hazard from a floating neutral or from a future ground fault from the now ungrounded neutral. When the utility ground fault is interrupted and the main circuit breaker, along with the utility ground fault protector, are reset; then the neutral is again grounded.

See public comments on companion proposal to CMP 4 for further substantiation. (Proposal 4-118)

The panel statement also says "the present requirement in 250.28 requires the main bonding jumper to be unspliced." The proposal does not provide a splice in the main bonding jumper, but does open the main bonding jumper. When the utility ground fault protector opens the main bonding jumper, it also opens the main circuit breaker preventing the hazards for which the 250.23 requirement was written.

If no valid reason can be given for rejecting the proposal, then the proposal should be accepted to prevent loss of lives and property.

Panel Meeting Action: Reject

Panel Statement: The panel affirms its original action and position on this proposal. Additional substantiation has not been provided to demonstrate a need for such a change. Utility ground fault protectors are not consistent to all installations and are not a requirement and the service point may have severe impact on routing the main bonding jumper as proposed. The panel maintains that the main bonding jumper is required to remain without a splice. A device that opens the main bonding jumper as presented in Comment 5-44 is in direct conflict with the requirements of the NEC as well as product standards.

There were no sketches, A & B, provided to CMP 5 in Proposals 5-66, 5-72, 5-75, or 5-76. Again as stated in the Panel Statement of the ROP, there was no technical substantiation provided by the submitter.

This comment sites several examples of fires but fails to submit any statistics or reports that officially document ground fault currents as the cause of these fires; all substantiation is purely anecdotal. The descriptions of some of the incidents in Comment 5-44 could lead to other possible conclusions, such as direct contact with electric lines or voltage gradient problems and may have no relation at all to ground fault current. No data or documentation was submitted showing any tests this device was subjected to that prove it will or does operate as stated. The panel is unwilling to mandate such a device without any device actually being made or available, and without any real documentation or substantiation of the stated safety concern.

Number Eligible to Vote: 16

Ballot Results: Affirmative: 16

5-45 Log #1122 NEC-P05
(250.24(B))

Final Action: Reject

Submitter: Paul Dobrowsky Holley, NY

Comment on Proposal No: 5-68

Recommendation: Accept the proposal in principle. Change the proposed term "equipment bonding conductor" to "equipment bonding jumper" and add the following as Exception No. 1 to 240.24(B) [2005 draft].

If an equipment bonding jumper is installed and the grounded conductor is not connected to the disconnecting means enclosure a main bonding jumper shall not be installed for the service.

Re-identify the existing exceptions as Exceptions No. 2. & No 3.

Substantiation: If it is desirable to "isolate" the grounded conductor from the service enclosure and a fault path is provided then this concept should be permitted. The fault current path would still be provided in the form of an equipment bonding jumper. This concept is commonly used at buildings supplied by feeders or branch circuits. Why should it not be acceptable for services? The conductor sizing requirements remain the same and are covered by 250.102(C).

Panel Meeting Action: Reject

Panel Statement: The proposal and comment would require a conductor of a specified size and installed in a specified manner to be installed, the same as the grounded circuit conductor that is now required. The only difference is that it would be called a "grounded conductor" where there is phase to neutral connected loads, and called an "equipment bonding jumper" when there are no phase to neutral loads being served. This dual naming of the same conductor will create confusion for identification (white or no identification) and not add clarity or safety to what is presently required.

Number Eligible to Vote: 16

Ballot Results: Affirmative: 16

5-46 Log #1021 NEC-P05
(250.28)

Final Action: Accept

Submitter: Noel Williams, Noel Williams Consulting

Comment on Proposal No: 5-74

Recommendation: This proposal should continue to be accepted in principal as modified by Panel 5.

Substantiation: I do not support the idea of renaming the equipment grounding conductor, unless it is renamed the "equipment grounding and bonding conductor." (I think that name is more descriptive and accurate but pretty unwieldy.) I do agree that a distinction should be made between the main bonding jumper and other similar bonding jumpers at separately derived systems. This proposal makes the distinction and also provides a distinction between a system bonding jumper and other "bonding jumpers."

Panel Meeting Action: Accept

Number Eligible to Vote: 16

Ballot Results: Affirmative: 16

5-47 Log #2138 NEC-P05
(250.28)

Final Action: Reject

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

Comment on Proposal No: 5-74

Recommendation: Accept the panel action in principle. Delete the term "system bonding jumper."

Substantiation: This comment is intended to signal agreement with the comments in the voting. The function of a main and system bonding jumper are identical. It is poor editorial practice to add distinctions without differences to a code already as complex as the NEC unavoidably has become. We just, finally, got over the confusion engendered by the fact that grounding electrode conductors for a very long time only originated at service equipment, and conductors with identical functions originating at building disconnects were something different. We did this by expanding the definition to cover all such conductors. CMP 1 only rejected the change in Article 100 because it was inconsistent with current provisions in Article 250. CMP 5 and CMP 1 should arrange for a small task group to produce consistent terminology in both articles, using only the term "main bonding jumper."

Panel Meeting Action: Reject

Panel Statement: Providing separate terms adds clarity. The term "System Bonding Jumper" has been defined in Article 100, so its use is appropriate in this section.

Number Eligible to Vote: 16

Ballot Results: Affirmative: 16

5-48 Log #3310 NEC-P05
(250.28)**Final Action: Reject****Submitter:** Charles Mello, Electro-Test, Inc.**Comment on Proposal No:** 5-74**Recommendation:** Delete all references to the “system bonding jumper” and use only the term “main bonding jumper”.**Substantiation:** This is a companion comment to comments on proposals 1-62 and 1-63 submitted to CMP 1 to overturn the rejection of the proposed change to the definition of main bonding jumper. A companion comment has also been submitted to proposal 5-78 to revise the use of “system bonding jumper” for separately derived systems. The proposed change would allow “main bonding jumper” to be used for other than services. A separate comment is submitted to reject the addition of a definition of system bonding jumper.

Today’s reality is that the “service” is at best a moving target. What are services today are being sold by the utilities and at the stroke of a pen become by definition “separately derived systems”. Conversely, universities and some industrial campuses are selling their privately owned primary distribution systems to the local utility so where there were 1 or 2 “services” at medium voltage, there are now a large number of “services” which just before the sale were “separately derived systems”.

From the stand point of the connection of the system grounded conductor to the equipment grounding conductor(s) and grounding electrode conductor(s) there is no technical difference between a “service” or a “separately derived system”. The materials are the same see 250.28(A). Conductor to the grounding system in a “service” 250.28 is referenced in 250.30 on connecting the system grounded conductor to the grounding system for a “separately derived system”.

Grounding and bonding are already confusing enough and the fostering or perpetuating of additional terminology for the same thing only exasperates that confusion. See also the comment for proposal 1-63.

Panel Meeting Action: Reject**Panel Statement:** Providing separate terms adds clarity. The term “System Bonding Jumper” has been defined in Article 100, so its use is appropriate in this section.**Number Eligible to Vote:** 16**Ballot Results:** Affirmative: 165-49 Log #56 NEC-P05
(250.30)**Final Action: Reject****Submitter:** Michael V. Glenn, Longview Fibre Co.**Comment on Proposal No:** 5-78**Recommendation:** Reject this proposal.**Substantiation:** Mr. Rappaport’s negative vote explanation is correct and this proposal should be rejected for that reason. His negative vote explanation found on Proposal 5-1 explains why the term “equipment bonding conductor” is not acceptable in 250.30(A)(1). I support Mr. Rappaport’s explanation of the purpose of the grounding electrode conductor within a building when supplied from a service or other separately derived system and request the panel consider this negative vote and reject this proposal.**Panel Meeting Action: Reject****Panel Statement:** The Technical Correlating Committee’s action on Proposal 5-1 rejected the proposal, so the issue about changing “equipment grounding conductor” to “equipment bonding conductor” is no longer an issue. No technical substantiation was provided to reject the improvements made to this section.**Number Eligible to Vote:** 16**Ballot Results:** Affirmative: 15 Negative: 1**Explanation of Negative:**

RAPPAPORT: See my explanation of negative vote on Comment 5-52.

5-50 Log #776 NEC-P05
(250.30)**Final Action: Accept in Principle****Submitter:** Michael J. Johnston Plano, TX**Comment on Proposal No:** 5-78**Recommendation:** Continue to accept the organizational revisions and technical clarifications to this accepted under the action to Proposal 5-78. The work of the task group on 250.30 was to revise 250.30(A) only and not 250.30(B). The proposal 5-78 should indicate Section 250.30(A). 250.30(B) should also remain in the Code as it was not deleted under this proposal.

Change the proposal Section to 250.30(A) and insert 250.30(B) back into the Code.

Substantiation: The 2005 NEC draft didn’t include 250.30(B). It was not the intent of the task group to remove 250.30(B) as part of the proposed changes.**Panel Meeting Action: Accept in Principle**

The results of action on this comment are incorporated in the action taken on Comment 5-52.

Panel Statement: See panel action and statement on Comment 5-52.**Number Eligible to Vote:** 16**Ballot Results:** Affirmative: 15 Negative: 1**Explanation of Negative:**

RAPPAPORT: See my explanation of negative vote on Comment 5-52.

5-51 Log #1123 NEC-P05 **Final Action: Accept in Principle in Part**
(250.30)**Submitter:** Paul Dobrowsky Holley, NY**Comment on Proposal No:** 5-78**Recommendation:** Continue to accept the proposal in principle without the changes to 250.30(A)(4) and further modify 250.30(A)(4)(c).

The “subdivisions” to read as follows:

250.30(A)(4) Where more than one separately derived system is connected to a common grounding electrode conductor, the common grounding electrode conductor shall be sized in accordance with 250.66, based on the sum of the circular mil area of the largest derived phase conductor(s) from each separately derived system connected to the common grounding electrode conductor.

250.30(A)(4)(c)

(c) Connections. All tap connections to the common grounding electrode conductor shall comply with the following:(1) Connections shall be made at an accessible location by exothermic welding or devices listed as grounding and bonding equipment.(2) Copper busbars not less than 6 mm ? 50 mm (1/4 in. ? 2 in.) and of sufficient length for all connections shall be permitted. The busbar shall be securely fastened and shall be installed in an accessible location.**Substantiation:** If two small transformers are installed some distance from the building grounding electrode system a common grounding electrode conductor sized for the actual installation should be permitted. There are many applications where a 3/0 minimum size requirement is unrealistic. The NEC should not contain requirements for possible future “additions” in accordance with 90.1(B). Where additional separately derived systems are expected to be installed then the designer or engineer can specify a larger common grounding electrode conductor. Enforcement of the NEC can solve the problem of incorrect sizes.

Products that are designed and evaluated for grounding and bonding in accordance with the appropriate product standard (UL 467) are all that is necessary. This standard does not require that devices are irreversible and neither should the NEC. Non-Irreversible connections have been safely used at services for many years with no evidence of problems. The termination connections at the separately derived system and at the electrode are not generally irreversible. Language and the list format were copied from proposal 5-158 [250.64(C)] for consistency.

Panel Meeting Action: Accept in Principle in Part

The results of action on this comment are incorporated in the action taken on Comment 5-52.

Panel Statement: The panel accepts the concept of restructuring but does not accept the portion related to devices being specifically listed as grounding and bonding equipment as distribution equipment such as switchboards, panelboards, and motor control centers commonly use listed lugs that are suitable for connecting grounding electrode conductors but are not necessarily listed as grounding and bonding equipment. See panel statement on Comment 5-38.

The panel did not accept removing the minimum size of 3/0 for the common grounding electrode conductor, because the minimum size avoids likely widespread inconsistency in applying the common grounding electrode conductor rule for multiple separately derived systems. The 3/0 minimum is necessary because other systems will likely be attached over time.

The recommendation on “sufficient length” of the bus bar was not accepted because “sufficient” is a vague term that is not enforceable.

Number Eligible to Vote: 16**Ballot Results:** Affirmative: 15 Negative: 1**Explanation of Negative:**

RAPPAPORT: See my explanation of negative vote on Comment 5-52.

5-52 Log #2140 NEC-P05 **Final Action: Accept in Principle in Part**
(250.30)**Submitter:** Frederic P. Hartwell, Hartwell Electrical Services, Inc.**Comment on Proposal No:** 5-78**Recommendation:** Accept the panel action in principle.

I) Use “main bonding jumper” instead of “system bonding jumper” throughout

I I) Revise the panel wording in proposed 250.30(A)(4) as follows:

Invert 250.30(A)(4) and 250.30(A)(4)(a), as follows:

(4) Grounding Electrode Conductor, Multiple Separately Derived Systems.

Where more than one separately derived system is installed, it shall be permissible to connect a tap from each 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. The grounding electrode conductors and taps shall comply with (a) through (d).

Exception No. 1: [same as 250.30(A)(4)(a) Exception No. 1 in the panel wording]

Exception No. 2: [same as 250.30(A)(4)(a) Exception No. 2 in the panel wording]

(a) Common Grounding Electrode Conductor Size. The common grounding electrode conductor shall not be smaller than 3/0 AWG copper or 250 kcmil aluminum.

(b) Tap Conductor Size. [same as 250.30(A)(4)(b) in the panel wording]

(c) Connections. [same as 250.30(A)(4)(c) in the panel wording]

III) Revise 250.30(A)(5) as follows:

(5) Installation. The grounding electrode conductor of a single separately derived system, and the common grounding electrode conductor and the taps to each derived system of a multiple separately derived system, shall comply with 250.64(A), (B), (C), and (E).

Exception: [relocate the text of 250.30(A)(7) Exception No. 2 and the ensuing FPN here; convert 250.30(A)(7) Exception No. 1 to 250.30(A)(7) Exception].

IV) Restore 250.30(B) from the 2002 NEC. Correct the final internal reference therein from 250.30(A)(4) to 250.30(A)(7).

Substantiation: I. The objection to “system bonding jumper” is for correlation with the submitter’s comment on Proposal 5-74.

II. This part of the comment is editorial; The parent wording in (4) should introduce the concept instead of jumping immediately to the size of the common conductor. The language in the first sub-paragraph is essentially suitable for this purpose.

III. The exception at 250.30(A)(7) Exception No. 2 in the rewrite actually takes exception to the rule in 250.64(C) for a continuous run from the system connection to the electrode, and therefore should follow the local reference thereto, 250.30(A)(5) in the rewrite. When a derived system grounding electrode conductor makes a connection to the parent source grounding electrode conductor, it is in violation of this provision unless exception is made in the NEC, and that is the function of rewritten 250.30(A)(7) Exception No. 2. The internal language of the exception assures us that no exception is taken to any grounding electrode provisions, nor to any sizing requirements, and therefore the exception is improperly located. See also the comments in the voting on Proposal 5-82.

IV. This appears to be a panel oversight. There was no substantiation to leave 250.30 with no provisions covering ungrounded systems, but the literal text of the action on this proposal does exactly that. This comment corrects the error.

Panel Meeting Action: Accept in Principle in Part

250.30 Grounding Separately Derived Alternating-Current Systems.

(A) **Grounded Systems.** A separately derived ac system that is grounded shall comply with (1) through (8). A grounding connection shall not be made to any grounded circuit conductor on the load side of the point of grounding of the separately derived system except as otherwise permitted in this article. FPN: See 250.32 for connections at separate buildings or structures, and 250.142 for use of the grounded circuit conductor for grounding equipment.

Exception: Impedance grounded neutral system grounding connections shall be made as specified in 250.36 or 250.186.

(1) **System Bonding Jumper.** An unspliced system bonding jumper in compliance with 250.28(A) through (D) that is sized based on the derived phase conductors shall be used to connect the equipment grounding conductors of the separately derived system to the grounded conductor. This connection shall be made at any single point on the separately derived system from the source to the first system disconnecting means or overcurrent device, or it shall be made at the source of a separately derived system that has no disconnecting means or overcurrent devices.

Exception No. 1: For separately derived systems that are dual fed (double ended) in a common enclosure or grouped together in separate enclosures and employing a secondary tie, a single system bonding jumper connection to the tie point of the grounded circuit conductors from each power source shall be permitted.

Exception No. 2: A system bonding jumper at both the source and the first disconnecting means shall be permitted where doing so does not establish a parallel path for the grounded conductor. Where a grounded conductor is used in this manner, it shall not be smaller than the size specified for the system bonding jumper but shall not be required to be larger than the ungrounded conductor(s). For the purposes of this exception, connection through the earth shall not be considered as providing a parallel path..

Exception No. 3: The size of the system bonding jumper 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, shall not be smaller than the derived phase conductors and shall not be smaller than 14 AWG copper or 12 AWG aluminum.

(2) **Equipment Bonding Jumper Size.** Where a bonding jumper of the wire type 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 250.102(C), based on the size of the derived phase conductors.

(3) **Grounding Electrode Conductor, Single Separately Derived System.** A grounding electrode conductor for a single separately derived system shall be sized in accordance with 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 250.30(A)(7). This connection shall be made at the same point on the separately derived system where the system bonding jumper is installed.

Exception No. 1: Where the system bonding jumper specified in 250.30(A)(1) is a wire or busbar, it shall be permitted to connect the grounding electrode conductor to the equipment grounding terminal, bar, or bus provided the equipment grounding terminal, bar, or bus is of sufficient size for the separately derived system.

Exception No. 2: Where a separately derived system originates in listed equipment suitable as service equipment, the grounding electrode conductor from the service or feeder equipment to the grounding electrode shall be permitted as the grounding electrode conductor for the separately derived system provided the grounding electrode conductor is of sufficient size for the separately derived system. Where the equipment ground bus internal to the equipment is not smaller than the required grounding electrode conductor for the separately derived system, the grounding electrode connection for the separately derived system shall be permitted to be made to the bus.

Exception No. 3: 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 grounded conductor is bonded to the transformer frame or enclosure by a jumper sized in accordance with 250.30(A)(1), Exception No. 3, and the transformer frame or enclosure is grounded by one of the means specified in 250.134.

(4) **Grounding Electrode Conductor, Multiple Separately Derived Systems.** Where more than one separately derived system is installed, it shall be permissible to connect a tap from each 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. The grounding electrode conductors and taps shall comply with (a) through (c).

Exception No. 1: Where the system bonding jumper specified in 250.30(A)(1) is a wire or busbar, it shall be permitted to connect the grounding electrode conductor to the equipment grounding terminal, bar, or bus provided the equipment grounding terminal, bar, or bus is of sufficient size for the separately derived system.

Exception No. 2: 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 250.30(A)(1), Exception No. 3 and the transformer frame or enclosure is grounded by one of the means specified in 250.134.

(a) **Common Grounding Electrode Conductor Size.** Where more than one separately derived system is connected to a common grounding electrode conductor, the common grounding electrode conductor shall not be smaller than 3/0 AWG copper or 250 kcmil aluminum.

(a) **Grounding Electrode Conductor Taps.** Where more than one separately derived system is installed, it shall be permissible to connect a tap from each 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.

Exception No. 1: Where the system bonding jumper specified in 250.30(A)(1) is a wire or busbar, it shall be permitted to connect the grounding electrode conductor to the equipment grounding terminal bar or bus provided the equipment grounding terminal bar or bus is of sufficient size for the separately derived system.

Exception No. 2: 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 250.30(A)(1), Exception No. 3 and the transformer frame or enclosure is grounded by one of the means specified in 250.134.

(b) **Tap Conductor Size.** Each tap conductor shall be sized in accordance with 250.66 based on the derived phase conductors of the separately derived system it serves.

Exception: Where a separately derived system originates in listed equipment suitable as service equipment, the grounding electrode conductor from the service or feeder equipment to the grounding electrode shall be permitted as the grounding electrode conductor for the separately derived system provided the grounding electrode conductor is of sufficient size for the separately derived system. Where the equipment ground bus internal to the equipment is not smaller than the required grounding electrode conductor for the separately derived system, the grounding electrode connection for the separately derived system shall be permitted to be made to the bus.

(c) **Connections.** All tap connections to the common grounding electrode conductor shall be made at an accessible location by one of the following methods:

(1) a listed connector

(2) an irreversible compression connector listed as grounding and bonding equipment

(2) listed connections to aluminum or copper busbars not less than 6 mm x 50 mm (1/4 in. x 2 in.). Where aluminum busbars are used, the installation shall comply with 250.64(A).

(3) by the exothermic welding process.

The Tap conductors shall be connected to the common grounding electrode conductor in such a manner that the common grounding electrode conductor remains without a splice or joint.

(5) **Installation.** The installation of all grounding electrode conductors common-grounding electrode conductor and the tap to each separately derived system shall comply with 250.64(A), (B), (C), and (E).

(6) **Bonding.** Structural steel and metal piping shall be bonded in accordance with 250.104(D).

(7) **Grounding Electrode.** The grounding electrode shall be as near as practicable to and preferably in the same area as the grounding electrode conductor connection to the system. The grounding electrode shall be the nearest one of the following:

(1) An effectively grounded metal water pipe grounding electrode as specified in 250.52(A)(1)

(2) An effectively grounded structural metal grounding electrode as specified in 250.52(A)(2)

Exception No. 1: Any of the other electrodes identified in 250.52(A) shall be used where the electrodes specified by 250.30(A)(7) 250.52(A)(7) are not available.

Exception No. 2 to (1) and (2): Where a separately derived system originates in listed equipment suitable for use as service equipment, the grounding electrode used for the service or feeder equipment shall be permitted as the grounding electrode for the separately derived system, provided the grounding electrode conductor from the service or feeder to the grounding electrode is of sufficient size for the separately derived system. Where the equipment ground bus internal to the equipment is not smaller than the required grounding electrode conductor, the grounding electrode connection for the separately derived system shall be permitted to be made to the bus.

FPN: See 250.104(A)(4) for bonding requirements of interior metal water piping in the area served by separately derived systems.

(8) **Grounded Conductor.** Where a grounded conductor is installed and the system 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 derived phase conductor. In addition, for 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 phase conductor. The grounded conductor of a 3-phase, 3-wire delta system shall have an ampacity not less than the ungrounded conductors.

(b) **Parallel Conductors.** Where the 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 conductors in the raceway but not smaller than 1/0 AWG.

FPN: See 310.4 for grounded conductors connected in parallel.

(c) **Impedance Grounded System.** The grounded conductor of an impedance grounded neutral system shall be installed in accordance with 250.36 or 250.186.

(B) **Ungrounded Systems.** The equipment of an ungrounded separately derived system shall be grounded as specified in 250.30(B)(1) and (2).

(1) **Grounding Electrode Conductor.** A grounding electrode conductor, sized in accordance with 250.66 for the derived phase conductors, shall be used to connect the metal enclosures of the derived system to the grounding electrode as specified in 250.30(B)(2). This connection shall be made at any point on the separately derived system from the source to the first system disconnecting means.

(2) **Grounding Electrode.** Except as permitted by 250.34 for portable and vehicle-mounted generators, the grounding electrode shall comply with 250.30(A)(4).

Panel Statement: The panel did not accept the proposed use of the term "main bonding jumper," since the term "system bonding jumper" has been defined in Article 100 and applies appropriately to 250.30. See panel action and statement on Comment 5-48. The panel accepted in principle the recommended organization of portions of 250.30 but made editorial improvements to this section.

Number Eligible to Vote: 16

Ballot Results: Affirmative: 15 Negative: 1

Explanation of Negative:

RAPPAPORT: In 250.30(A)(4), the fixed size of "3/0 AWG copper or 250 kcmil aluminum" is not reasonable and has no technical justification. The purpose of the grounding electrode is to provide a reference for stabilizing voltage, minimize transient overvoltages, and to limit voltage due to lightning or contact with higher voltage systems. The grounding electrode conductor is merely a means of connecting the system to be grounded to the electrode. Stabilizing voltage is accomplished by discharging the capacitive stored energy that would otherwise tend to raise the separately derived system output voltage.

Capacitive stored energy for under 600 volt systems are generally low and even a resistance in the hundreds of ohms would be adequate.

Limiting voltage due to lightning is accomplished by providing a path for lightning to ground. Unless the grounding electrode conductor is short and trained properly in a downward direction, it would be ineffective for limiting lightning damage. The addition of a tap from a separately derived system to the grounding electrode conductor would introduce additional impedance to negate the effectiveness of the grounding electrode conductor.

Providing a return path for higher voltage systems back to the source in order to operate an overcurrent protective device is accomplished by sizing the grounding electrode conductor per Table 250.66. There is nontechnical justification for this requirement since the amount of current flow through the ground will be limited by the grounding electrode resistance to ground. We bury our heads in the sand when we permit the grounding electrode conductor to be limited to 6 AWG for connection to rod, pipe, or plate electrodes as permitted in 250.66(A) yet we want to require a conductor larger than required for one system to be installed when two or more systems are connected to the same grounding electrode conductor. Is the larger conductor necessary for short time current rating or to reduce the resistance to the grounding electrode when the current flow will be limited by the electrode resistance to ground? In the event of a primary to secondary fault, where the fault return path is to ground and not to the equipment grounding conductor, the fault current will depend upon the electrode resistance to ground and not on the number of other systems connected to the grounding electrode conductor.

5-53 Log #2402 NEC-P05
(250.30)

Final Action: Reject

Submitter: Charles Mello, Electro-Test, Inc.

Comment on Proposal No: 5-80

Recommendation: The panel should reconsider and reject this proposal and accept the term "main bonding jumper" as the only term to be used to connect the grounding system to the grounded conductor at the service or at a separately derived system

Substantiation: There is no need to create this term "system bonding jumper" which is the same thing as the "main bonding jumper" by its very use in this application. Adding terminology like this only adds to the confusion and misunderstanding that the panel is trying to clear up. From the standpoint of the connection between the equipment grounding conductor(s), possibly the grounding electrode conductor and the system grounded conductor (neutral) there is no technical difference between a "service" or a "separately derived system". Both are sources of power for supplying the premises wiring system that happens to be served by that system. If there is such a critical difference then the panel should also change the name of the "grounding electrode conductor" which typically does serve a slightly different purpose in separately derived systems than it does for a service. To do that is not warranted just as calling this conductor anything other than a "main bonding jumper" is not technically warranted.

In today's deregulated utility world the "service" is at best a moving target. Utilities are selling parts of their existing systems to owners whereby the "service" instantly is transformed into a "separately derived system" and as far as this conductor is concerned nothing changed in terms of form, function, application, duty, withstand etc. Conversely there are owners, like several universities, that are now selling their primary distribution to the local utility thereby instantly making many "separately derived systems" into "services". Again, regarding the connection between the neutral and the equipment grounding system, there is no difference in form or function, so why the need for a different term? The correct action for the panel is to change the definition of "main bonding jumper" in article 100 to reflect the real world application of this connection. Also see comments to proposal 5-78 and 5-74. Companion comments have been submitted to CMP 1 for proposals 1-62 and 1-63 to revise the applicable definitions accordingly.

Panel Meeting Action: Reject

Panel Statement: See panel action and statement on Comment 5-48.

Number Eligible to Vote: 16

Ballot Results: Affirmative: 16

5-54 Log #3311 NEC-P05
(250.30)

Final Action: Reject

Submitter: Charles Mello, Electro-Test, Inc.

Comment on Proposal No: 5-78

Recommendation: Replace "system bonding conductor" with "main bonding jumper" wherever it appears in the proposed text accepted by the panel at the 2005 NEC ROP meeting.

Substantiation: This is a companion comment to comments on proposals 1-62 and 1-63 submitted to CMP 1 to overturn the rejection of the proposed change to the definition of main bonding jumper. A companion comment has also been submitted to proposal 5-78 to revise the use of "system bonding jumper" for separately derived systems. The proposed change would allow "main bonding jumper" to be used for other than services. A separate comment is submitted to reject the addition of a definition of system bonding jumper.

Today's reality is that the "service" is at best a moving target. What are services today are being sold by the utilities and at the stroke of a pen become

by definition “separately derived systems”. Conversely, universities and some industrial campuses are selling their privately owned primary distribution systems to the local utility so where there were 1 or 2 “services” at medium voltage, there are now a large number of “services” which just before the sale were “separately derived systems”.

If the proposed change stands, it would require changes to product safety standards, specifically for fused switches, dead front switchboards, motor control centers, and panelboards to allow for this additional designation. In addition, the required markings for all this equipment would have to be changed to a field installed option for no good technical justification which aggravates the confusion and would create possible enforcement nightmares.

Grounding and bonding are already confusing enough and the fostering or perpetuating of additional terminology for the same thing only exasperates that confusion. See also the comment for proposal 1-63.

Panel Meeting Action: Reject

Panel Statement: See panel action and statement on Comment 5-48.

Number Eligible to Vote: 16

Ballot Results: Affirmative: 15 Negative: 1

Explanation of Negative:

RAPPAPORT: See my explanation of negative vote on Comment 5-52.

5-55 Log #212 NEC-P05 **Final Action: Reject**
(250.30(A)(2))

Submitter: Glenn W. Zieseniss Crown Point, IN

Comment on Proposal No: 5-78

Recommendation: Add a new paragraph to read:

“ Where the derived phase conductors from the source of a separately derived system to the first disconnecting means are installed in parallel in separate raceways the equipment bonding jumper, for or in, each raceway shall be sized not less than the largest size as required by 250.28(D) for the separately derived system.”

Substantiation: The NEC does not specifically address the grounding or bonding of separately derived installations at the source end of a raceway system that use RNC with metal 90°s at each end of the raceway between the source and the first disconnecting means.

Where such metal 90°s are used on a nonmetallic installation of raceway, a definite size of Equipment Bonding Jumper must be installed in each raceway to bond the metal 90°s to the EBC and also the enclosure (transformer case) at the source end of the installation typically pad mounted transformers where metal raceways stubs into an open bottom enclosure.

Panel Meeting Action: Reject

Panel Statement: The substantiation for bonding requirements for metal pulling elbows does not seem to be related to the recommendation.

Number Eligible to Vote: 16

Ballot Results: Affirmative: 15 Negative: 1

Explanation of Negative:

RAPPAPORT: See my explanation of negative vote on Comment 5-52.

5-56 Log #438 NEC-P05 **Final Action: Reject**
(250.30(A)(2))

Submitter: Glenn W. Zieseniss Crown Point, IN

Comment on Proposal No: 5-78

Recommendation: Replace the word “phase” with “circuit” in two places to read:

“...derived circuit conductors...”

Substantiation: The word “phase” could be construed to mean only polyphase installations and not include single phase separately derived systems.

Panel Meeting Action: Reject

Panel Statement: The term “phase” can refer to both single phase and poly-phase systems.

Number Eligible to Vote: 16

Ballot Results: Affirmative: 15 Negative: 1

Explanation of Negative:

RAPPAPORT: See my explanation of negative vote on Comment 5-52.

5-57 Log #439 NEC-P05 **Final Action: Reject**
(250.30(A)(2))

Submitter: Glenn W. Zieseniss Crown Point, IN

Comment on Proposal No: 5-78

Recommendation: Add a second paragraph to read:

Where a grounded conductor is installed and the system bonding jumper is not located at the source of the separately derived system, metal raceway(s) that are not continuous metal raceways between the source of the separately derived circuit conductors to the first disconnecting means, the metal raceway(s) shall be bonded to the Equipment Bonding Conductor(s) in accordance with one of the methods of 250.92(B)(2), 250.92(B)(3) or 250.92(B)(4).

Substantiation: Many separately derived systems (SDS) originate in pad mounted transformer which have open bottoms and the metal 90°s or metal “stub-ups” are not bonded to the transformer enclosure. Many installations use nonmetallic raceway system between these metal 90°s and the disconnecting means enclosure. These metal raceway(s) are required to be bonded to the equipment bonding conductor (EBC) which originates where the system bonding jumper (SBJ) is installed.

The EBJ size is per the first paragraph.

Panel Meeting Action: Reject

Panel Statement: Bonding requirements for metal pulling elbows are in 250.86.

Number Eligible to Vote: 16

Ballot Results: Affirmative: 15 Negative: 1

Explanation of Negative:

RAPPAPORT: See my explanation of negative vote on Comment 5-52.

5-58 Log #759 NEC-P05 **Final Action: Reject**
(250-30(A)(2)(b))

Submitter: Michael J. Johnston Plano, TX

Comment on Proposal No: 5-91

Recommendation: The panel should reconsider its original action on this proposal and move to accept in principle.

Substantiation: This proposal should be accepted in principle because the clarification in the requirement was already accepted in the reorganization of Section 250.30 as a result of the efforts of the task group. See Panel action on Proposal 5-78 and 5-79. The same concept proposed in proposal 5-91 is already included in the task group’s work on Section 250.30, which was accepted in principle by CMP-05 at the panel ROP hearings in January 2003. The panel action on 5-78 incorporates a revision that meets the intent of this proposal.

Panel Meeting Action: Reject

Panel Statement: See panel action and statement on Comment 5-51.

Number Eligible to Vote: 16

Ballot Results: Affirmative: 16

5-59 Log #706 NEC-P05 **Final Action: Reject**
(250.30(A)(2)(b))

Submitter: David Sroka Turner Falls, MA

Comment on Proposal No: 5-92

Recommendation: I agree with Mr. Fahey that the present language is unclear. Perhaps, if Table 250.66 read: “Over 1100 - unlimited” and “over 1750 - unlimited” or “over 1100 (unlimited)” and “over 1750 (unlimited)”, it would be clearer.

Since Table 310.16 stops at 2,000 MCM conductor size, it could be inferred that Table 250.66 only goes up to size 2,000 MCM as well. At 75° C, aluminum, for instance, ampacity between 1,750 and 2,000 MCM conductors it’s only 15 amps. The difference between 1,000 and 2,000 MCM copper conductors is 120 amps at 75° C.

Substantiation: However, I disagree with limiting the grounding electrode conductor size. I believe the grounding electrode conductor should be required to be the same size as the bonding jumper.

Under short-circuit conditions, the grounding electrode conductor should not be the weakest link in the fault current path.

Panel Meeting Action: Reject

Panel Statement: This comment does not comply with 4-4.5 of the Regulations Governing Committee Projects because it does not include the wording to be added, revised (and how revised), or deleted. The change proposed for Table 250.66 is without substantiation. The panel does not agree that the grounding electrode conductor should be the same size as the system bonding jumper in all cases since it serves a different purpose. The grounding electrode conductor is not intended to be part of the effective ground fault current path.

Number Eligible to Vote: 16

Ballot Results: Affirmative: 16

5-60 Log #1124 NEC-P05 **Final Action: Reject**
(250-30(A)(2)(b))

Submitter: Paul Dobrowsky Holley, NY

Comment on Proposal No: 5-93

Recommendation: Reject the proposal.

Substantiation: If two small transformers are installed some distance from the building grounding electrode system a common grounding electrode conductor sized for the actual installation should be permitted. There are many applications where a 3/0 minimum size requirement is unrealistic. The NEC should not contain requirements for possible future “additions” in accordance with 90.1(B). Where additional separately derived systems are expected to be installed then the designer or engineer can specify a larger common grounding electrode conductor. Enforcement of the NEC can solve the problem of incorrect sizes.

Panel Meeting Action: Reject**Panel Statement:** See panel action and statement on Comment 5-51.**Number Eligible to Vote:** 16**Ballot Results:** Affirmative: 15 Negative: 1**Explanation of Negative:**

RAPPAPORT: See my explanation of negative vote on Comment 5-52.

 5-61 Log #2141 NEC-P05 **Final Action: Accept in Principle**
 (250.30(A)(2)b.)
Submitter: Frederic P. Hartwell, Hartwell Electrical Services, Inc. / Rep. Massachusetts Electrical Code Advisory Committee**Comment on Proposal No:** 5-93**Recommendation:** Continue to accept the proposal as it was incorporated into the action on Proposal 5-78.**Substantiation:** Although a theoretical case can be made for reducing the size of this conductor for particular circumstances, as a practical matter it will be used as an extension of the principal grounding electrode conductor for the building and receive future system connections. It should be fully sized accordingly. In addition, a 3/0 AWG conductor assures significant mechanical permanence. With multiple systems connected, a mechanical failure has a far greater safety implication than when each system has its own connection.**Panel Meeting Action: Accept in Principle**

The results of action on this comment are incorporated in the action taken on Comment 5-52.

Panel Statement: See panel action and statement on Comment -5-52.**Number Eligible to Vote:** 16**Ballot Results:** Affirmative: 15 Negative: 1**Explanation of Negative:**

RAPPAPORT: See my explanation of negative vote on Comment 5-52.

 5-62 Log #407 NEC-P05 **Final Action: Reject**
 (250.30(A)(4)(c))
Submitter: Gregory J. Steinman, Thomas & Betts Corporation**Comment on Proposal No:** 5-78**Recommendation:** Revise text to read as follows:

(c) Connections. All tap connections to the common grounding electrode conductor shall be made at an accessible location by a listed connector; an irreversible compression connector listed as grounding and bonding equipment; 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 in such a manner that the common grounding electrode conductor remains without splice or joint.

Substantiation: The revised wording allows any listed connector to be used in the grounding electrode conductor. The rules for splicing a grounding electrode conductor require the use of permanent style connections; irreversible compression or exothermic welding. By adding optional mechanical type connections, this change lowers the level of safety without any substantiation. In addition, this change permits any listed connector to be used, while requiring irreversible type connectors to be listed as grounding and bonding equipment. No technical substantiation was provided to lower the safety level on these requirements. UL 467 requires a current test to be performed to verify the connection can carry fault current. This test is not performed on all "listed connectors". The permanence of irreversible compression and exothermic type connectors is imperative when working with the grounding electrode conductor. If these connections are tampered with, the entire grounding system is lost. The NEC has accepted exothermic welding for use as grounding connections without requiring listing based on their history of performance.**Panel Meeting Action: Reject****Panel Statement:** Article 250 permits listed wire pressure connectors for making connections of grounding electrode conductors to grounding electrodes. See panel action and statement on Comment 5-51. Also see 250.8 and 250.70 of the 2002 NEC. This comment would limit the connections of the grounding electrode taps to only exothermic welding and irreversible compression connectors without adequate substantiation.**Number Eligible to Vote:** 16**Ballot Results:** Affirmative: 15 Negative: 1**Explanation of Negative:**

RAPPAPORT: See my explanation of negative vote on Comment 5-52.

 5-63 Log #1226 NEC-P05 **Final Action: Reject**
 (250.30(A)(4) Exception No. 2 (New))
Submitter: Donald A. Ganiere Ottawa, IL**Comment on Proposal No:** 5-99**Recommendation:** Panel should accept this change.**Substantiation:** The panel is correct that the only real purpose for the GEC in this type of installation is to provide an earth ground reference. It takes very

little current to establish this earth ground reference. If the primary equipment bonding (grounding) conductor is of sufficient size to clear a primary fault, it is of sufficient size to establish an earth ground reference.

Panel Meeting Action: Reject**Panel Statement:** Separately derived systems may be installed both inside or outside a building. In addition, transformers may be located in close proximity to lightning protection systems and be subject to flashover. Thus, the grounding electrode conductor must be sized in accordance with 250.66.**Number Eligible to Vote:** 16**Ballot Results:** Affirmative: 16

 5-64 Log #389 NEC-P05 **Final Action: Reject**
 (250.30(B) Exception (New))
Submitter: Dan Leaf Rancho Santa Margarita, CA**Comment on Proposal No:** 5-105**Recommendation:** Accept proposal revised:

(B) Ungrounded Systems. The equipment of an ungrounded separately derived system shall be grounded as specified in 250.30(B)(1) and (2).

Exception: Where a transformer or other source is not a stand-alone system and is supplied by a circuit originating in the same building or structure a grounding electrode conductor shall not be required.**Substantiation:** Metal enclosures for a transformer and connected equipment supplied by a circuit originating in the same building or structure is required to be adequately grounded by other Code rules which are sufficient. The reasons for grounding services in 250.24(D) are not any more applicable than a grounding electrode requirement for other metal equipment supplied by a service, equipment or feeder. Nor is 250.4(B)(1) since all of 250.4(B) applies in any case.**Panel Meeting Action: Reject****Panel Statement:** There is no technical substantiation to reduce the requirements for grounding electrodes and grounding electrode conductors for ungrounded systems. Separately derived systems may be installed both inside or outside a building. In addition, transformers may be located in close proximity to lightning protection systems and be subject to flashover. Thus, the grounding electrode conductor must be sized in accordance with 250.66.**Number Eligible to Vote:** 16**Ballot Results:** Affirmative: 16

 5-65 Log #777 NEC-P05 **Final Action: Accept in Principle**
 (250.32)
Submitter: Michael J. Johnston Plano, TX**Comment on Proposal No:** 5-109**Recommendation:** Continue to accept this proposal and make the following adjustments to 250.32(B)(2) for consistency.

(2) Grounded Conductor. Where (1) an equipment grounding conductor is not run with the supply to the building or structure, (2) there are no continuous metallic paths bonded to the grounding system in both each buildings or structures involved, and (3) ground-fault protection of equipment has not been installed on the supply side of the feeder(s) common ac service, the grounded circuit conductor run with the supply to the building or structure shall be connected to the building or structure disconnecting means and to the grounding electrode(s) and shall be used for grounding or bonding of equipment, structures, or frames required to be grounded or bonded.

Substantiation: The additional editorial revisions to 250.32(B)(2) are needed for consistency with the accepted revisions to this section under Proposal 5-109. The term "common ac service" was removed as a result of the action on the proposal.**Panel Meeting Action: Accept in Principle**

Change "structures" to "structure" so that 250.32(B)(2) reads as follows:

(2) Grounded Conductor. Where (1) an equipment grounding conductor is not run with the supply to the building or structure, (2) there are no continuous metallic paths bonded to the grounding system in each building or structure involved, and (3) ground-fault protection of equipment has not been installed on the supply side of the feeder(s), the grounded circuit conductor run with the supply to the building or structure shall be connected to the building or structure disconnecting means and to the grounding electrode(s) and shall be used for grounding or bonding of equipment, structures, or frames required to be grounded or bonded.

Panel Statement: The panel makes a grammatical correction to make "structures" singular. See correlating panel action on Comment 5-66.**Number Eligible to Vote:** 16**Ballot Results:** Affirmative: 16

 5-66 Log #3367 NEC-P05 **Final Action: Accept**
 (250.32 and 250-104(A)(3))
Submitter: Michael J. Johnston Plano, TX**Comment on Proposal No:** 5-109**Recommendation:** Continue to accept this proposal and make the following adjustments to 250.32(B)(2) for consistency.

(2) Grounded Conductor. Where (1) an equipment grounding conductor is not run with the supply to the building or structure, (2) there are no continuous metallic paths bonded to the grounding system in both each buildings or structures involved, and (3) ground-fault protection of equipment has not been installed on the supply side of the feeder(s) common ac service; the grounded circuit conductor run with the supply to the building or structure shall be connected to building or structure disconnecting means and to the grounding electrode(s) and shall be used for grounding or bonding of equipment, structures, or frames required to be grounded or bonded.

Also a related revision is needed in Section 250.104(A)(3) to provide proper correlation between the revised 250.32 and 250.104(A)(3) as follows:

(3) Multiple Buildings or Structures Supplied by a Feeder(s) or Branch Circuit(s) from a Common Service: The metal water piping system(s) installed in or attached to a building or structure shall be bonded to the building or structure disconnecting means enclosure where located at the building or structure, to the equipment grounding conductor run with the supply conductors, or to the one or more grounding electrodes used. The bonding jumper(s) shall be sized in accordance with 250.66, based on the size of the feeder or branch circuit conductors that supply the building. The bonding jumper shall not be required to be larger than the largest ungrounded feeder or branch circuit conductor supplying the building.

Substantiation: The additional editorial revisions to 250.32(B)(2) are needed for consistency with the accepted revisions to this section under Proposal 5-109. The term “common ac service” was removed as a result of the action on the proposal. The second suggested change in this comment is directed at correlation between 250.32 and 250.104(A)(3) by removing the term or concept of “from a common service” from this section and revise to be consistent with the accepted revisions to 250.32 in Proposal 5-109.

Panel Meeting Action: Accept

Number Eligible to Vote: 16

Ballot Results: Affirmative: 16

5-67 Log #1213 NEC-P05
(250.32(A) Exception)

Final Action: Reject

Submitter: Jeffrey Boksiner, Telcordia Technologies

Comment on Proposal No: 5-44

Recommendation: Revise Exception as follows:

Exception: A grounding electrode at separate buildings or structures shall not be required where only one branch circuit supplies the building or structure and the branch circuit includes an equipment grounding conductor for grounding or bonding the conductive non-current-carrying parts of all equipment.

Substantiation: The significant and pervasive changes to Article 250 in this proposal are not needed and do not improve the clarity of the NEC. Instead, this comment is one of a series to address a few specific instances in Article 250 where the term “grounding” or “grounded” could be misinterpreted. This changes address 250.32(A) Exception to match the wording of 250.32(B)(1) and 250.32(B)(2).

Panel Meeting Action: Reject

Panel Statement: The panel has determined that the concepts in Proposal 5-44 require further study. See the panel action and statement on Comment 5-1.

Number Eligible to Vote: 16

Ballot Results: Affirmative: 16

Comment on Affirmative:

BOKSINER: See my comment on affirmative on Comment 5-1.

5-68 Log #3629 NEC-P05
(250.32(B)(2))

Final Action: Reject

Submitter: Dann Strube, Strube Consulting

Comment on Proposal No: 5-88

Recommendation: Reconsider this proposal.

Substantiation: Reconsider the proposal to add language to 250.32(B)(2). Due to a typographical error, the proposal was made to add to 250.32(A)(2). My intent was to add the requirement into 250.32(B)(2). In this case, the concern for parallel paths is eliminated. The real intent of this proposal is to enhance protection from lightning introduced between the transformer and the building.

Panel Meeting Action: Reject

Panel Statement: See panel action and statement from Proposal 5-88. A transformer installed outside of the building being served would be properly identified as a “separate structure” and the feeder from the transformer to the building would be covered by 250.32. Section 250.32 would require in all cases—neutral, no neutral, equipment grounding conductor or not—that a grounding electrode or grounding electrode system complying with Part III be installed at the transformer specifically for lightning protection. The proposed text would be redundant and not add clarity to these requirements.

Number Eligible to Vote: 16

Ballot Results: Affirmative: 16

5-69 Log #57 NEC-P05
(250.34)

Final Action: Reject

Submitter: Michael V. Glenn, Longview Fibre Co.

Comment on Proposal No: 5-111

Recommendation: Reject this proposal.

Substantiation: Mr. Rappaport’s negative vote explanation is correct and this proposal should be rejected for the reason explained on Proposal 5-1. “Equipment bonding conduct” is not acceptable and this proposal should be rejected.

Panel Meeting Action: Reject

Panel Statement: The proposal includes numerous changes other than the terminology change from “equipment grounding conductor” to “equipment bonding conductor”. The submitter did not provide any technical substantiation to reject all these other changes nor alternatives to the terms that were objectionable.

Number Eligible to Vote: 16

Ballot Results: Affirmative: 16

5-70 Log #113 NEC-P05
(250.34)

Final Action: Reject

Submitter: Vasudevan Prakash, National Petroleum Construction Company

Comment on Proposal No: 5-111

Recommendation: Add text to read as follows:

250.34 Portable and vehicle mounted Generators.

A) Portable generators. 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 system supplied by the generator under the following conditions:

(1) The generator supplies only equipment mounted on the generator, cord-and plug-connected equipment through receptacles mounted on the generator and protected with suitable GFCI for the personnel as specified in 527.6, or both, and

(2) The non-current carrying metal parts of the equipment and equipment grounding conductor terminals of the receptacles are bonded to the generator frame and

(3) The system complies with all other provisions of this article.

B) Vehicle-Mounted Generators. The frame of a vehicle shall be permitted to serve as the grounding electrode for a system supplied by a generator located on the vehicle under the following conditions:

(1) The frame of the generator is bonded to the vehicle frame, and

(2) The generator supplies only equipment located on the vehicle or cord-and plug connected equipment through receptacles mounted on the vehicle and protected with suitable GFCI for the personnel as specified in 527.6, or both equipment located on the vehicle and cord-and-plug connected equipment through receptacles mounted on the vehicle and protected with suitable GFCI for the personnel as specified in 527.6, or on the generator, and

(3) The non-current-carrying metal parts of equipment and the equipment grounding conductor terminals of the receptacles are bonded to the generator frame and

(4) The system complies with all other provisions of this article.

C) Grounded Conductor bonding. A system conductor that is required to be grounded by 250.26 shall be bonded to the generator frame where the generator is a component of a separately derived system.

Substantiation: The existing article is not fully covering the potential electric shock hazard involved on the portable/vehicle mounted generators that are provided with receptacles, as several portable/vehicle mounted generators and welding power sources purchased are provided with the receptacles, not protected with GFCI in accordance with 527.6, for the general services of the common people who are unaware of the code requirements and the grounding arrangement of the equipment that they are being connected/used.

These receptacles are meant for direct connection of independent equipment (welding power rectifiers, lighting and double insulated type hand tools, etc.) where the system grounding in accordance with 250.26 and local grounding are not possible. If they are used in the construction sites or marine vessels, the protection of flexible cords from accidental damage as stated 527.4(H) and equipment exposure to the water/rain are unavoidable. It will be more dangerous on the generators that are rated for 220/380V, multiphase systems in which the neutral/one phase is grounded and provided with unprotected receptacles.

See the drawing I have provided indicating the possible shock hazard along with two schematics for the unprotected receptacles provided on the portable generators.

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

Panel Meeting Action: Reject

Panel Statement: Other articles of this Code contain requirements for ground-fault circuit-interrupters, so it is inappropriate to add those requirements to this section.

Number Eligible to Vote: 16

Ballot Results: Affirmative: 16

5-71 Log #3437 NEC-P05
(250.34)

Final Action: Accept

Submitter: Paul J. LeVasseur, Bay City JEATC

Comment on Proposal No: 5-111

Recommendation: Continue to Accept in Principle and revise 250.34 to read as follows:

(A) Portable Generators. The frame of a portable generator shall not be required to be ~~grounded connected to a grounding electrode as defined in 250.52 and shall be permitted to serve as the grounding electrode~~ for a system supplied by the generator under the following conditions:

(1) The generator supplies only equipment mounted on the generator, cord-and-plug-connected equipment through receptacles mounted on the generator, or both, and

(2) The non-current-carrying metal parts of equipment and the equipment grounding conductor terminals of the receptacles are bonded to the generator frame.

(B) Vehicle-Mounted Generators. The frame of a vehicle shall ~~not be required to be permitted connected to a grounding electrode as defined in 250.52 to serve as the grounding electrode~~ for a system supplied by a generator located on this vehicle under the following conditions:

(1) The frame of the generator is bonded to the vehicle frame, and

(2) The generator supplies only equipment located on the vehicle or cord-and-plug-connected equipment through receptacles mounted on the vehicle, or both equipment located on the vehicle and cord-and-plug-connected equipment through receptacles mounted on the vehicle or on the generator, and

(3) The non-current-carrying metal parts of equipment and the equipment grounding conductor terminals of the receptacles are bonded to the generator frame, and

(4) The system complies with all other provisions of this article.

Substantiation: The revised text meets the intent of both the panel and the submitter and does not contain the “bonding conductor” terminology. See TCC comment on ROP 5-1.

Panel Meeting Action: Accept

Number Eligible to Vote: 16

Ballot Results: Affirmative: 16

5-72 Log #3107 NEC-P05
(250.34(A), (B), (C))

Final Action: Accept

Submitter: Kenneth E. Vannice, Leviton/NSI-Colortran / Rep. United States Institute for Theatre Technology

Comment on Proposal No: 5-113

Recommendation: Continue to reject this proposal for the reasons stated in the panel statement.

Substantiation: The proposed changes greatly impact the entertainment industry without the opportunity to add to Articles 518, 520, 525, and 530 to adjust for these changes.

Panel Meeting Action: Accept

Number Eligible to Vote: 16

Ballot Results: Affirmative: 16

5-73 Log #516 NEC-P05
(250.50)

Final Action: Accept in Principle

Submitter: Richard E. Loyd Sun Lakes, AZ

Comment on Proposal No: 5-115

Recommendation: Accept this proposal as written.

Substantiation: Accepting this proposal will promote a consistently better grounding electrode system. The proponent is correct. The deletion of “where available” removes an alibi for the installers and enforcers that overlook the requirements that all existing electrodes be bonded together forming a grounding electrode system. Many jurisdictions already require all electrodes (qualifying as per 250.52(A)(1) through 250.52(A)(6)) be utilized and be bonded together without causing any problems for the electricians. Where the electrode is inaccessible, the Authority Having Jurisdiction can determine and grant a variance in the code, if needed.

Panel Meeting Action: Accept in Principle

Panel Statement: See panel action and statement on Comment 5-81.

Number Eligible to Vote: 16

Ballot Results: Affirmative: 16

5-74 Log #537 NEC-P05
(250.50)

Final Action: Accept in Principle

Submitter: Michael J. Johnston Plano, TX

Comment on Proposal No: 5-115

Recommendation: This proposal should be accepted in principle and the concept or objective of the proposed revision should be incorporated into the requirements for the grounding electrode system specified in 250.50. I respect-

fully encourage the panel to reconsider its initial action on this proposal and suggest the following. Revise the text as follows:

250.50 Grounding Electrode System. ~~The grounding electrode system shall effectively connect the system and non-current-carrying conductive parts of equipment to the earth in a manner that meets the applicable performance requirements of 250.4. If available on the premises-~~ At each building or structure served, each ~~item~~ grounding electrode specified in 250.52(A)(1) through (A)(6) shall be bonded together to form the grounding electrode system. ~~Where the use of the grounding electrodes specified in 250.52(A)(1) through (6) is impracticable, none of these electrodes are available;~~ one or more of the electrodes specified in 250.52(A)(4) through (A)(7) shall be installed and used.

~~Exception: Concrete-encased electrodes in concrete footings of existing buildings shall not be required to be part of the grounding electrode system.~~

~~FPN: Examples of impracticable include, but are not limited to, existing buildings with concrete-encased electrodes in existing footings where the steel reinforcing bars or rods are not accessible for use without disturbing the existing footing.~~

Substantiation: This proposal revision is an attempt to address the panel’s concern relative to the terms “existing electrodes” and the term “exist” as proposed originally in Proposal 5-115. It was never intended under the concept of this proposal that existing footings be disturbed to incorporate the concrete-encased electrode in all cases. The concrete-encased is an effective grounding electrode that is inherent to most types of building construction and should be used as part of the grounding electrode system. The word “available” is identified by the NEC Style Manual as a word to avoid in Code rules. This proposal is an attempt to revise this section to eliminate the word “available” and at the same time provide more specific requirements that will only serve to enhance the grounding electrode system at each electrical installation. The word “available” as used in this section should not relate in any fashion to a point in time on the construction project. All electrodes that are connected to the earth at the building or structure served should be used as part of the grounding electrode system from a safety standpoint. I chose the term “impracticable” to be consistent with other similar rules in the Code were revised to address situations where inconsistencies in application of the rules were evident in the field. For example, the term impracticable was used in a revision to 430.102(B) Exception in the 2002 NEC and was inserted to clarify the panel’s original intent. The word “impracticable” as used in that section and some examples was also addressed in the new FPN to provide further clarification.

Panel Meeting Action: Accept in Principle

Panel Statement: See panel action and statement on Comment 5-81.

Number Eligible to Vote: 16

Ballot Results: Affirmative: 16

5-75 Log #538 NEC-P05
(250.50)

Final Action: Accept in Principle

Submitter: Michael J. Johnston Plano, TX

Comment on Proposal No: 5-118

Recommendation: This proposal should be accepted in principle and the concept or objective of the proposed revision should be incorporated into the requirements for the grounding electrode system specified in 250.50. I respectfully encourage the panel to reconsider its initial action on this proposal and suggest the following. Revise the text as follows:

250.50 Grounding Electrode System. ~~If available on the premises~~ At each building or structure served, each ~~item~~ grounding electrode specified in 250.52(A)(1) through (A)(6) shall be bonded together to form the grounding electrode system. ~~Where the use of the grounding electrodes specified in 250.52(A)(1) through (6) is impracticable, none of these electrodes are available;~~ or one or more of the electrodes specified in 250.52(A)(4) through (A)(7) shall be installed and used.

~~Exception: Concrete-encased electrodes in concrete footings of existing buildings shall not be required to be part of the grounding electrode system.~~

Substantiation: This proposed revision is an attempt to address the panel’s concern relative to the terms “existing electrodes” and the term “exist” as proposed originally in Proposal 5-115. It was never intended under the concept of this proposal that existing footings be disturbed to incorporate the concrete-encased electrode in all cases. The concrete-encased is an effective grounding electrode that is inherent to most types of building construction and should be used as part of the grounding electrode system. The word “available” is identified by the NEC Style Manual as a word to avoid in Code rules. This proposal is an attempt to revise this section to eliminate the word “available” and at the same time provide more specific requirements that will only serve to enhance the grounding electrode system at each electrical installation. The word “available” as used in this section should not relate in any fashion to a point in time on the construction project. All electrodes that are connected to the earth at the building or structure served should be used as part of the grounding electrode system from a safety standpoint. I chose the term “impracticable” to be consistent with other similar rules in the Code were revised to address situations where inconsistencies in application of the rules were evident in the field. For example, the term “impracticable” was used in a revision to 430.102(B) Exception in the 2002 NEC and was inserted to clarify the panel’s original intent.

Panel Meeting Action: Accept in Principle**Panel Statement:** See panel action and statement on Comment 5-81.**Number Eligible to Vote:** 16**Ballot Results:** Affirmative: 165-76 Log #760 NEC-P05 **Final Action: Accept in Principle**
(250.50)**Submitter:** Michael J. Johnston Plano, TX**Comment on Proposal No:** 5-115**Recommendation:** The panel should reconsider its initial action on this proposal and accept in principle the concept and merit of the revision. Revise the proposed text as follows:

250.50 Grounding Electrode System. ~~If available on~~ The grounding electrode or grounding electrode system for the premises at each building or structure served, shall be any electrode or combination of all such existing electrodes ~~each item~~ specified in 250.52(A)(1) through (A)(6). ~~These electrode(s) shall be bonded together to form the grounding electrode system. Where there are no none of these grounding electrodes specified by this section for use as the grounding electrode or grounding electrode system exist are available, one or more of the electrodes specified in 250.52(A)(4) through (A)(7) shall be installed and used.~~

Substantiation: For clarification, it was not intended that this proposed change to this section cause the rule to be applied to existing buildings or buildings with existing footings. This revision would remove the word “available” from a mandatory requirement and be consistent with the Style Manual direction that encourages the word “available” be avoided. The section as previously worded left a lot of questions as to what the requirement of the section really is providing. If effective electrodes are inherent to building construction, it should be clear that all such electrodes should make up the grounding electrode system and be used. It is also a style manual recommendation to avoid the word “available” in mandatory Code rules. The revision should help clarify what is intended relative to the grounding electrode system for buildings or structures.

Panel Meeting Action: Accept in Principle**Panel Statement:** See panel action and statement on Comment 5-81.**Number Eligible to Vote:** 16**Ballot Results:** Affirmative: 165-77 Log #778 NEC-P05 **Final Action: Accept in Principle**
(250.50)**Submitter:** Michael J. Johnston Plano, TX**Comment on Proposal No:** 5-115**Recommendation:** This proposal should be accepted in principle and the concept or objective of the proposed revision should be incorporated into the requirements for the grounding electrode system specified in 250.50. I respectfully encourage the panel to reconsider its initial action on this proposal and suggest the following. Revise the text as follows:

250.50 Grounding Electrode System. The grounding electrode system shall effectively connect the system and non-current-carrying conductive parts of equipment to the earth in a manner that meets the applicable performance requirements of 250.4. ~~If available on the premises~~ At each building or structure served, each item grounding electrode specified in 250.52(A)(1) through (A)(6) shall be bonded together to form the grounding electrode system. ~~Where the use of the grounding electrodes specified in 250.52(A)(1) through (6) is impracticable, none of these electrodes are available, one or more of the electrodes specified in 250.52(A)(4) through (A)(7) shall be installed and used.~~

Exception: Concrete-encased electrodes in concrete footings of existing buildings shall not be required to be part of the grounding electrode system.

FPN: Examples of impracticable include, but are not limited to, buildings with existing concrete-encased electrodes in existing footings where the steel reinforcing bars or rods are not accessible for use without disturbing the existing footing.

Substantiation: This proposed revision is an attempt to address the panel’s concern relative to the terms “existing electrodes” and the term “exist” as proposed originally in Proposal 5-115. It was never intended under the concept of this proposal that existing footings be disturbed to incorporate the concrete-encased electrode in all cases. The concrete-encased is an effective grounding electrode that is inherent to most types of building construction and should be used as part of the grounding electrode system. The word available is identified by the NEC Style Manual as a word to avoid in Code rules. This proposal is an attempt to revise this section to eliminate the word “available” and at the same time provide more specific requirements that will only serve to enhance the grounding electrode system at each electrical installation. The word available as used in this section should not relate in any fashion to a point in time on the construction project. All electrodes that are connected to the earth at the building or structure served should be used as part of the grounding electrode system from a safety standpoint. I chose the term “impracticable” to be consistent with other similar rules in the Code were revised to address situations where inconsistencies in application of the rules were evident in the field. For example the term impracticable was used in a revision to 430.102(B) Exception in the 2002 NEC and was inserted to clarify the panel’s original intent. The word “impracticable” as used in that section and some examples was also addressed

in the new FPN to provide further clarification. The FPN is proposed as further clarification only, but may not be needed.

Panel Meeting Action: Accept in Principle**Panel Statement:** See panel action and statement on Comment 5-81.**Number Eligible to Vote:** 16**Ballot Results:** Affirmative: 165-78 Log #1227 NEC-P05 **Final Action: Accept in Principle**
(250.50)**Submitter:** Donald A. Ganiere Ottawa, IL**Comment on Proposal No:** 5-115**Recommendation:** Panel should accept in principle using the wording suggested by Mr.Boksiner.

If available in existing installations, or if present on new installations, 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 are available, one or more of the electrodes specified in 250.52(A)(4) through (A)(7) shall be installed and used. **Substantiation:** The requirement to use the concrete encased electrode for a new building would be an improvement. In many areas where nonmetallic water distribution is used, the rebar in the building footing is the most effective electrode available. If an effective grounding electrode system is required for a safe electrical system, this proposal should be accepted.

Panel Meeting Action: Accept in Principle**Panel Statement:** See panel action and statement on Comment 5-81.**Number Eligible to Vote:** 16**Ballot Results:** Affirmative: 165-79 Log #2923 NEC-P05 **Final Action: Accept in Principle in Part**
(250.50)**Submitter:** Charles Mello, Electro-Test, Inc.**Comment on Proposal No:** 5-115**Recommendation:** Revise the text of 250.50 as follows:

250.50 Grounding Electrode System.

~~If available on the premises at each~~ Each building or structure served shall have a grounding electrode or grounding electrode system established in accordance with (A) through (D); ~~each item in 250.52(A)(1) through (A)(6) shall be bonded together to form the grounding electrode system.~~ [5-147]

(A) New Construction. Where any of the electrodes of the types specified in 250.52(A)(1) to 250.52(A)(6) are installed as part of the new building or structure construction, they shall be bonded together in accordance with 250.53 to form the grounding electrode system. Electrodes that will be completely encased in permanent building construction shall be made accessible for connection the grounding electrode conductor in accordance with 250.68, but shall not be required to be accessible after installation and approval by the Authority Having Jurisdiction.

(B) Existing Construction. Where any of the electrodes specified in 250.52(A)(1) to 250.52(A)(6) are accessible, they shall be bonded together in accordance with 250.53 to form the grounding electrode system.

FPN: It is not the intent that during remodeling, existing permanent building construction such as concrete foundations or footings be disturbed to provide access to grounding electrodes.

(C) Electrodes Not Installed. Where none of these electrodes specified in 250.50(A) or 250.50(B) are available installed during new construction or found accessible during remodeling, one or more of the electrodes specified in 250.52(A)(4) through (A)(7) shall be installed and used.

(D) Isolated electrodes Prohibited. Except where bonded in accordance with 250.50 or connected in accordance with 250.54, electrodes of the types specified in 250.52(A)(1) to 250.52(A)(7) shall not be permitted to be installed or used for grounding of systems or equipment.

Substantiation: The revised text removes the term “if available” as specified by the Style manual as a term that is unenforceable. In addition, the revisions clarify other issues regarding establishing the grounding electrode or electrode system. The revisions resolve the objections raised that for remodeling work, the requirements could be used to cause disturbance of existing foundations or footings. There is Code precedence for separating requirements in new construction and existing construction as pointed out in the ballot comment from Mr. Boksiner.

The first part clearly establishes that at any building for structure that has an electric supply, shall have a grounding electrode or electrode system. With one part establishing the requirements for new construction and another part the requirements for existing construction there should not be any confusion of what is needed. The proposed fine print note amplifies the panel’s intent that existing finished structure is not to be disturbed. The last part clarifies a long time problem in the field where separate electrodes are installed, typically to satisfy operational concerns for electronic equipment, which has never been allowed by Code but not clearly prohibited.

Panel Meeting Action: Accept in Principle in Part

The separation into parts is not accepted. Proposed (D) is not accepted. The remainder is accepted in principle. The results of action on this comment are incorporated in the action taken on Comment 5-81.

Panel Statement: The proposed text in (D) is not needed because it is already covered by text of 250-50 and other parts of the NEC, such 250.54, 250.58, 250.60, etc. See panel action and statement in Comment 5-81.

Number Eligible to Vote: 16

Ballot Results: Affirmative: 16

5-80 Log #1228 NEC-P05
(250.50 Exception (New))

Final Action: Reject

Submitter: Donald A. Ganiere Ottawa, IL

Comment on Proposal No: 5-119

Recommendation: Panel should accept this proposal.

Substantiation: This exception would just make clear that where there is objectionable current on the metal underground water pipe caused by the connection of the GEC to the water pipe, that the water pipe would not be required to be used as a grounding electrode. It appears that 250.6 would already permit this action to prevent the objectionable current.

Panel Meeting Action: Reject

Panel Statement: Water pipes as described in 250.52(A)(1) are required to be used as a grounding electrode.

Number Eligible to Vote: 16

Ballot Results: Affirmative: 16

5-81 Log #1365 NEC-P05
(250.50 Exception)

Final Action: Accept in Principle

Submitter: Andre R. Cartal, Princeton Borough Building Dept.

Comment on Proposal No: 5-115

Recommendation: The Panel should accept this proposal with the following Exception:

Exception: Concrete-encased electrodes in footings of existing buildings shall not be required to be part of the grounding electrode system.

Substantiation: The words "if available" has prevented the use of a proven grounding electrode for too many years. These words have no place in the NEC. From the inspector's viewpoint, it presents a no-win enforcement problem. The removal of these words will require electrical design professionals to specify and also enforce compliance with 250.50.

Panel Meeting Action: Accept in Principle

Revise 250.50 to read as follows:

"250.50 Grounding Electrode System.

All grounding electrodes as described in 250.52(A)(1) through (A)(6) that are present at each building or structure served shall be bonded together to form the grounding electrode system. Where none of these grounding electrodes exist, one or more of the grounding electrodes specified in 250.52(A)(4) through (A)(7) shall be installed and used.

Exception: Concrete-encased electrodes of existing buildings or structures shall not be required to be part of the grounding electrode system where the steel reinforcing bars or rods are not accessible for use without disturbing the concrete."

Panel Statement: Implementation of requirements proposed in 5-115 is not feasible for all installations. An exception is needed to prevent situations where concrete would be required to be disturbed. Additional editorial changes were made to improve clarity.

Number Eligible to Vote: 16

Ballot Results: Affirmative: 16

Comment on Affirmative:

ROBERTSON: I am voting in the affirmative, however, I would like to make a comment on this one.

I agree with the substantiation that the words "if available" have prevented the use of a proven electrode for too many years. By removing the words "if available" and replacing with the proposed text will now mean the Authority Having Jurisdiction will need to be aware of the sequence of construction and the reality that in a lot of cases the concrete encased electrode is, in fact, not available by the time the decision is made on which electrical contractor will be doing the project.

It will now become the responsibility of the Authority Having Jurisdiction to make sure these electrodes are made available for use prior to the concrete being poured in the foundations.

On far too many projects the foundations, spread beams, piers and grade beams are poured prior to awarding the electrical work on a project.

This concern should not be a factor in making the change, it will however, require some changes in the timing of when electrical contracts are awarded in some areas.

Electrical contractors will need to keep this in mind when accepting projects.

5-82 Log #2142 NEC-P05
(250.50 Exception (New))

Final Action: Accept

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

Comment on Proposal No: 5-119

Recommendation: Continue to reject the proposal.

Substantiation: The NEC already allows what the submitter wants to achieve. If a dielectric union is installed at the building wall or even on the other side of the wall below grade, then the qualified (>10 ft) water pipe becomes unavailable, and as such, no longer qualifies as one of the principal grounding electrode choices. Not long ago when we were all going to die of cancer due to low-level magnetic fields, many consumers rushed to separate their electrical systems from copper water laterals (see Proposal 5-180 for a contemporary example of this foolishness). Some even consulted me and other experts and did it correctly by making the water pipe electrode unavailable in this way. Of course the 250.104(A) bonding connection still had to be made, and alternate electrodes needed to be provided.

Panel Meeting Action: Accept

Panel Statement: The panel does not necessarily agree with all of the submitter's substantiation.

Number Eligible to Vote: 16

Ballot Results: Affirmative: 16

5-83 Log #1249 NEC-P05
(250.52(A)(1) Exception)

Final Action: Reject

Submitter: Charles M. Trout, Maron Electric Co. Inc.

Comment on Proposal No: 5-122

Recommendation: This proposal should be Accepted in Principle. Do not delete as the proposal suggests but rather add a second and third paragraph to the Exception to read:

The name(s) of the qualified person(s) shall be kept in a permanent record at the office of the establishment in charge of the completed installation and at the office of the Authority Having Jurisdiction. Notification of any changes in the employment of the designated qualified person(s) shall be made to the office of the Authority Having Jurisdiction.

A person designated as a qualified person shall possess the skills and knowledge related to the construction and operation of the electrical equipment and installation and shall have received documented safety training on the hazards involved. Documentation of their qualifications shall be on file with the office of the Authority Having Jurisdiction and the office of the establishment in charge of the completed installation.

Substantiation: It was not necessarily my desire to have the wording in Exception deleted, if the wording could be changed to include prescriptive requirements that could ensure that qualified persons are actually performing the maintenance and supervision as required by the exception. The National Electrical Code is a prescriptive code and it is the technical committees' responsibility to ensure that prescriptive requirements are present for the Authority Having Jurisdiction to use.

It is difficult to understand how it is possible to relax requirements for safety in a Code that tells us in 90.1(B), "this Code contains provisions that are considered NECESSARY for safety." This section further states that "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." It appears to me that this tells us that these requirements are the MINIMUM requirements for safety and anything less will result in an installation that is NOT FREE FROM HAZARD.

Proponents of this travesty, knowing the truth in this, attempt to circumvent the obvious degradation of safety by using phraseology such as "the installation is under engineering supervision" or "a qualified person will monitor the system." What is monitoring the installation? What does engineering supervision mean?

I have submitted several proposals to delete these exceptions to requirements for safety but they were all rejected. Perhaps in the comment stage, enough persons will comment in favor of accepting these proposals or at least accepting them in a manner where some prescriptive requirements will be added to accurately describe what "engineering supervision" entails. What does "monitoring" the installation mean, what type of record keeping is necessary to assure compliance, what is a "monitor" or what is a "qualified person?" How is documentation of the qualifications and presence of a "qualified person" accomplished by the Authority Having Jurisdiction?

Without these prescriptive requirements, these exceptions to the requirements for safety appear to be "just another subterfuge to avoid compliance with the safety requirements of the National Electrical Code without regard to putting persons and equipment at risk."

Panel Meeting Action: Reject

Panel Statement: No new technical substantiation was submitted. See panel action and statement on Comment 5-19.

Number Eligible to Vote: 16

Ballot Results: Affirmative: 15 Negative: 1

Explanation of Negative:

TOOMER: Accepting this comment would ensure that the provision in this section is being enforced.

5-84 Log #3644 NEC-P05
(250.52(A)(1) Exception)

Final Action: Reject

Submitter: W. Creighton Schwan Hayward, CA

Comment on Proposal No: 5-122

Recommendation: Reconsider, and accept proposal to delete 250.52(A)(1) Exception.

Substantiation: The existing wording weakens the Code, and places an unacceptable burden on the AHJ. To expect the AHJ to judge that all of the maintenance personnel on a property meet the definition of "Qualified Person" in Article 100 is an onerous change, and even if it could be done, considering the frequency of personnel changes in the usual commercial and industrial occupancy, it is an impossible task for the AHJ to continuously monitor the qualifications of the maintenance personnel.

Panel Meeting Action: Reject

Panel Statement: See panel statement on Comment 5-19.

Number Eligible to Vote: 16

Ballot Results: Affirmative: 16

5-85 Log #1022 NEC-P05
(250.52(A)(2))

Final Action: Reject

Submitter: Noel Williams, Noel Williams Consulting

Comment on Proposal No: 5-126

Recommendation: This proposal should continue to be rejected.

Substantiation: Effectively grounded is well-defined in Article 100. The more common problem here, in my experience, is with misunderstandings about what constitutes a metal frame. That issue is not addressed. The proposed methods of grounding the building steel are overly restrictive and do not recognize two of the most common methods: ground rods and ground rings.

Panel Meeting Action: Reject

Panel Statement: CMP 5 concludes that clarification of the requirement is needed. See panel action and statement on Comment 5-86.

Number Eligible to Vote: 16

Ballot Results: Affirmative: 16

5-86 Log #2406 NEC-P05
(250.52(A)(2))

Final Action: Accept in Principle

Submitter: Charles Mello, Electro-Test, Inc.

Comment on Proposal No: 5-126

Recommendation: Revise the text of 250.52(A)(2) to read as follows:

250.52(A)(2) Metal Frame of the Building or Structure. The metal frame of the of the building or structure, where effectively grounded. The structural metal frame along the exterior walls of the building or structure meeting one of the following.

(a) Conductive metal pilings or casings in direct contact with the earth that form part of the building structure or are made electrically continuous with the structural metal frame.

(b) Structural metal frame that has a direct metallic path to the reinforcing bars located in the base of the foundation or footing supporting that portion of the structural metal frame. The reinforcing bars shall be a minimum trade size number 4 or 13mm (1/2 inch) diameter rebar and encased by at least 50mm (2 inches) of concrete in direct contact with the earth. The reinforcing bars from the base of the footing or foundation shall be made electrically continuous to the structural metal member by the use of tie wires, welding or other approved means. The structural metal frame mounting bolts, where used, shall be made electrically continuous to the steel reinforcing bars by tack welding or other approved means.

(c) At least 6m (20 feet) of 4 AWG bare copper conductor encased by a minimum of 50mm (2 inches) of concrete in direct contact with the earth at the base of the footing or foundation supporting that portion of the structural metal member. The copper conductor shall be bonded to the structural metal frame in an accessible location by exothermic welding, a clamp assembly listed for grounding and bonding equipment, other listed connectors, or other approved means.

(d) Other approved means of establishing connection to earth of the structural metal frame.

Substantiation: The present language is vague and subject to wide interpretation. All the other electrodes specified in 250.52(A) are clear as to the materials, length of contact with the earth, burial depth etc, except the structural metal. Presently one could drive one ground rod and bond a structural metal column with a 6 AWG copper conductor and call it "effectively grounded" as the sole connection to earth for a large high rise building. The changes delete the subjective "effectively grounded" which could not be enforced with consistency and replaced with prescriptive text that is clear and able to be inspected to ensure compliance.

The proposed text establishes the requirement for the structural metal electrode to be along the exterior walls to ensure the metal member in the ground or made electrically connected to the earth can maintain itself in the part of the earth that has replenished moisture on a regular basis.

The four methods provide for direct contact of bare, or electrically coated steel or other suitable metal in the earth, the connection of the structural metal to the "rebar that is concrete encased" that is formed in the supporting footing under the structural metal column(s) or the use of a copper "concrete encased electrode" installed specifically for providing a conductive path for the structural metal column to earth. The last provision provides for alternatives where acceptable to the authority having jurisdiction that would allow for possible differences in local site conditions.

The term structural metal was used instead of steel since there may be cases of other metals, such as structural aluminum that might be used in the building where the use of steel in this requirement would impose an unwanted restriction. The intent is that the metal used in the building structural be of substantial cross sectional area ('I' beams, channel and angle iron) and truly provides structural support such as columns and beams, but would not include sheet metal or items such as metal studs that do not have substantial cross sectional area.

See attached photographs for examples of the above requirements.

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

Panel Meeting Action: Accept in Principle

Revise 250.52(A)(2) to read as follows:

"The metal frame of the building or structure, where any of the following methods are used to make an earth connection:

(a) 3.0 m (10 ft) or more of a single structural metal member in direct contact with the earth or encased in concrete that is in direct contact with the earth

(b) the structural metal frame is bonded to one or more of the grounding electrodes as defined in 250.52(A)(1), (3), or (4)

(c) the structural metal frame is bonded to one or more of the grounding electrodes as defined in 250.52(A)(5) or (6) that comply with 250.56, or

(d) other approved means of establishing a connection to earth."

Panel Statement: Editorial revisions were made to the concepts contained in this proposal and comment.

Number Eligible to Vote: 16

Ballot Results: Affirmative: 16

5-87 Log #205 NEC-P05
(250.52(A)(5))

Final Action: Reject

Submitter: Roger J. Montambo, Glavan Industries, Inc.

Comment on Proposal No: 5-129

Recommendation: Revise text to read as follows:

Rod and Pipe Electrodes. Rod and pipe electrodes shall not be less than 2.44 m (8 ft) in length and shall consist of the following materials:

a) Electrodes of pipe or conduit shall not be smaller than metric designator 21 (trade size 3/4 in. nominal) and, where of iron or steel, shall have the outer surface hot-dip galvanized or otherwise metal-coated for corrosion protection.

b) Electrodes of rods of iron or steel shall be at least 13.71 mm (5/8 in. nominal) in diameter, or either equivalent shall be listed and shall not be less than 12.7 mm (1/2 in.) in diameter.

FPN: For further information on rods of iron or steel, refer to standard ANSI/NEMA GR 1-2001 Latest Revision, Grounding Rod Electrodes and Grounding Rod Electrode Couplings.

c) Stainless steel rods less than 13.71 mm (5/8 in. nominal) in diameter or their equivalent shall be listed and shall not be less than 12.7 mm (1/2 in.) in diameter.

Substantiation: Subsequent to the initial submittal of the code proposal changes, Galvan received UL Listing in April 2003 for hot-dip galvanized ground rods manufactured to the ANSI Approved/NEMA GR-1 specification. The commercially available NEMA GR-1 specification is 1) complete and comprehensive for manufacturers and end-users alike; 2) the GR-1 specification achieved ANSI Approval; 3) the galvanized ground rod is UL Listed with an agency responsible for monitoring compliance worldwide; 4) meets the strictest interpretation of the 2002 NEC Code (250.52); and 5) the GR-1 galvanized ground rod is in full compliance with the 2002 NESC Code (094.B.2 Driven Rods). With this solid foundation of allied support and compliance, Galvan is recommending that the next issue of the NEC Code be changed to reflect industry standards of today and incorporate reference to the ANSI Approved/NEMA GR-1 specification.

We are also suggesting 250.51(A)(5) be updated to specific (or hard) numbers to eliminate manufacturer or electrical inspector interpretation. A strict interpretation of this paragraph would mandate a 5/8-in. diameter galvanized rod be 0.625 in. minimum. There never has been such a product manufactured in the past 50 years by any major domestic ground rod manufacturer, but this is a reference to an ANSI C135.30 document which expired in 1993.

The current code may be interpreted to be specific in terms of use of a copper-clad rod because of its reference in UL-467. However, details regarding the galvanized rod continue to remain unclear. And while UL 467 does address criteria to attain a UL Listing in terms of nominal length, specific diameter, one type of cladding, etc. it is completely vague on the physical and chemical characteristics critically important to the ease and success of proper installation of the ground rod electrode. This may include such considerations as rigidity,

toughness, hardness, straightness, yield strength, points and chamfers. The ANSI Approved/NEMA GR-1 document clarifies these important variables, which offer the user a comprehensive specification to assure the best ground rod electrodes possible, even if the specifier is not entirely knowledgeable with the product.

There is much confusion regarding use of the words “ferrous” and “nonferrous.” As an example, copper-clad or hot-dip galvanized grounding electrodes both utilize the same steel core. The only difference is the method of service life protection (copper or zinc) since both effectively transfer stray and/or fault currents to earth (properly designed). This has caused much confusion to interpreters of this paragraph (e.g. electrical inspectors) who are quite obviously not as familiar with the production process of grounding products as manufacturers.

The definition of ferrous and nonferrous is also causing inspectors and engineers to mistakenly utilize one rod (copper or zinc or stainless) when in fact the other should be specified. An example of this would be using a copper rod where a galvanized anchor-rod is nearby, setting up an “electrical cell” which may result in electrode corrosion, potential failure of the installation, and the opportunity for equipment and/or personal injury (safety).

The NEMA GR-1 specification further clarifies each of the above options, mandating specific criteria for manufacturers to follow. It is a specification which does not exclude any manufacturer domestic or non-domestic, but provides very important information to follow for manufacture and application of a reliable ground rod system. Many users are not internally staffed nor have the resources to develop such a document. The NEMA/ANSI Approved GR-1 specification provides that assurance and we feel inclusion of the proposed “revised text” will resolve many issues currently faced in the use and application of ground rod electrodes.

Panel Meeting Action: Reject

Panel Statement: There is no technical substantiation for the dimensional change from 15.87 mm to 13.71 mm in the proposed text of this comment. The word “nominal” was added without substantiation.

Number Eligible to Vote: 16

Ballot Results: Affirmative: 16

Comment on Affirmative:

BRENDER: In addition to the panel’s statement, I believe NEMA GR-1 should not be part of a reference in the NEC. GR-1 is a product manufacturing standard, not a performance standard.

(Note: The sequence no. 5-88 was not used)

5-89 Log #761 NEC-P05 **Final Action: Reject**
(250.52(A)(5))

Note: The Technical Correlating Committee directs that Comment 5-89 be reported as “Reject” because less than two-thirds of the members eligible to vote have voted in the affirmative on Comment 5-90.

Submitter: Michael J. Johnston Plano, TX

Comment on Proposal No: 5-129

Recommendation: Continue to accept the proposal and adjust the revised text as follows:

Stainless steel and galvanized rods less than 16 mm (5/8 in.) in diameter, nonferrous rods, galvanized rods, or their equivalent shall be listed and shall not be less than 13 mm (1/2 in.) in diameter.

Substantiation: The proposal as accepted and the text as printed in the NEC draft appear to show the term “galvanized rods” twice in this section as revised which is redundant.

Panel Meeting Action: Accept in Principle

Continue to accept the proposal and adjust the revised text to read as follows:

Stainless steel and galvanized rods less than 16 mm (5/8 in.) in diameter, nonferrous rods, galvanized rods; or their equivalent shall be listed and shall not be less than 13 mm (1/2 in.) in diameter.

Panel Statement: This change is an editorial change to Proposal 5-129 and eliminates redundancy of the term “galvanized rods.”

Number Eligible to Vote: 16

Ballot Results: Affirmative: 15 Negative: 1

Explanation of Negative:

BOKSINER: The editorial correction is appropriate if Proposal 5-129 were to remain accepted. However, this proposal should be rejected and 250.52(A)(5) should revert to 2002 NEC wording. See my explanation of negative on Comment 5-90 for additional explanation.

5-90 Log #1214 NEC-P05 **Final Action: Reject**
(250.52(A)(5))

Note: The Technical Correlating Committee directs that Proposal 5-129 be reported as “Reject” because less than two-thirds of the members eligible to vote have voted in the affirmative on Comment 5-90.

Submitter: Jeffrey Boksiner, Telcordia Technologies

Comment on Proposal No: 5-129

Recommendation: CMP 5 is urged to reconsider and reject Proposal 5-129 entirely and restore the text of 250.52(A)(5) to the text of the 2002 edition of the NEC.

Substantiation: There are several reasons for rejection of Proposal 5-129.

There is significant opposition in the industry to provisions of GR-1. Two of the largest producers of Grounding Rod Electrodes, Erico and Southern Grounding Products oppose GR-1. In addition, there have been objections to the ANSI Board of Standards Review from the Rural Utilities Service (RUS, formerly the Rural Electrification Administration). The objections of the industry focus on several provisions of the GR-1 standard including the requirements for copper thickness and the diameter of the rod.

Clause 3.4 of GR-1 dealing with the diameter of the rod is especially troubling. It specifies that the finished diameter of a 5/8 inch galvanized ground rod is 0.539” minimum and 0.555” maximum. This is a clear violation of the NEC as it stands, which has always required that “Electrodes of rods of iron or steel shall be at least 15.87 mm (5/8 in.) in diameter”. Iron or steel electrodes manufactured to the provisions of ANSI C135.30 have a diameter of 5/8 in with a tolerance of 1/32 in, while the or the previous version of GR-1 (1997) specifies 0.600” to 0.614”. Besides the fact that there is no solid technical rationale to reduce the size of the electrode that had been used for many years, the reduced electrode is incompatible with couplers and clamps designed for a fully sized 5/8 in electrode. Since fully sized 5/8 in electrode continue to be manufactured in compliance with the NEC, the presence of the reduced -size “5/8 in” electrode create a situation where the standard clamps and fittings designed for the 5/8 electrodes do not fit properly leading to safety hazard.

For these reasons, the NESC Subcommittee responsible for grounding methods has unanimously rejected the use of GR-1 and of rods smaller than 5/8 in during its September meeting. Organizations that voted against acceptance included ATIS, TIA, EIA, EEL, IEEE and RUS.

In view of all the information that has become available since the ROP meeting, it is in the best interests of electrical safety to keep this paragraph of the NEC unchanged.

Panel Meeting Action: Reject

Panel Statement: Ground rods are listed to ANSI/UL 467-1998 and not ANSI/NEMA GR 1. The ANSI/UL 467-1998, product standard permits ground rods 1/2 in. and larger with suitable nonferrous metal coatings. Ground rods are listed for use with specific fittings. These fittings are not interchangeable.

Number Eligible to Vote: 16

Ballot Results: Affirmative: 10 Negative: 6

Explanation of Negative:

BOKSINER: This comment should be accepted. Proposal 5-129 should be rejected entirely and the text of 250.52(A)(5) should be restored to the text of the 2002 edition of the NEC.

There is no substantiation in the original proposal or the panel statement for reducing the minimum required size of the ferrous electrodes from the present 5/8 inch minimum. There have been no changes to UL 467 in this respect. An STP for UL 467 is presently ongoing.

The panel statement states: “Ground rods are listed for use with specific fittings. These fittings are not interchangeable.” While this alleviates somewhat the safety concern with mismatched connector sizes described in the comment, it does not resolve the safety issue entirely. Enforcing the use of a special connector for a particular rod is going to be a problem. An installer is likely to use whatever connector is at hand.

The panel statement states: “Ground rods are listed to ANSI/UL 467-1998 and not ANSI/NEMA GR 1.” Thus, it would be more useful for the new FPN to refer to UL 467 not to NEMA GR-1. Nothing has changed with respect to NEMA GR-1. As it stands, it is still not well received by users and ground rod manufacturers. A reference to GR-1 in the NEC is still not appropriate.

BRENDER: I agree with the submitter that no technical substantiation was submitted that would permit the use of a ground rod of reduced diameter.

BRETT: I agree with the negative comments of Mr. Boksiner, Mr. Brender, Mr. Rappaport and Mr. White. I do not believe the submitter’s substantiation adequately supports the change.

Proposal 5-129 should be rejected. I believe 250.52(A)(5) should revert back to the language of the 2002 NEC.

HADEEN: I agree with Mr. Brender’s explanation of negative vote.

RAPPAPORT: There is no reason to change the 2002 wording since nominal 1/2 in. rods are permitted if listed. It is not necessary to provide a footnote that gives an NEC endorsement to a manufacturing standard that is not generally accepted by the other manufacturers of ground rods, not accepted by the technical community (as documented by the commentor), and not accepted by the other nationally accepted electrical code (NESC). There is concern that the longevity of a galvanized rod is compromised by complying with GR-1 for 1/2 in. rods.

WHITE: For reasons stated in the substantiation of Comments 5-90, 5-95, 5-96, and 5-97 EEL/EL&P recommends that these comments be accepted which would result in the rejection of Proposal 5-129. The panel’s decision to include galvanized ground rods less than 5/8 in. in diameter at the ROP stage was based on their being listed. But now we learn that there is no galvanized ground rod listing requirements in the current applicable listing standard. Galvanized ground rods less than 5/8 inch should not be included in the NEC until the listing requirements are established that will assure these ground rods are equivalent in performance and longevity as the other types of ground rods in this category. In addition, reference to the NEMA GR1 standard in the FPN makes no sense as it is a manufacturing standard. Also, this standard specifies a diameter range for 5/8 inch ground rods that is less than 5/8 inch. This action has created compatibility problems for utilities as they discovered their couplers in stock will not correctly fit all ground rods. These problems caused the NESC to reject specification of this standard. Based on these issues, EEL/EL&P recommends that the panel accept these comments and return to the original 2002 language for 250.52(A)(5).

5-91 Log #1363 NEC-P05
(250.52(A)(5))**Final Action: Reject****Submitter:** Andre R. Cartal, Princeton Borough Building Dept.**Comment on Proposal No:** 5-128**Recommendation:** Panel should reconsider and accept the proposal.

Substantiation: The Panel notes that there are many locations in the US where only one made electrode would be required. However, these could only be approved after a test determined that the ground resistance was 25 OHMS or below - and were all those electrodes tested? In the 80 years of this requirement (1923 Edition) one could argue that this rule has stood the test of time, and it has since, in my experience, been generally ignored. Electrical inspection acceptance by the public and the industry is directly related to the credibility of the NEC. A provision that demands a 25 OHM value for a single made electrode but ignores that value if a second made electrode is installed defies common sense, which makes the NEC and inspectors subject to unnecessary criticism. A "User Friendly" code must be a "User Credible" code.

Panel Meeting Action: Reject

Panel Statement: No technical substantiation was submitted to delete the option of using one electrode to obtain a maximum 25 ohms resistance. The NEC does not preclude the installation of additional electrodes. This requirement has been used successfully for many years.

Number Eligible to Vote: 16**Ballot Results:** Affirmative: 15 Negative: 1**Explanation of Negative:**

BOKSINER: As detailed in the negative vote for the ROP, this NEC requirement is confusing and seemingly illogical. The submitter makes a well-substantiated argument to accept the original proposal.

5-92 Log #2143 NEC-P05
(250.52(A)(5))**Final Action: Reject**

Note: The Technical Correlating Committee directs that Comment 5-92 be reported as "Reject" because less than two-thirds of the members eligible to vote have voted in the affirmative on Comment 5-90.

Submitter: Frederic P. Hartwell, Hartwell Electrical Services, Inc.**Comment on Proposal No:** 5-129

Recommendation: Accept the panel action in principle. Delete one instance of "galvanized rods" in paragraph (b), depending on the intended meaning. If the intent is to require listing on only the thinner galvanized rods, then delete the second instance. If the intent is to require listing on all galvanized ground rods, then delete the first instance.

Substantiation: Editorial. As written the second instance, being unqualified, includes the first and therefore all galvanized rods regardless of whether or not less than 5/8 inch, would require grounding. This begs the question of why the first instance is there. If the intent is to only require listing on the thinner rods, then the second instance must be deleted. Please clarify which galvanized rods require listing.

Panel Meeting Action: Accept in Principle**Panel Statement:** See panel action and statement on Comment 5-89.**Number Eligible to Vote:** 16**Ballot Results:** Affirmative: 15 Negative: 1**Explanation of Negative:**

BOKSINER: See my explanation of negative vote on Comment 5-89.

5-93 Log #2404 NEC-P05
(250.52(A)(5))**Final Action: Reject****Submitter:** Charles Mello, Electro-Test, Inc.**Comment on Proposal No:** 5-128**Recommendation:** Revise the text of 250.52(A)(5) to read as follows:

Rod and Pipe Electrodes. A rod or pipe electrode system shall consist of a rod or pipe electrode and at least one additional electrode of the types specified in 250.52(A)(2) to (A)(6). Where the additional electrode consists of a rod, pipe, or plate, there shall be a minimum of 1.8m (6 feet) of space between the electrodes. Rod and pipe electrodes shall not be less than 2.5 m (8 ft) in length and shall consist of the following materials.

Exception: A single rod or pipe electrode shall be permitted where the resistance to earth is less than 25 Ohms. The single ground rod shall be performance tested when first installed. A written record of this test shall be made and shall be available to the authority having jurisdiction.

(a) Electrodes of pipe or conduit shall not be smaller than metric designator 21 (trade size i) and, where of iron or steel, shall have the outer surface galvanized or otherwise metal-coated for corrosion protection.

(b) Electrodes of rods of iron or steel shall be at least 15.87 mm (5/8 in.) in diameter. Stainless steel and galvanized rods less than 16 mm (5/8 in.) in diameter, nonferrous rods, galvanized rods or their equivalent shall be listed and shall not be less than 13 mm (1/2 in.) in diameter.

FPN: For further information on ground rods, see ANSI/NEMA GR1-2001, Grounding Rod Electrodes and Grounding Rod Electrode Couplings.

Substantiation: The proposal to require two rods or two pipes and eliminate the 25 Ohm requirement had technical merit. The submitter provided a specific case where a single rod at numerous dwelling units did not meet the requirement and when two rods together, that by definition are automatically acceptable, were tested the values still did not come close to the 25 Ohms, yet the Code required this to now be accepted. The panel did not technically substantiate that the value of 25 Ohms had solid scientific merit.

From thousands of tests done across the country by independent testing companies, it is much more common that a single rod or pipe does not meet the 25 Ohm specification than those that do. The revised language in this comment would establish the requirement for the installation that is most commonly required. In addition the revised language allows for the cases where a single electrode will suffice and would provide for adequate enforcement by requiring the 25 Ohms to be proven by test with a copy of that test record made available to the authority having jurisdiction. The original proposed test was also overly restrictive in that the revised text did not allow for a single rod or single pipe in addition to one of the other electrodes of 250.52(A)(2) to 250.52(A)(6). The revised text here provides that flexibility.

This comment is a companion to comments on proposals 5-133 and 5-144.

Panel Meeting Action: Reject

Panel Statement: There is no requirement to require a written record of the resistance test. The proposed wording includes an exception that is not user friendly because it is not in positive language.

Number Eligible to Vote: 16**Ballot Results:** Affirmative: 165-94 Log #2633 NEC-P05
(250.52(A)(5))**Final Action: Reject****Submitter:** Paul Dobrowsky Holley, NY**Comment on Proposal No:** 5-128

Recommendation: Accept the proposal in principle by making the change and adding an exception to read as follows:

A single electrode shall be permitted where the single electrode has a resistance to ground of 25 ohms or less.

Substantiation: The submitter is correct. In many installations the first choice is to install two electrodes and never consider the resistance to earth. Because this is usually the default concept, then revising the section as proposed by the submitter and adding an exception may add clarity.

Panel Meeting Action: Reject**Panel Statement:** This editorial change does not add clarity.**Number Eligible to Vote:** 16**Ballot Results:** Affirmative: 15 Negative: 1**Explanation of Negative:**

BOKSINER: The submitter is correct. The proposed change adds clarity by placing the most common approach first.

5-95 Log #3039 NEC-P05
(250.52(A)(5))**Final Action: Reject****Submitter:** David Brender, Copper Development Assn. Inc.**Comment on Proposal No:** 5-129

Recommendation: The submission is not based on safety or testing for longevity. There is no substantiation that a change in present Code language is needed. The wording of the submission asks for compliance with NEMA GR-1 as being Code acceptable. The issue of listing by an NRTL is the only requirement the Panel should be concerned with. The submitters substantiation is non-persuasive. After review, we feel that this proposal should have been rejected.

Substantiation: We feel that the submitter is asking to put the designation of ANSI/NEMA GR-1 minimums into the NEC where it does not belong. If the submitter wishes to have his construction listed by a NRTL, then that is the appropriate format to follow. The NEC should not be charged to include any wording other than a listing requirement. Designation of NEMA GR-1 in the FPN is not the equivalent of listing by an NRTL. The submitter should be required to prove that any changes to coating thickness produce an equivalent product performance, including longevity.

Panel Meeting Action: Reject**Panel Statement:** See panel action and statement on Comment 5-90.**Number Eligible to Vote:** 16**Ballot Results:** Affirmative: 12 Negative: 4**Explanation of Negative:**

BOKSINER: See my explanation of negative vote on Comment 5-90.

BRENDER: The original proposal included reference to NEMA GR-1, which does not belong in the NEC. Further, UL stated at the hearing that they do not test for performance or longevity. No technical substantiation was submitted with the proposal to allow reduced diameter of ground rods. Evidence is currently being developed in connection with the National Electrical Grounding Electrode Project that may help answer some questions with respect to performance and corrosion of electrodes over time. That data is not yet available or published.

The comment should have been accepted.

BRETT: See my explanation of negative vote on comment 5-90.

WHITE: See my explanation of negative vote on Comment 5-90.

5-96 Log #3355 NEC-P05
(250.52(A)(5))**Final Action: Reject****Submitter:** Chris Rempe, ERICO Inc.**Comment on Proposal No:** 5-129

Recommendation: ERICO would like to respectfully recommend that proposal 5-129 be rejected allowing section 250.52(A)(5) to remain unchanged.

Substantiation: NEMA GR 1 is a useful manufacturing standard for copper-bonded ground rods and the couplers used to connect them. The vast majority of producers manufacture product to its specifications and have for many years. The 2001 version of the standard significantly reduced the diameter requirements for galvanized rods. As a result of widespread rejection by the end-user community, most manufacturers do not follow it. The biggest issue is the diameter range specified for 5/8 in. galvanized rods (.539 in. - .555 in.) This diameter range is in violation of the NEC and NESC that require 5/8 in., and rods made to this standard have been widely rejected by electrical inspectors, utilities, and AHJs. In September, the NESC grounding methods committee unanimously defeated proposals to make GR 1 its ground rod specification citing, among other things, insufficient technical justification to reduce the long-standing 5/8 in. diameter requirement. As a member of the NEMA GR 1 committee, ERICO recommends that the NEC consider removing references to this standard until it has been revised.

Additionally, the proposal seeks to add galvanized ground rods to the list of rod electrodes that must be listed if less than 5/8 in. The current version of UL 467 requires a coating of 10 mils of copper or 15 mils of stainless steel for a ground rod to be listed. There is no thickness requirement specified for a galvanized ground rod to be listed. It is the thickness and type of material used to protect a ground rod's steel core that primarily determines its corrosion resistance and, therefore, service life. Recently, the UL 467 STP issued a request for comments on a proposed change to the 2005 edition that seeks to add 3.9 mils of zinc as the new listing requirement for galvanized ground rods. 3.9 mil of zinc is derived from ASTM A 123 - not from studies done showing the below-grade corrosion performance of zinc. In a letter to the STP citing independent reports by the National Bureau of Standards, The Navy, and the National Electrical Grounding Research Project, ERICO highlighted the difference in corrosion protection provided by 10 mils of copper vs. 3.9 mils of zinc. The studies showed that a UL listed copperbonded rod could be expected to perform for 40+ years while 10-15 years is reasonable for galvanized rods in most soils. UL listing a 3.9 mil zinc coated rod would give the impression that both rod types provide the same service life. As a manufacturer of both types of rods, ERICO believes that this may compromise safety by encouraging the misapplication of galvanized rods on facilities with a long service life. A new PDE has recently been assigned to the 467 standard by UL. He attended the most recent NEMA GR 1 meeting held in Washington D.C. on October 15th to discuss the issue. He expressed concerns about how to technically equate 3.9 mils of zinc to be established requirements set for copper and stainless steel. At this time, the future of this UL listing requirement has not been decided. Given the fact that there is no galvanized ground rod listing requirements in the current version of UL 467 and an uncertainty surrounding possible future listing requirements, we believe that it would be premature for the NEC to add galvanized rods to section 250.52(A)(5). For these reasons, we hope that proposal 5-129 will be rejected.

A copy of ERICO's letter to UL is available upon request.

Panel Meeting Action: Reject**Panel Statement:** See panel action and statement on Comment 5-90.**Number Eligible to Vote:** 16**Ballot Results:** Affirmative: 12 Negative: 4**Explanation of Negative:**

BOKSINER: See my explanation of negative vote on Comment 5-90.

BRENDER: See my explanation of negative vote on Comment 5-95.

BRETT: See my explanation of negative vote on comment 5-90.

WHITE: See my explanation of negative vote on Comment 5-90.

5-97 Log #3549 NEC-P05
(250.52(A)(5))**Final Action: Reject****Submitter:** Percy E. Pool, Verizon NS**Comment on Proposal No:** 5-129

Recommendation: I urge CMP 5 to reconsider the approval of Proposal 5-129 and reject it entirely. The text of 250.52(A)(5) should be restored to the text of the current 2002 edition.

Substantiation: There is significant industry opposition to provisions of GR-1. The largest producers of grounding rod electrodes oppose the requirements of GR-1. The objections of the industry focus on the requirements for copper thickness and the diameter of the rod. Additionally, Rural Utilities Services (RUS/REA) has filed procedural objections to the ANSI Board of Standards Review.

GR-1 specifies that the finished diameter of a 5/8-inch galvanized ground rod is 0.539 in. minimum and 0.555 in. maximum. This is clearly different than NEC requirements. The NEC has always required that "electrodes of rods of iron or steel shall be at least 15.87 mm (5/8 in.) in diameter." The traditional manufacturing tolerance has been 1/32 in. The submitter provided neither a

solid technical rationale to change the size of the rod electrode nor any safety reasons for the changes. The reduced electrode size is not compatible with couplers and clamps that have been designed for a 5/8 inch electrode. This creates a safety hazard since the standard clamps and fittings designed for the 5/8-inch electrode do not fit properly.

Panel Meeting Action: Reject**Panel Statement:** See panel action and statement on Comment 5-90.**Number Eligible to Vote:** 16**Ballot Results:** Affirmative: 12 Negative: 4**Explanation of Negative:**

BOKSINER: See my explanation of negative vote on Comment 5-90.

BRENDER: See my explanation of negative vote on Comment 5-95.

BRETT: See my explanation of negative vote on comment 5-90.

WHITE: See my explanation of negative vote on Comment 5-90.

5-98 Log #1362 NEC-P05
(250.52(A)(6))**Final Action: Reject****Submitter:** Andre R. Cartal, Princeton Borough Building Dept.**Comment on Proposal No:** 5-133**Recommendation:** Panel should reconsider and accept the proposal.

Substantiation: The Panel notes that there are many locations in the US where only one made electrode would be required. However, these could only be approved after a test determined that the ground resistance was 25 OHMS or below - and were all those electrodes tested? In the 80 years of this requirement (1923 Edition) one could argue that this rule has stood the test of time, and it has since, in my experience, been generally ignored. Electrical inspection acceptance by the public and the industry is directly related to the credibility of the NEC. A provision that demands a 25 OHM value for a single made electrode but ignores that value if a second made electrode is installed defies common sense, which makes the NEC and inspectors subject to unnecessary criticism. A "User Friendly" code must be a "User Credible" code.

Panel Meeting Action: Reject**Panel Statement:** See panel action and statement on Comment 5-91.**Number Eligible to Vote:** 16**Ballot Results:** Affirmative: 15 Negative: 1**Explanation of Negative:**

BOKSINER: See my explanation of negative vote on Comment 5-91.

5-99 Log #2403 NEC-P05
(250.52(A)(6))**Final Action: Reject****Submitter:** Charles Mello, Electro-Test, Inc.**Comment on Proposal No:** 5-133**Recommendation:** Revise the text of 250.52(A)(6) to read as follows:

250.52(A)(6) Plate Electrodes. A plate electrode system shall consist of a plate and at least one additional electrode of the types specified in 250.52(A)(2) to 250.52(A)(6). Where the additional electrode consists of a rod, pipe or plate, there shall be a minimum of 1.8m (6 feet) of space between the electrodes. Each plate electrode shall expose not less than 0.186 m² (2 ft²) of surface to exterior soil. Electrodes of iron or steel plates shall be at least 6.4 mm (1/4 in.) in thickness. Electrodes of nonferrous metal shall be at least 1.5 mm (0.06 in.) in thickness.

Exception: A single plate electrode shall be permitted where the resistance to earth is less than 25 Ohms. The single ground rod shall be performance tested when first installed. A written record of this test shall be made and shall be available to the authority having jurisdiction.

Substantiation: The proposal to require two plate electrodes and eliminate the 25 Ohm requirement had technical merit. The submitter provided a specific case where a single rod at numerous dwelling units did not meet the requirement and when two rods together, that by definition are automatically acceptable, were tested the values still did not come close to the 25 Ohms, yet the Code required this to now be accepted. The panel did not technically substantiate that the value of 25 Ohms had solid scientific merit.

From thousands of tests done across the country by independent testing companies, it is much more common that a single plate electrode does not meet the 25 Ohm specification than those that do. The revised language in this comment would establish the requirement for the installation that is most commonly required. In addition the revised language allows for the cases where a single electrode will suffice and would provide for adequate enforcement by requiring the 25 Ohms to be proven by test with a copy of that test record made available to the authority having jurisdiction. The original proposed test was also overly restrictive in that the revised text did not allow for a single plate electrode in addition to one of the other electrodes of 250.52(A)(2) to 250.52(A)(6). The revised text here provides that flexibility.

This comment is a companion to comments on proposals 5-128 and 5-144.

Panel Meeting Action: Reject**Panel Statement:** See panel action and statement on Comment 5-93.**Number Eligible to Vote:** 16**Ballot Results:** Affirmative: 15 Negative: 1**Explanation of Negative:**

BOKSINER: The panel statement reference to 5-93 is not totally applicable since there is no proposal for testing in this comment. The proposed language

is more user-friendly since the most common action is placed first, while the proposed exception is truly an exception.

5-100 Log #2634 NEC-P05 **Final Action: Reject**
(250.52(A)(6))

Submitter: Paul Dobrowsky Holley, NY

Comment on Proposal No: 5-133

Recommendation: Accept the proposal in principle by making the change and adding an exception to read as follows:

A single electrode shall be permitted where the single electrode has a resistance to ground of 25 ohms or less.

Substantiation: The submitter is correct. In many installations the first choice is to install two electrodes and never consider the resistance to earth. Because this is usually the default concept, then revising the section as proposed by the submitter and adding an exception may add clarity.

Panel Meeting Action: Reject

Panel Statement: See panel action and statement on Comment 5-94.

Number Eligible to Vote: 16

Ballot Results: Affirmative: 15 Negative: 1

Explanation of Negative:

BOKSINER: See my explanation of negative vote on Comment 5-94.

5-101 Log #2144 NEC-P05 **Final Action: Accept**
(250.52(A)(7))

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

Comment on Proposal No: 5-134

Recommendation: Accept the proposal in principle. Change “which” to “that.”

Substantiation: Grammar; the word does not introduce a subordinate clause.

Panel Meeting Action: Accept

Number Eligible to Vote: 16

Ballot Results: Affirmative: 16

5-102 Log #2959 NEC-P05 **Final Action: Reject**
(250.52(A)(7))

Submitter: Melvin K. Sanders, TECo., Inc.

Comment on Proposal No: 5-134

Recommendation: The Panel should reconsider its action to accept and instead reject this change. This would then have the effect of maintaining the present text of the 2002 NEC.

Substantiation: 250.112(L) in the 2002 NEC on page 112 and retained in the 2005 ROP Draft on page 91 will continue to require a motor operated water pump, including submersible types, to be grounded by an equipment grounding conductor, and 250.112(M) in the 2002 NEC on page 112 and retained in the 2005 ROP Draft on page 91 require the metal well casing to be bonded to the pump circuit bonding conductor. If the purpose of a water well is to provide water, and a pump is necessary to accomplish that, and the pump has an electric motor with the motor circuit providing the required equipment grounding conductor and is bonded to the metal well casing, the metal well casing appears to be bonded, would not be permitted to serve as an electrode, which appears to be the intent of this proposal.

Panel Meeting Action: Reject

Panel Statement: The panel disagrees with the submitter’s substantiation because the equipment grounding conductor required by 250.112(M) must be connected to the metal casing whether or not the metal casing is used as an electrode or part of the grounding electrode system.

Number Eligible to Vote: 16

Ballot Results: Affirmative: 16

5-103 Log #1985 NEC-P05 **Final Action: Reject**
(250.53)

Submitter: James T. Dollard, Jr., IBEW Local 98

Comment on Proposal No: 5-128

Recommendation: Accept this proposal in principle.

The intent of this proposal can be met by the following revision to 250.53(D). Note this does not represent new material as the intent of the submitter’s proposal is met as follows:

250.53(D) Metal Underground Water Pipe. Where used as a grounding electrode, metal underground water pipe shall meet the requirements of 250.53(D)(1) and (D)(2).

(1) Continuity. Continuity of the grounding path or the bonding connection to interior piping shall not rely on water meters or filtering devices and similar equipment.

(2) Supplemental Electrode Required. A metal underground water pipe shall be supplemented by an additional electrode of a type specified in 250.52(A)(2)

through (A)(7). Where the supplemental electrode is a rod, pipe, or plate type, a minimum of two electrodes shall be installed or a single electrode shall be permitted provided the single electrode complies it shall comply with 250.56. The supplemental electrode/s shall be permitted to be bonded to the grounding electrode conductor, the grounded service-entrance conductor, the nonflexible grounded service raceway, or any grounded service enclosure.

Exception: The supplemental electrode/s shall be permitted to be bonded to the interior metal water piping at any convenient point as covered in 250.52(A)(1), Exception.

Substantiation: The submitter has attempted to correct a serious problem in Article 250. In the Philadelphia area application of 250.56 can vary dramatically from one inspection agency to another.

This comment will not address all situations in which made electrodes are applied.

Where made electrodes are used in a grounding electrode system as a “supplemental” electrode they are by design intended to serve someday as a “sole electrode.”

Made electrodes are merely toothpicks in the earth when compared to a metal underground water piping system. As water systems are upgraded the electrode is in many cases removed as plastic pipe is used for the water service. The rod, pipe or plate electrodes then become our sole grounding electrode. I agree with the panel statement that there may well be geographical areas in the world where (when conditions are optimum) a resistance to ground of 25-ohms or less may be achieved. However these locations represent the minority of installations.

The submitter has singled out a requirement that is sometimes misunderstood and more often intentionally overlooked. In essence the NEC requires a test be performed on the soil with acceptable results or two made electrodes are required. No one is doing the testing, very few are installing the second made electrode. A simple fix may be to require two made electrodes in all cases unless documentation of testing at 25-ohms or less is made available.

Good code is practical, enforceable and easy to read. It is practical to accept in principle proposal 5-128 to clearly settle this issue with a mandatory requirement of two rods in all cases where the made electrodes are supplemental.

This should be done for the user of this code as it provides uniformity, clarity and is extremely user friendly. This issue must also be addressed for the enforcement community.

Beyond two made electrodes the resistance to ground would be a performance requirement and as such would be at the whim of the owner or project engineer.

A minimum of two made electrodes should be required for all cases requiring where made electrodes play a role in a grounding electrode system.

This change is safety driven, user friendly, practical, easy to read and will increase the enforceability of the NEC.

Panel Meeting Action: Reject

Panel Statement: The revised wording does not added clarity and as written has conflicting requirements.

Number Eligible to Vote: 16

Ballot Results: Affirmative: 16

5-104 Log #2405 NEC-P05 **Final Action: Reject**
(250.53(D))

Submitter: Charles Mello, Electro-Test, Inc.

Comment on Proposal No: 5-141

Recommendation: Revise 250.53(D) and 250.53(E) as follows:

(D) Metal Underground Water Pipe. Where used as a grounding electrode, metal underground water pipe shall meet the requirements of 250.53(D)(1) and (D)(2).

(1) Continuity. Continuity of the grounding path or the bonding connection to interior piping shall not rely on water meters or filtering devices and similar equipment.

(2) Supplemental Additional Electrode Required. A metal underground water pipe shall be supplemented by an additional electrode of a type specified in 250.52(A)(2) through (A)(7). Where the supplemental additional electrode is a rod, pipe, or plate type, it shall comply with 250.56. The supplemental additional electrode shall be permitted to be bonded to the grounding electrode conductor, the grounded service-entrance conductor, the nonflexible grounded service raceway, or any grounded service enclosure.

Exception: The supplemental additional electrode shall be permitted to be bonded to the interior metal water piping at any convenient point as covered in 250.52(A)(1), Exception.

(E) Supplemental Additional Electrode Bonding Connection Size. Where the supplemental additional electrode is a rod, pipe, or plate electrode, that portion of the bonding jumper that is the sole connection to the supplemental additional grounding electrode shall not be required to be larger than 6 AWG copper wire or 4 AWG aluminum wire.

Substantiation: Proposal 5-141 identified a problem where the terms “supplemental electrode” used in 250.53 and “supplementary electrode” used in 250.54 were so close that it was confusing when complying with the differing requirements. The panel rejected the proposed change to 250.54 indicating that “supplementary” and “additional” meant the same thing.

250.53(D) requires that water pipe electrode have another electrode installed in the event the water pipe is changed in the future thereby making it no longer

suitable as a grounding electrode. The use of the term supplemental electrode here could be clarified by changing it to “additional electrode” which is really what the Code is asking for. In addition to clarifying what is required for 250.53(D) and 250.53(E), this also resolves the problem identified previously with the closely related terms used for different purposes.

Panel Meeting Action: Reject

Panel Statement: Revised wording does not add clarity and substantiation has not been provided that the current wording is not adequate.

Number Eligible to Vote: 16

Ballot Results: Affirmative: 16

5-105 Log #1125 NEC-P05
(250.54)

Final Action: Reject

Submitter: Paul Dobrowsky Holley, NY

Comment on Proposal No: 5-141

Recommendation: Accept the proposal and also delete the term “additional” from the first sentence of 250.53(D)(2).

Substantiation: The existing terms supplemental and supplementary are too similar. Using different terms will improve clarity. The term “additional” is not necessary in 250.53(D)(2) and deleting it will further enhance the usability.

Panel Meeting Action: Reject

Panel Statement: See panel action and statement on Comment 5-104.

Number Eligible to Vote: 16

Ballot Results: Affirmative: 16

5-106 Log #2635 NEC-P05
(250.54)

Final Action: Reject

Submitter: Paul Dobrowsky Holley, NY

Comment on Proposal No: 5-141

Recommendation: Accept the proposal in principle and change the term to “accessory”, “ancillary”, “auxiliary”, or “subsidiary”.

Substantiation: The existing terms supplemental and supplementary are too similar. Using different terms will improve clarity. The term “additional” is not necessary in 250.53(D)(2) and deleting it will further enhance the usability. This is a second comment on this section offering an alternative option.

Panel Meeting Action: Reject

Panel Statement: The proposal does not comply with 4-3.3(c) of Regulations Governing Committee Projects in that the submitter has not provided a specific recommended text.

Number Eligible to Vote: 16

Ballot Results: Affirmative: 16

5-107 Log #120 NEC-P05
(250.56)

Final Action: Reject

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education

Comment on Proposal No: 5-144

Recommendation: Add to both 250.53(G) and 250.53(H): “At least two electrodes shall be installed, not less than 1.8 m (6 ft) apart.”

Follow with an Exception to 250.53(G) and (H):

“A single electrode shall be permitted where its resistance to ground is 25 ohms or less.”

Then delete 250.56, as proposed.

Substantiation: An Ohio project determined that a single electrode installed most anywhere in the state had resistance to ground of far less than 25 ohms. Still, in most places where the NEC is used, two electrodes is the norm, and seven or seventeen will not yield the magical 25. Let’s not imply that two electrodes is a makeshift rather than a safe, standard way to provide a ground reference.

Panel Meeting Action: Reject

Panel Statement: The change does not add clarity or effectively change the current requirements.

Number Eligible to Vote: 16

Ballot Results: Affirmative: 15 Negative: 1

Explanation of Negative:

BOKSINER: The proposed language is more user-friendly since the most common action is placed first, while the proposed Exception is truly an Exception.

5-108 Log #730 NEC-P05
(250.56)

Final Action: Reject

Submitter: Robert J. Friebe, Delaware Technical & Community College

Comment on Proposal No: 5-142

Recommendation: 250.56 Resistance of Rod, Pipe and Plate Electrodes.

A single electrode consisting of a rod, pipe or plate that does not have a resistance to ground of “2” ohms or less shall be augmented by additional

electrodes of any of the type specified by 250.52(A)(2) through (A)(7). Where multiple rod, pipe or plate electrodes are installed to meet the requirements of this section, they shall not be less than 1.8m (6 ft) apart.

Substantiation: Using ohms law, if we have a main ground of 2.5 ohms and a voltage of 120 volts, and a fault occurs to ground, the current will be 4.8 amperes. A 15 ampere fuse or circuit breaker will never open.

Now, if we lower the main ground ohms to “2” ohms and with a voltage of 120, and a fault to ground occurs, the current to ground will be 60 amperes. Now we are protected. At the DuPont plant, where I worked for 45 years, our standard was 2 ohms max on the main ground.

Panel Meeting Action: Reject

Panel Statement: The purpose of the grounding electrode system is to limit the voltage imposed by lightning, line surges, etc. and to stabilize the voltage to earth during normal operation, not to clear faults.

Number Eligible to Vote: 16

Ballot Results: Affirmative: 16

5-109 Log #779 NEC-P05
(250.56)

Final Action: Accept in Part

Submitter: Michael J. Johnston Plano, TX

Comment on Proposal No: 5-144

Recommendation: Continue to reject this proposal however revise the section as follows:

250.56 Maximum Resistance of Rod, Pipe, and Plate Electrodes.

A single grounding electrode(s) consisting solely of a rod(s), pipe(s), or plate(s) that does not shall have a maximum resistance to ground of 25 ohms or less and shall be performance tested when first installed on site. A written record of this test shall be made available to the authority having jurisdiction, shall be augmented by one additional electrode of any of the types specified by 250.52(A)(2) through (A)(7): Where multiple rod, pipe, or plate electrodes are installed, to meet the requirements of this section, they shall not be less than 1.8 m (6 ft) apart.

FPN: The paralleling efficiency of rods longer than 2.5 m (8 ft) is improved by spacing greater than 1.8 m (6 ft). Some manufacturers produce listed grounding electrodes or electrode systems that require more depth than the minimum specified in this section and may also require additional space separation based on the manufacturer’s installation instructions.

Substantiation: I support the panel’s initial action to reject this proposal as deleting the section would lessen a current minimum requirement without enough substantiation and could impact safety. However, the submitter has clearly identified a need for improvement in this section for consistency and from a safety standpoint. The maximum resistance value established in the 1920s has been a benchmark threshold for these types of grounding electrodes for several cycles and CMP-05 clearly indicated in its statement to this proposal that to remove the 25 ohm value reduces current minimum requirements. The problem is that within the requirements of this section lies a contradiction to this maximum resistance value. The section currently sets a maximum value (25 ohms) and then allows relief in the same sentence which sends mixed signals to users and enforcers. If a single electrode does not meet the 25 ohm value, then it is currently permitted to augment the single electrode with another electrode without a requirement to meet the 25 ohm maximum value. It is generally agreed that as this resistance to ground on this electrode value goes up, the level of safety is reduced from a shock hazard and performance standpoint. The rule should clearly require an effective connection to the earth only, not a adding more if the minimum value of resistance in the connection cannot be established. The Code specifies the maximum value of 25 ohms and these electrodes should be required to meet that minimum value, or another electrode that does should be established. This is clearly a performance issue and the section should be revised to clarify what is really intended in the interest of safety. The proposed text is worded the same as the performance testing requirement text contained in 230.95 for EGFP testing. There are no current requirements in Section 250.56 for testing, but this is generally the basis for inspector approvals where the maximum resistance to ground values are questioned. The proposed revisions to require testing will encourage consistent enforcement and ensure that these types of electrodes do meet that 25 ohm maximum resistance threshold benchmark value. This section does need to be revised to clarify what is required from a performance standpoint relative to safety. The revision as proposed will also clarify what is required from an enforcement perspective. Currently there appears to be some misuse of this section that is leading to electrical installations in the field that are unsafe because a suitable grounding electrode connection to the earth is avoided by the current allowance based on the provisions of this section. There are alternate methods in the industry readily available to meet the requirement of 25 ohms that include the use of other types of electrodes, increased depth of electrodes, etc. As I already indicated, I support the panel’s decision to reject the original proposal, but I concur with the submitter’s intention to clarify this requirement and do so in the interest of safety and for the enforcement community. I feel there is a definite need for improvement in this section as it currently sends mixed signals to users and enforcers.

Panel Meeting Action: Accept in Part

Continue to reject proposal 5-144.

Panel Statement: The panel accepts the comment to continue the rejection of Proposal 5-144. The panel rejects the revisions to 250.56 and the FPN. The text in 250.56 is not required since the AHJ has the flexibility to enforce 250.56. The proposed additional text to the FPN is already covered by 110.3(B), which requires the adherence to instructions included in the listing and labeling requirements. Comparable substantiation that caused the requirements in 230.95 has not been provided.

Number Eligible to Vote: 16

Ballot Results: Affirmative: 16

5-110 Log #1364 NEC-P05 **Final Action: Reject**
(250.56)

Submitter: Andre R. Cartal, Princeton Borough Building Dept.

Comment on Proposal No: 5-144

Recommendation: Delete this section.

Substantiation: The Panel statement to the effect that deleting this section “reduces current minimum requirements” is bogus as there are no minimum values - when more than one made electrode is installed the NEC would be well served by deletion of this section. The panel statement that there is “insufficient substantiation provided” when, in fact, the substantiation already exists in the rule. In the 80 years (at least) of this requirement, one could argue that it has stood the test of time, and it has - since it has been universally ignored. Electrical inspection acceptance by the public and industry is directly dependent to the credibility of the NEC. A provision that demands a 25 OHM value for a single made electrode but ignores that value if a second made electrode is installed defies common sense which makes NEC enforcement and the NEC subject to criticism. A “user friendly” code must also be a “user credible” code. If the Panel is concerned about a 25 OHM safety threshold, then this value should be required for all the electrodes listed in 250.52.

Panel Meeting Action: Reject

Panel Statement: See panel action and statement on Comment 5-91.

Number Eligible to Vote: 16

Ballot Results: Affirmative: 15 Negative: 1

Explanation of Negative:

BOKSINER: See my explanation of negative vote on Comment 5-91.

5-111 Log #2957 NEC-P05 **Final Action: Reject**
(250.56)

Submitter: David Beach, PAE Consulting Engineers

Comment on Proposal No: 5-144

Recommendation: Accept the proposal.

Substantiation: The present code language makes the completely unsubstantiated statement that a single ground rod with a measured resistance to remote earth of 26 ohms is unacceptable as a grounding electrode while two ground rods providing a resistance of 200 ohms to remote earth is just fine. The code should either require 25 ohms, or it should just come out and require 2 ground rods, but the present requirements have no defensible basis in engineering or physics. If there is, or has been, any technical substantiation for the 25 ohm requirement, how can that substantiation be squared with allowing higher resistances just because there are two ground rods. Either delete the 25 ohm requirement, or better yet, require all grounding electrode systems to meet the same standard, whether 25 ohms or some other value.

Panel Meeting Action: Reject

Panel Statement: See panel action and statement on Comment 5-91.

Number Eligible to Vote: 16

Ballot Results: Affirmative: 15 Negative: 1

Explanation of Negative:

BOKSINER: See my explanation of negative vote on Comment 5-91.

5-112 Log #1126 NEC-P05 **Final Action: Reject**
(250.58)

Submitter: Paul Dobrowsky Holley, NY

Comment on Proposal No: 5-146

Recommendation: Accept the proposal.

Substantiation: Section 250.50 requires all the electrodes to be bonded together to form the grounding electrode system. This applies to services and separately derived systems. Section 250.58 only addresses services and the argument is being made that separately derived systems can be grounded to “isolated” electrodes because they are not covered by this section.

Panel Meeting Action: Reject

Panel Statement: As stated in the original proposal panel statement, the requirements in 250.58 are needed. Removing this section could lead to conditions where separate electrodes for different services or other systems might not be bonded together. The direct wording addressing multiple services on one building or structure in 250.58 should be retained.

Number Eligible to Vote: 16

Ballot Results: Affirmative: 16

5-113 Log #3000 NEC-P05 **Final Action: Reject**
(250.58)

Submitter: James M. Imlah, City of Hillsboro

Comment on Proposal No: 5-145

Recommendation: Revise text as follows:

250.58 Common Grounding Electrode. Where an ac system is connected to a grounding electrode in or at a building as specified in 250.24 and 250.32, the same electrode shall be used to ground conductor enclosures and equipment in or on that building. Where separate services supply a building **or multiple buildings on a common slab or foundations shall and are required to be connected** to a grounding electrode, the same grounding electrode **system** shall be used. Two or more grounding electrodes that are effectively bonded together shall be considered a single grounding electrode system in this sense.

Substantiation: The problem arises when there are buildings with 2 hr fire-wall separation (by definition), in effect a separate building and the grounding system is not tied together. Older structures have multiple services and a separate grounding system for each of the separate structures and is being upgraded with new systems should be required to be tied together. The issue is further complicated when new phone systems, cable television conductors, or fire alarms are fed through the whole structure that have multiple services. If the grounding system is not tied together to from a single system reference, then the potential difference could create a hazard between persons and property.

I understand this may be new material and not accepted, but the section was opened as part of the proposal stage. Please consider this addition to code section 250.58.

(No Drawings received at NFPA)

Panel Meeting Action: Reject

Panel Statement: The submitter’s concerns relate to the bonding requirements of Chapter 8.

Number Eligible to Vote: 16

Ballot Results: Affirmative: 16

Comment on Affirmative:

JOHNSTON: I concur with the panel’s decision to reject the comment as introducing new material which was clearly indicated by the submitter. Code-Making Panel 5 did discuss the nature of the concerns the submitter was trying to address in the comment. The submitter is encouraged to submit a proposal to the 2008 NEC that will help clarify this issue. I agree that the submitter’s concerns are addressed in Chapter 8, but also feel there is a need for similar language in Article 250.

5-114 Log #155 NEC-P05 **Final Action: Reject**
(250.64(B))

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education

Comment on Proposal No: 5-154

Recommendation: Add “Where subject to damage” at the beginning of the paragraph.

Substantiation: As three of the minority Code-Making Panel members pointed out, and Mr. Johnston concurred, this proposal is needed where the GEC is subject to damage not elsewhere.

Panel Meeting Action: Reject

Panel Statement: The new paragraph from Proposal 5-154 is deleted by action of Comment 5-116.

Number Eligible to Vote: 16

Ballot Results: Affirmative: 16

5-115 Log #156 NEC-P05 **Final Action: Reject**
(250.64(B))

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education

Comment on Proposal No: 5-150

Recommendation: Accept in principle as reworded by the CMP, with two changes. First, delete the adjective “physical” as unnecessary (This applies equally elsewhere, but I can’t spend the time to chase them all down). Second, add “where exposed to damage” to the last sentence.

Substantiation: Otherwise, an 8 AWG GEC will have to be sleeved in a rigid raceway, unless Proposal 5-149 is accepted, because “cable armored” GECs are not available in my area, and the earlier uses of “where exposed” concern either fastening or only larger sizes.

Panel Meeting Action: Reject

Panel Statement: The term “physical” is appropriate to differentiate from other types of damage such as thermal.

Number Eligible to Vote: 16

Ballot Results: Affirmative: 16

Comment on Affirmative:

ROBERTSON: See my Explanation of Affirmative Vote on Comment 5-81.

5-116 Log #372 NEC-P05
(250.64(B))

Final Action: Accept

Submitter: Gregory J. Steinman, Thomas & Betts Corporation

Comment on Proposal No: 5-154

Recommendation: Delete the following text:

A bare or insulated direct burial grounding electrode conductor from the building surface to the grounding electrode or run between grounding electrodes shall be installed to a depth of not less than 300 mm (12 in.) below grade. The depth of burial shall be permitted to be reduced to 150 mm (6 in.) where the cable is beneath concrete or similar material with a thickness of not less than 50 mm (2 in.).

Substantiation: Reject this proposal. The burial depth has no technical substantiation - see Mr. Toomer's comment. Also, the performance of the grounding system will be degraded. Grounding conductors should be as short and straight as possible for best performance. This requirement will be difficult for installers where the grounding electrode is installed in close proximity to a building wall.

Panel Meeting Action: Accept

Number Eligible to Vote: 16

Ballot Results: Affirmative: 16

5-117 Log #747 NEC-P05
(250.64(B))

Final Action: Accept

Submitter: Mark Shapiro Farmington Hills, MI

Comment on Proposal No: 5-154

Recommendation: Reject the proposal.

Substantiation: The proposal has merit. It would fill a gap, and provide an answer to a common question. However, there are problems with the proposal.

1. Why 300 mm/12 in.?

The first thing that comes to mind is that some direct-burial cables are required to be buried at 12 in. But there, the main concern would seem to be to prevent damage to the cable's insulation. If a shovel nicks the insulation on a buried grounding electrode conductor, it is not normally a concern. Perhaps a less burdensome 150 mm/6 in. rule would be okay, as Mr. Toomer pointed out in the ROP.

2. What portion of the underground run must be 300 mm/12 in. deep? How is the vertical portion of the conductor (that is, the portion that is between grade and 12 in. deep) to be treated?

It does not seem that the panel wishes to require the tops of ground rods to be 12 in. deep. But, it is possible to read that into the proposed requirement. If they are not, then a portion of the grounding conductor, will be less than 12 in. deep. (And, be assured that there will be people who will read the rule as requiring just that).

In order to avoid having exposed grounding electrode conductors less than 12 in. deep, the proposal is also likely to result in some grounding electrode conductors being fitted with improperly installed metal sleeves, between grade and 12 in. this will create more problems than it will solve.

3. Mr. Steinman's comments in the ROP on the 90 degree bends that would result from this proposal also need to be addressed.

In summary, the idea behind this proposal is excellent. But the devil is in the details.

Panel Meeting Action: Accept

Number Eligible to Vote: 16

Ballot Results: Affirmative: 16

5-118 Log #1084 NEC-P05
(250.64(B))

Final Action: Reject

Submitter: Neil F. LaBrake, Jr., Niagara Mohawk, a National Grid Company / Rep. Edison Electric Institute

Comment on Proposal No: 5-154

Recommendation: The Panel Action should be Accept in Principle. Revise the proposed wording by adding the following words:

A bare or insulated direct burial grounding electrode conductor from the building surface to the grounding electrode or the bonding jumpers run between grounding electrodes shall be installed to a depth of not less than 300 mm (12 in.) below grade. The depth of burial shall be permitted to be reduced to 150 mm (6 in.) where the cable is beneath concrete or similar material with a thickness of not less than 50 mm (2 in.).

Substantiation: The only conductor that is technically the Grounding Electrode Conductor is the conductor from the ground bus of the service entrance equipment to the first convenient electrode. All other conductors used to connect Grounding Electrodes together, as required by 250.50, are bonding

jumpers.

Panel Meeting Action: Reject

Panel Statement: The new paragraph from Proposal 5-154 is deleted by action of the Comment 5-116.

Number Eligible to Vote: 16

Ballot Results: Affirmative: 16

5-119 Log #1388 NEC-P05
(250.64(B))

Final Action: Reject

Submitter: Greg Hudecek Owosso, MI

Comment on Proposal No: 5-154

Recommendation: Revise the proposed text as follows:

"A bare or insulated direct burial directly buried grounding electrode conductor installed outside and more than 300 mm (12 in.) from the building surface or structure to the grounding electrode or run between grounding electrodes shall be installed to a depth of not less than 300 mm (12 in.) below grade. The depth of burial shall be permitted to be reduced to 150 mm (6 in.) where the cable conductor is beneath concrete or similar material with a thickness of not less than 50 mm (2 in.)."

Substantiation: I support this long overdue requirement, but some modifications are needed. I also agree with 600 mm (12 in.) depth of burial requirement. From my experience as an electrician, a lesser depth of burial is likely to result in damage to the grounding electrode conductor. Mr. Brender's comment to use the words directly buried or is an improvement. The problem of depth of burial is only outside a building not inside. Mr. Robertson, Mr. Steinman, and Mr. Boksiner make a good point about permitting a reduction of depth of burial close to the building but from practical experience I feel 600 mm (2 feet) is too great a distance. I recommend the depth of burial only apply for distances greater than 300 mm (12 in.) from a building of structure. The problem of damage to grounding electrode conductors too close to the surface also applies to "structures" as well as buildings. The words "to the grounding electrode or run between grounding electrodes" is not needed and should be deleted. If a concrete cover or equivalent is provided, there does not need to be a required depth of burial. In the last sentence, delete "to 150 mm (6 in.)". Also, in the last sentence, change "cable" to "conductor".

Panel Meeting Action: Reject

Panel Statement: The new paragraph from Proposal 5-154 is deleted by action of the Comment 5-116.

Number Eligible to Vote: 16

Ballot Results: Affirmative: 16

5-120 Log #1604 NEC-P05
(250.64(B))

Final Action: Accept

Submitter: Jim Pauley, Square D Company

Comment on Proposal No: 5-154

Recommendation: Reject the proposal.

Substantiation: Applying a burial depth to a grounding electrode conductor is not substantiated by the submitter. What are the installation conditions where the conductor is being damaged? Is it when the grounding electrode is next to the building? When the grounding electrode is 6 feet away? Or are they actually being damaged at all?

It seems a little overboard to require that I bury a grounding electrode conductor 12" deep when the grounding electrode is only 4 inches away from where the conductor enters the ground.

By accepting this revision, the panel is also implying that the top of an 8' grounding electrode must now be buried one foot deep because that is the only way that the conductor will be at least one foot deep at the point where it connects.

It would be prudent to reject the proposal completely until the panel is presented with substantiation as to where the alleged damage is occurring.

Panel Meeting Action: Accept

Number Eligible to Vote: 16

Ballot Results: Affirmative: 16

5-121 Log #2146 NEC-P05
(250.64(B))

Final Action: Accept

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

Comment on Proposal No: 5-149

Recommendation: Continue to reject the proposal.

Substantiation: This submitter agrees with the comment in the voting that the panel action was not suitably responsive, however, the proposed use of greenfield as a component of a grounding electrode raceway raises a host of problems. What fault current should be assumed relative to the mandatory bonding requirement above 20 amps? How would it be bonded properly? If neater, internal connections were to be made, then enclosures would be needed at each end. Enclosures require connectors, which in turn introduce additional possibilities of failure in the ground-fault return current path.

Panel Meeting Action: Accept

Panel Statement: The panel reaffirms its position on the action taken on Proposal 5-149. The panel does not necessarily agree with all of the submitter's substantiation.

Number Eligible to Vote: 16

Ballot Results: Affirmative: 16

5-122 Log #1127 NEC-P05 **Final Action: Accept in Principle**
(250.64(C))

Submitter: Paul Dobrowsky Holley, NY

Comment on Proposal No: 5-158

Recommendation: (C) Connections.

Grounding electrode conductors and grounding electrode bonding jumpers shall comply with the following:

(1) Splices and terminations shall be made by exothermic welding or devices listed as grounding and bonding equipment

(2) Sections of busbars shall be permitted to be connected together to form a grounding electrode conductor.

(3) Bonding jumper(s) from grounding electrode(s) and grounding electrode conductor(s) shall be permitted to be connected to a copper busbar not less than 6 mm x 50 mm (1/4 in. x 2 in.) and of sufficient length for all connections. The busbar shall be securely fastened and shall be installed in an accessible location.

Substantiation: If two small transformers are installed some distance from the building grounding electrode system a common grounding electrode conductor sized for the actual installation should be permitted. There are many applications where a 3/0 minimum size requirement is unrealistic. The NEC should not contain requirements for possible future "additions" in accordance with 90.1(B). Where additional separately derived systems are expected to be installed then the designer or engineer can specify a larger common grounding electrode conductor. Enforcement of the NEC can solve the problem of incorrect sizes.

Products that are designed and evaluated for grounding and bonding in accordance with the appropriate product standard (UL 467) are all that is necessary. This standard does not require that devices are irreversible and neither does the NEC. Non-irreversible connections have been safely used at services for many years with no evidence of problems. The termination connections at the service and at the electrode are not generally irreversible.

Panel Meeting Action: Accept in Principle

Panel Statement: See panel action and statement on Comment 5-123.

Number Eligible to Vote: 16

Ballot Results: Affirmative: 16

5-123 Log #2407 NEC-P05 **Final Action: Accept in Principle**
(250.64(C))

Submitter: Charles Mello, Electro-Test, Inc.

Comment on Proposal No: 5-158

Recommendation: Revise the text of 250.64(C) as provided from the panel action in the 2005 ROP as follows:

(C) Continuous. Grounding electrode conductor(s) shall be installed in one continuous length without a splice or joint except as permitted in (1) through (3):

(1) Splicing of wire type conductors shall be permitted only by irreversible compression-type connectors listed as grounding and bonding equipment or by the exothermic welding process.

(2) Sections of busbars shall be permitted to be connected together to form a grounding electrode conductor.

(3) Bonding jumper(s) from the grounding electrode(s) and grounding electrode conductor(s) shall be permitted to be connected to a copper busbar not less than 6 mm x 50 mm (1/4 in. x 2 in.) and of sufficient length for all connections to form the grounding electrode system. The busbar shall be securely fastened and shall be installed in an accessible location. The grounding electrode conductor shall be permitted to be connected to this busbar. Connections shall be made by irreversible compression-type connectors listed as grounding and bonding equipment or by the exothermic welding process. Terminations on the copper busbar shall be by any listed type connector suitable for the use or by exothermic welding.

(F) To Electrode(s). 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, or to the copper busbar as permitted in 250.64(C). The grounding electrode conductor shall be sized for the largest grounding electrode conductor required among all the electrodes connected to it.

Substantiation: The revised text accepts the concept for applying a copper busbar as the means to bond several grounding electrodes together to form the grounding electrode system. The first requirement as proposed could be interpreted that any conductor including busbars as permitted in 250.64(C)(2) would have to be assembled using irreversible compression connectors or exothermic welding. The panel's intent in allowing "busbar splices" in the past has been that the actual joining of busbar sections could be done by bolting and this added restriction for joining busbars was not substantiated. The revised

text ensures that 250.64(C)(1) only applies to wire type conductors.

250.64(C) is being overly restrictive in the terminations used to connect the bonding conductors from the electrodes to the busbar to form the grounding electrode system and also to connect the unspliced grounding electrode conductor from this busbar to the equipment served. This busbar is no different than taking the grounding electrode conductors individually to the equipment ground bus located in the panelboard or switchboard where standard listed mechanical connectors are allowed, except this bus could now be outside an enclosure. With regard to the integrity of the system, the connections at the electrodes are permitted to be of the mechanical type now and subject to the same possibility of being disconnected as at this busbar. The connectors in switchboards, panelboards, MCCs and separately derived systems are standard mechanical lugs again subject to the same risk of being disconnected as would exist for the proposed alternate system.

The standard for listing of equipment for grounding and bonding equipment, UL 467, covers devices for bonding of electrodes together where subject to corrosion, bonding in systems, connecting equipment grounding conductors, and for ground rods. The products used are tested and evaluated for the intended use. The grounding electrode conductor is not in the effective ground fault current path, that is what the equipment grounding conductors and some bonding jumpers are for. The primary instance where a grounding electrode conductor carries substantial fault current is in the event of lightning. The fault current test requirements in UL 467 are not for lightning but more for equipment ground fault current carrying capacity. Just as a wire nut for connecting equipment grounding conductors is not subject to the same corrosion requirements as a direct buried connector for a ground rod, one should not try and apply fault current carrying issues to a grounding electrode conductor. These type installations and use of standard terminations have been used in industry, high tech fabrication facilities, data centers, and telecommunications facilities for many years without any reported problems or failures. See attached drawing for example of one such system.

The revision to 250.64(F) is still required, as modified from the original proposal, to correlate with the permission in 250.64(C). Without this change, an AHJ taking this section alone could interpret that the grounding electrode could only go to one or more of the electrodes and not be permitted to go to the busbar used to bond the various electrodes together into the grounding electrode system.

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

Panel Meeting Action: Accept in Principle

Revise 250.64(C) and (F) from the 2005 ROP Draft to read as follows:

(C) Continuous. Grounding electrode conductor(s) shall be installed in one continuous length without a splice or joint except as permitted in (1) through (3):

(1) Splicing shall be permitted only by irreversible compression-type connectors listed as grounding and bonding equipment or by the exothermic welding process.

(2) Sections of busbars shall be permitted to be connected together to form a grounding electrode conductor.

(3) Bonding jumper(s) from grounding electrode(s) and grounding electrode conductor(s) shall be permitted to be connected to an aluminum or copper busbar not less than 6 mm x 50 mm (1/4 in. x 2 in.) and of sufficient length for all connections. The busbar shall be securely fastened and shall be installed in an accessible location. Connections shall be made by irreversible compression-type connectors listed as grounding and bonding equipment a listed connector or by the exothermic welding process.

(4) Where aluminum busbars are used, the installation shall comply with 250.64(A).

(F) To Electrode(s). 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, or to the aluminum or copper busbar as permitted in 250.64(C). The grounding electrode conductor shall be sized for the largest grounding electrode conductor required among all the electrodes connected to it.

Panel Statement: The panel concludes that the revised text is consistent with 250.30 and meets the intent of the submitter. Addition of "aluminum" is incorporated from the action on Comment 5-124.

Number Eligible to Vote: 16

Ballot Results: Affirmative: 15 Negative: 1

Explanation of Negative:

BRENDER: I appreciate the panel's rewrite efforts in this section. However, there are important issues that merit comment, and were added without adequate technical evaluation.

One is the inclusion of aluminum busbar in the grounding electrode system. This item is new material that did not receive public review, nor was technical substantiation submitted. Also see my explanation pertaining to my vote on Comment 5-124.

Second, the use of dissimilar metals should be avoided. Permitting aluminum busbar, which could be used with copper conductors, would insert two dissimilar metal joints in the ground path. There is no language to prevent this application. I believe this application would be undesirable practice. I would recommend against use of dissimilar metals in this application.

5-124 Log #3292 NEC-P05 **Final Action: Accept in Principle**
(250.64(C)(3))

Submitter: Larry G. Watkins, Alcan Cable

Comment on Proposal No: 5-158

Recommendation: Revise text to read as follows:

(3) Bonding jumper(s) from grounding electrode(s) and grounding electrode conductor(s) shall be permitted to be connected to a copper busbar not less than 6 mm x 50 mm (1/4 in. x 2 in.) and of sufficient length for all connections.

Substantiation: Remove the limitation to only copper. Aluminium busbar should also be permitted. No justification to only limit copper.

Panel Meeting Action: Accept in Principle

The results of action on this comment are incorporated in the action taken on Comment 5-123.

Panel Statement: Deleting copper would allow any material. Aluminium is acceptable, and the panel concludes that this meets the intent of the submitter. See panel action and statement on Comment 5-123.

Number Eligible to Vote: 16

Ballot Results: Affirmative: 15 Negative: 1

Explanation of Negative:

BRENDER: There was no technical substantiation presented for this revision in code language. No data was presented on performance of aluminum bus, or possible copper-aluminum joints under fault, lightning or other transient conditions. In fact there was no data presented that aluminum busbar is suitable for the purpose at all. Copper busbar used for this purpose for years and has established a track record of longevity and suitability.

This comment introduces new material that has not had public review. Use of dissimilar metals, especially within the possibility of two dissimilar-metal joints being created in one path, is not desirable practice and should be dissuaded. Performance of such joints under fault or lightning conditions is unknown.

5-125 Log #3432 NEC-P05 **Final Action: Accept**
(250.64(D))

Submitter: Paul J. LeVasseur, Bay City JEATC

Comment on Proposal No: 5-161

Recommendation: The panel should continue to Accept in Principle Proposal 5-161 and revise existing 250.64(D) to read as follows:

(D) Grounding Electrode Conductor Taps. Where a service consists of more than a single enclosure as permitted in 230.71(A) 230.40, Exception No. 2, it shall be permitted to connect taps to the common grounding electrode conductor. Each such tap conductor shall extend to the inside of each such enclosure. The common grounding electrode conductor shall be sized in accordance with Section 250-66, based on the sum of the circular mil area of the largest ungrounded service entrance conductor. Where more than one set of service entrance conductors as permitted by 240.40, Exception No. 2 connect directly to a service drop or lateral the common grounding electrode conductor shall be sized in accordance with Table 250.66 Note 1. 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 common grounding electrode conductor in such a manner that the common grounding electrode conductor remains without a splice or joint.

Substantiation: The additional language would clarify that a tap to the common grounding electrode conductor is permitted where multiple sets of service entrance conductors connect directly to a service drop or lateral where a service consists of more than a single enclosure.

Panel Meeting Action: Accept

Panel Statement: Editorially correct “conductor” to “conductors” so that the phrase reads as follows: “...largest ungrounded service entrance conductors.” Editorially correct the cross reference from “240.40” to “230.40.”

Number Eligible to Vote: 16

Ballot Results: Affirmative: 16

5-126 Log #58 NEC-P05 **Final Action: Accept in Principle**
(250.64(E))

Submitter: Michael V. Glenn, Longview Fibre Co.

Comment on Proposal No: 5-162

Recommendation: Delete the word Ferrous.

Substantiation: Why did the panel add the word Ferrous to make the requirement technically correct? The panel did not supply any substantiation that Aluminum raceway is not acceptable. If an aluminum conductor is acceptable as a grounding electrode conductor then an aluminum raceway or enclosure should be acceptable as well. I request the panel reconsider this addition.

Panel Meeting Action: Accept in Principle

Revise Section 250.64(E) from the ROP draft to read as follows:

(E) Enclosures for Grounding Electrode Conductors. Ferrous 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. Nonferrous metal enclosures shall not be required to be electrically continuous. Ferrous metal enclosures that are not physically continuous from cabinets or equipment to the grounding

electrode shall be made electrically continuous by bonding each end of the raceway or enclosure to the grounding electrode conductor.

Bonding shall apply at each end and to all intervening ferrous raceways, boxes, and enclosures between the service equipment and the grounding electrode. The bonding jumper for a grounding electrode conductor raceway or cable armor shall be the same size as or larger than the required enclosed 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.

Panel Statement: The panel affirms its initial action on this proposal clarifying that where aluminum or other nonferrous enclosures are used for enclosing grounding electrode conductors, the bonding requirement at each end of the nonferrous raceway is not required. The insertion of the word “ferrous” adds clarification on the issue being addressed by the submitter of this comment.

Number Eligible to Vote: 16

Ballot Results: Affirmative: 16

Comment on Affirmative:

BOKSINER: The change to this section does not address clearly the case where a ferrous raceway or enclosure is in series with nonferrous raceways or enclosures. If a portion of the enclosing structure is ferrous, then it is necessary to bond the ferrous and nonferrous parts together and connect the ends of the structure to the grounding electrode and the service equipment, or the ferrous portions of the enclosures have to be bonded to the grounding electrode conductor at their ends. The goal of this is to allow the current to flow through the ferrous enclosure in parallel with the grounding electrode conductor. I do not believe the revised language is sufficiently clear on this.

5-127 Log #88 NEC-P05 **Final Action: Accept in Principle**
(250.64(E))

Submitter: Dan Leaf Rancho Santa Margarita, CA

Comment on Proposal No: 5-162

Recommendation: Delete the word “ferrous”.

Substantiation: The word may be construed as not permitting aluminum or brass conduit grounding electrode enclosures.

Panel Meeting Action: Accept in Principle

Panel Statement: See panel action and statement on Comment 5-126.

Number Eligible to Vote: 16

Ballot Results: Affirmative: 16

5-128 Log #117 NEC-P05 **Final Action: Reject**
(250.64(F))

Submitter: Abel S. Lampa, T&M Assoc.

Comment on Proposal No: 5-158

Recommendation: Please add the following statement to 250.64(F).

“Where the grounding electrode system consists of more than one grounding electrode, a grounding electrode conductor loop conductor shall be installed and arranged to minimize the potential difference between the individual electrodes.”

Substantiation: Years ago, I encountered a grounding problem on two new projects. After the project was approved and commissioned, we discovered that the water coming out from the faucet was green in color. The water was green for over a week or so. To solve the problem, we created a loop on the grounding system, as shown on the drawing I have provided. A few hours later, the green color disappeared. Since then I have been putting attached loop grounding system into all my drawings and have not encountered the problem again.

When I studied the problem, I found that if there is a difference in resistance on the ground between the water pipe, ground rod and steel building elements, there will be a potential difference (voltage) between these building elements. If there is a voltage at the water pipe terminal, the copper pipe will oxidize and contact with water.

The solution I have presented minimized this problem by allowing the current that flows to the neutral conductor to flow to ground since the neutral conductor is connected to the ground. See Figure 1 that I have provided.

I suggest the attached grounding procedure be followed to minimize the chance of people ingesting the contaminants.

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

Panel Meeting Action: Reject

Panel Statement: No technical substantiation has been provided to require a “loop” for the electrode system.

Number Eligible to Vote: 16

Ballot Results: Affirmative: 16

5-129 Log #118 NEC-P05 **Final Action: Reject**
(250.64(G))

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education

Comment on Proposal No: 5-167

Recommendation: Leave introductory phrase but reword the rest as follows: "...if not secured within 30 cm (12 in.) of where it leaves the enclosure, the conductor shall be attached to the enclosure in a manner that provides strain relief acceptable to the Authority Having Jurisdiction."

Substantiation: The guidance for securing other conductors and cables is much clearer than that for grounding electrode conductors, yet they are far from unimportant. Used correctly, the ground bar is perfectly adequate for connecting the GEC to the enclosure electrically, but we do want to avoid putting a strain on that connection.

Panel Meeting Action: Reject

Panel Statement: There is no technical substantiation for the 12 in. requirement.

Number Eligible to Vote: 16

Ballot Results: Affirmative: 16

5-130 Log #154 NEC-P05 **Final Action: Reject**
(250.64(G))

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education

Comment on Proposal No: 5-166

Recommendation: Accept in principle, using the language suggested by Mr. Boksiner.

Substantiation: Adding this will assist installers in dealing with customers on this design issue, when there is pressure to put aside considerations of relative safety because of aesthetics. Customers sometimes want the GEC run up, over, down, snaked all over the place, to avoid, for example, disrupting their finished basement.

Panel Meeting Action: Reject

Panel Statement: The requirement in the proposal is unenforceable.

Number Eligible to Vote: 16

Ballot Results: Affirmative: 14 Negative: 2

Explanation of Negative:

BOKSINER: I disagree that the requirement is not enforceable. Similar requirements exist elsewhere in the NEC. The language proposed in this proposal would give the AHJ a tool to correct situations where the GEC is routed in an unnecessarily indirect way, while still providing flexibility to installers.

SKUGGEVIG: See my Explanation of Negative Vote on Comment 5-132.

5-131 Log #886 NEC-P05 **Final Action: Reject**
(250.64(G))

Submitter: Wayne H. Robinson, Prince George County Government

Comment on Proposal No: 5-167

Recommendation: Grounding Electrode Connections to Enclosures.

Substantiation: Include the words grounding electrode before connection to enclosures, clarifies intent. Rejection based on strain relief not required. UL 486(A) provides standards for listed connectors to provide adequate strain relief through a push pull test. Additionally 250.64(B) "Securing and Protection from Physical Damage," provides no support requirements, i.e., every two feet, one foot from enclosure, leaving many grounding electrode conductors unsupported and dangling from installations. Many installations of grounding electrode conductors are not securely fastened and are trip hazards. See documentation, in NECA "Significant Code Changes" for the 2002 Code. Code Panel 5, states that "protecting the grounding electrode conductor where it enters enclosures may be required" and is already covered by other general installation provisions of the NEC. This is an elusive statement and provides no clarity when interpreting installation provisions for grounding electrode conductors or its connection to enclosures. A new Section 250.64(G) will accomplish and complete the language for installation requirements of grounding electrode conductors. It will additionally help with enforcement and training of new electricians entering the industry. 250.32(D)(3) allows connection of the grounding electrode conductor to a junction box, are we interpreting this can be completed without a listed connector? Are installations violating 110.3(B)? Are we implying, that installation requirements under 250.92 "Bonding of Services" requires no listed fitting or connector when grounding electrode conductors enter and exit service equipment and auxiliary gutters. It will complete the requirements for installations of grounding electrode conductors to enclosures in Article 250.

Its only through definition of grounding conductor that we can apply the provisions of 250.8 for listed fittings. Code Panel 5 can resolve these issues and many others associated with grounding electrode conductor installations for clarity and enforcement with this new section.

Panel Meeting Action: Reject

Panel Statement: The comment does not make a recommendation and is inconsistent with 4-4.5 of the NFPA Regulations Governing Committee Projects. The panel affirms its initial action and position on Proposal 5-167. The submitter has not provided any additional substantiation to support a need for requiring strain relief or the need for a specific fitting where grounding electrode conductors enter enclosures.

Number Eligible to Vote: 16

Ballot Results: Affirmative: 16

5-132 Log #1215 NEC-P05 **Final Action: Reject**
(250.64(G))

Submitter: Jeffrey Boksiner, Telcordia Technologies

Comment on Proposal No: 5-166

Recommendation: CMP 5 is urged to reconsider and accept the original proposal, as indicated in the explanation of negative comments.

Substantiation: Adding the requirement that the grounding electrode conductor (GEC) be installed in as straight and direct a line to the grounding electrode(s) as permitted by the conditions of the installation will serve to minimize voltages that may be developed in the GEC during lightning events. The proposed requirement is a prescriptive method needed to comply with requirements of 250.4(A)(1). The voltage developed when the GEC conducts lightning currents, which can typically exhibit a fast rise time (in the range of one to ten microseconds), is primarily a function of its inductance. Unnecessary length and indirect routing of the GEC increase its inductance and the voltage that will develop across the GEC under lightning conditions. The proposed new requirement is not an unenforceable design requirement, but provides guidance similar to the requirement for conductors used for surge arresters in 280.12 where lightning currents are also a consideration.

Panel Meeting Action: Reject

Panel Statement: The requirement in the proposal is unenforceable.

Number Eligible to Vote: 16

Ballot Results: Affirmative: 14 Negative: 2

Explanation of Negative:

BOKSINER: I disagree that the requirement is not enforceable. Similar requirements exist elsewhere in the NEC. The language proposed in this proposal would give the AHJ a tool to correct situations where the GEC is routed in an unnecessarily indirect way, while still providing flexibility to installers.

SKUGGEVIG: Comment 5-132 urging acceptance of Proposal 5-166 should be accepted. The grounding electrode conductor is intended to conduct high-frequency bursts of current to ground from lightning-induced impulses. To be effective and to keep from possibly damaging voltage excursions on conductors in the building as low as practicable with respect to the earth (that is, the earth and things in the building connected to the earth), the grounding electrode conductor needs to have low impedance at high frequencies. Every sharp bend in the conductor and every unnecessary length in the conductor add inductance to the grounding electrode conductor. The extra impedance from this inductance might be insignificant at power frequencies, but it is not insignificant at high frequencies. Voltages dropped across the unwanted impedance along the grounding electrode when current bursts occur from lightning strikes have greater magnitude in the building because of the impedance and, therefore, have a greater likelihood of damaging equipment and wiring insulation. This can increase the risk of electric shock, either directly from the surges themselves or indirectly from damage to the electrical insulation. UL does not agree with the panel statement that this text is unenforceable. Similar text can be found in other sections of the Code where the same need for low impedance exists. Examples include 280.12, 285.12, 800.40(A)(4) and (5), 810.21(E), 820.40(A)(4) and (5), and 830.40(A)(4) and (5). This text guides the installer and inspector to make better choices in routing the grounding electrode conductor to enhance high-frequency performance without being too detailed and impractical.

5-133 Log #1128 NEC-P05 **Final Action: Reject**
(250.66(A), (B), and (C))

Submitter: Paul Dobrowsky Holley, NY

Comment on Proposal No: 5-173

Recommendation: Accept the proposal in principal by inserting "or grounding electrode bonding jumper" after grounding electrode in the section heading, first paragraph and in (A), (B), & (C).

Substantiation: This will provide the correct terms and clearly indicate the appropriate sizes.

Based on the information in Proposal 250-50 (2002 NEC) using a 6 AWG grounding electrode conductor is permitted for one or more of these types of electrodes.

Panel Meeting Action: Reject

Panel Statement: The sizing requirements for bonding jumpers between grounding electrodes are already provided in 250.53(C), which refers to 250.66 for the sizing requirements.

Number Eligible to Vote: 16**Ballot Results:** Affirmative: 165-134 Log #762 NEC-P05
(250.80)**Final Action: Reject****Submitter:** Michael J. Johnston Plano, TX**Comment on Proposal No:** 5-178**Recommendation:** The Panel should reconsider the initial action on this proposal. The proposal should be accepted in principle. Adjust the wording as follows:250.80 Service Raceways and Enclosures. Metal enclosures and raceways for service conductors and equipment shall be grounded and bonded.

Exception: A metal elbow that is installed in an underground installation of rigid nonmetallic conduit and is isolated from possible contact by a minimum cover of 450 mm (18 in.) to any part of the elbow shall not be required to be grounded or bonded.

Substantiation: The terms “grounded” and “bonding (bonded)” are presently defined in article 100 and have specific meaning related to performance. If the intent of this section was to not allow the metal conductor enclosures and raceways to become energized by facilitating overcurrent device operation, then “bonded (bonding)” is the correct term that should be incorporated into this section. The use of the term “grounded” alone literally and as defined in Article 100 does not require the effective path back to the source, but only a connection to the earth. The process of bonding generally accomplishes the grounding and provides the effective path for fault current. The term “bonded” should be incorporated into this section if the intent was to minimize the chances of metal raceways or enclosures of becoming energized because grounded (as defined) does not provide this performance required to facilitate OCPD operation.**Panel Meeting Action: Reject****Panel Statement:** Section 250.80 is in Part IV of Article 250, which deals with enclosure, raceway, and service cable grounding. Bonding requirements are in Part V, which covers bonding.**Number Eligible to Vote:** 16**Ballot Results:** Affirmative: 16**Comment on Affirmative:**

JOHNSTON: I do concur with the decision of the panel to reject this comment and agree that the bonding requirements are found in Part V of Article 250. The original proposal did make a valid point about using the correct terms within this section. Based on the discussion of Code-Making Panel 5 during the ROC meeting, there is an identified need for revisions where terms are not used consistently with how they are defined. The metal elbows buried in the earth under a minimum of 450 mm (18 in.) of cover are, by definition, grounded. The correct term should be bonded, and it is understood that this information should be more appropriately located under Part V of the article.

5-135 Log #1129 NEC-P05
(250.80)**Final Action: Reject****Submitter:** Paul Dobrowsky Holley, NY**Comment on Proposal No:** 5-178**Recommendation:** Accept the proposal in part by changing the term “grounded” to “bonded to provide an effective fault current path”.**Substantiation:** The submitter is correct. The elbows are typically in the earth so are literally grounded by definition with out any connected conductor. This is a great example of how the term grounded is misused. Changing the term “equipment grounding conductor” to “equipment bonding conductor” would help solve the problem also.**Panel Meeting Action: Reject****Panel Statement:** Section 250.80 is in Part IV of Article 250. This deals with enclosure, raceway, and service cable grounding. Bonding requirements are in Part V, which covers bonding.**Number Eligible to Vote:** 16**Ballot Results:** Affirmative: 165-136 Log #2147 NEC-P05
(250.84)**Final Action: Reject****Submitter:** Frederic P. Hartwell, Hartwell Electrical Services, Inc. / Rep. Massachusetts Electrical Code Advisory Committee**Comment on Proposal No:** 5-181**Recommendation:** Reject the proposal.**Substantiation:** Although it is theoretically true that EMT could be used underground because no code rule actually prohibits it, it would never be used as described in this section. This archaic section goes back over 70 years essentially without change, and refers to extensive underground systems and street mains. The use of EMT underground is severely circumscribed by its listing restrictions, which require supplementary corrosion protection over and above the galvanizing. The testing laboratories then state that they do not evaluate any such protective materials for corrosion protection. This means that any

AHJ who wanted to permit this use would have to go out on a limb and make his or her own evaluation of the proposed protection. Although that might happen in an isolated case because of a particular hardship, it would not be in this context.

Panel Meeting Action: Reject**Panel Statement:** No technical substantiation has been provided that “raceway” is not the correct term. Corrosion requirements are already elsewhere in the Code.**Number Eligible to Vote:** 16**Ballot Results:** Affirmative: 14 Negative: 2**Explanation of Negative:****BRENDER:** The comment should have been accepted, thus the original proposal rejected. The term “raceway” is not a substitute for “conduit”, in that “raceway” includes EMT. There was no substantiation presented why EMT should be permitted as underground service conduit.**WHITE:** The submitter of Comment 5-136 makes a good point. It does not seem reasonable to make a change that would accommodate an obscure and unlikely to be used option such as substantiated by the submitter of Proposal 5-181. The present wording provides ample options and this change would only weaken these installations by adding an option that is very susceptible to corrosion.5-137 Log #780 NEC-P05
(250.86)**Final Action: Reject****Submitter:** Michael J. Johnston Plano, TX**Comment on Proposal No:** 5-182**Recommendation:** The Panel should reconsider the initial action on this proposal. The proposal should be accepted in principle. Adjust the wording as follows:

250.86 Other Conductor Enclosures and Raceways.

Except as permitted by 250.112(I), metal enclosures and raceways for other than service conductors shall be grounded and bonded in accordance with the applicable provisions of Part V.

Exception No. 1: Metal enclosures and raceways for conductors added to existing installations of open wire, knob and tube wiring, and nonmetallic-sheathed cable shall not be required to be bonded grounded where these enclosures or wiring methods

(a) Do not provide an equipment ground;

(b) Are in runs of less than 7.5 m (25 ft);

(c) Are free from probable contact with ground, grounded metal, metal lath, or other conductive material; and

(d) Are guarded against contact by persons.

Exception No. 2: Short sections of metal enclosures or raceways used to provide support or protection of cable assemblies from physical damage shall not be required to be bonded grounded.Exception No. 3: A metal elbow shall not be required to be bonded 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.**Substantiation:** The terms “grounded” and “bonding (bonded)” are presently defined in article 100 and have specific meaning related to performance. If the intent of this section was to not allow the metal conductor enclosures and raceways to become energized by facilitating overcurrent device operation, then “bonded (bonding)” is the correct term that should be incorporated into this section. The use of the term “grounded” alone literally and as defined in Article 100 does not require the effective path back to the source, but only a connection to the earth. The process of bonding generally accomplishes the grounding and provides the effective path for fault current. The term “bonded” should be incorporated into this section if the intent was to minimize the chances of metal raceways or enclosures of becoming energized because grounded (as defined) does not provide this performance required to facilitate OCPD operation. See definitions of grounded and bonded (bonding).**Panel Meeting Action: Reject****Panel Statement:** Section 250.86 is in Part IV of Article 250, which deals with enclosure, raceway, and service cable grounding. Bonding requirements are in Part V, which covers bonding.**Number Eligible to Vote:** 16**Ballot Results:** Affirmative: 16**Comment on Affirmative:**

JOHNSTON: See my Affirmative Comment on Comment 5-134.

5-138 Log #1130 NEC-P05
(250.86)**Final Action: Reject****Submitter:** Paul Dobrowsky Holley, NY**Comment on Proposal No:** 5-182**Recommendation:** Accept the proposal in part by changing the term “grounded” to “bonded to provide an effective fault current path” in exception No. 3.

Substantiation: The submitter is correct. The elbows are typically in the earth so are literally grounded by definition with out any connected conductor. This is a great example of how the term grounded is misused. Changing the term “equipment grounding conductor” to “equipment bonding conductor” would help solve the problem also.

Panel Meeting Action: **Reject**

Panel Statement: See panel statement on Comment 5-137.

Number Eligible to Vote: 16

Ballot Results: Affirmative: 16

Comment on Affirmative:

JOHNSTON: See my Affirmative Comment on Comment 5-134.

5-139 Log #153 NEC-P05
(250.86 Exception No. 2)

Final Action: Reject

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education

Comment on Proposal No: 5-183

Recommendation: Accept in principle, but change “10 ft “ to “450 mm (18 in.)”, and replace “in length” with “longer, if acceptable to the authority having jurisdiction”.

Substantiation: The submitter is correct in saying installers deserve some relief from having to guess what the CMP means by “short”, as you offer no other guidelines as to how to determine whether 10 ft is “too short or too great” or is okay. The 18 in. dimension is hallowed by the exception for underground ells. Although that is a rather different circumstance, it is the only number we have to work with. The 2 ft dimension is used to define short only with regard to heat dissipation. Saying that the Authority Having Jurisdiction may waive the 18 in. restriction without invoking 90.4 will allow installers to argue for that 10 ft or longer section in the period until the CMP or someone does come up with guidelines.

Panel Meeting Action: **Reject**

Panel Statement: The submitter has not provided substantiation to place a specific 450 mm (18 in.) dimension within this section to replace the term “short.” This would add a greater restriction to this section. The panel maintains its original position on Proposal 5-183 owing to a lack of substantiation.

Number Eligible to Vote: 16

Ballot Results: Affirmative: 16

5-140 Log #1023 NEC-P05
(250.92(B)(4))

Final Action: Accept in Principle

Note: The Technical Correlating Committee directs that the Panel Action on Comment 5-140 be reported as “Accept in Principle” to correlate with the action on Proposal 5-185.

Submitter: Noel Williams, Noel Williams Consulting

Comment on Proposal No: 5-185

Recommendation: This proposal should be accepted or remain accepted in principal.

Substantiation: The panel has addressed the primary issue in the proposal. Although the term “bonding” may be more appropriate to the title of the section, the fact is that bushings made to be used with jumpers are listed as “grounding bushings.” The language proposed is more technically accurate, but the language as accepted is adequate.

Panel Meeting Action: **Accept**

Number Eligible to Vote: 16

Ballot Results: Affirmative: 16

5-141 Log #2999 NEC-P05
(250.94(A))

Final Action: Reject

Submitter: James M. Imlah, City of Hillsboro

Comment on Proposal No: 5-186

Recommendation: 250.94 Bonding for other systems.

(A) An accessible means external to enclosures for connecting intersystem bonding and ground conductors shall be provided at the service equipment and at the disconnecting means for any 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.

4. Multiple buildings (by definition) on a common slab or foundation shall have bonding and grounding for each service or system tied together to form a single system.

Substantiation: The drawing I provided is showing 11 buildings with multiple services on each building separated by 2 hour firewalls (in effect a separate structure by definition). Additionally, there are some house lighting and low voltage systems being installed in each building for service to each tenant or structure. As this drawing is showing the low voltage systems are fed to every structure and through every structure from one central location. There is no

method in place that requires services having separate ground rods for each service being tied together when additional systems are installed throughout a structure. These types of installations is becoming more and more common for multi-tenant and multi-use structures that could have any combination of one and two family residences, commercial tenants or both within a structure.

Please review this comment as part of the proposal for inclusion.

(No drawings received at NFPA)

Panel Meeting Action: **Reject**

Panel Statement: See panel action and statement on Comment 5-113.

Number Eligible to Vote: 16

Ballot Results: Affirmative: 16

Comment on Affirmative:

JOHNSTON: See my Affirmative Comment on Comment 5-113.

5-142 Log #1131 NEC-P05
(250.96(B))

Final Action: Reject

Submitter: Paul Dobrowsky Holley, NY

Comment on Proposal No: 5-188

Recommendation: Accept the proposal in principle by changing the term “isolated” to “insulated” throughout the section, its heading and the FPN.

Substantiation: The device terminal is actually insulated from the strap or yoke. Some still believe they can install a conductor to an “isolated” ground rod.

Panel Meeting Action: **Reject**

Panel Statement: Making the proposed change may cause confusion since not all insulated equipment grounding conductors in branch circuits are installed for the purpose of creating an isolated equipment grounding circuit.

Number Eligible to Vote: 16

Ballot Results: Affirmative: 16

5-143 Log #1132 NEC-P05
(250.102(C))

Final Action: Accept

Submitter: Paul Dobrowsky Holley, NY

Comment on Proposal No: 5-190

Recommendation: Accept the proposal.

Substantiation: The requirement is already contained in 250.64(E).

Repeating requirements does not improve usability. Many times when future modifications are made, only one of the sections gets changed resulting in inconsistencies.

Panel Meeting Action: **Accept**

Number Eligible to Vote: 16

Ballot Results: Affirmative: 16

5-144 Log #1133 NEC-P05
(250.102(E))

Final Action: Reject

Submitter: Paul Dobrowsky Holley, NY

Comment on Proposal No: 5-191

Recommendation: Accept the proposal.

Substantiation: What is “significant impedance” as stated in the panel statement. The conductor does not need to be spiraled.

Panel Meeting Action: **Reject**

Panel Statement: The submitter did not provide any added technical substantiation that the change is needed.

Number Eligible to Vote: 16

Ballot Results: Affirmative: 16

5-145 Log #2149 NEC-P05
(250.104(A)(4))

Final Action: Reject

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

Comment on Proposal No: 5-196

Recommendation: Reject the proposal.

Substantiation: The companion proposal (5-201) was rejected, which makes this proposal even worse. However, this section is quite logical in the 2002 NEC and should not be disturbed. Certain systems requiring bonding connections are arranged by system, first water, then other metal, and then structural steel. The water piping then has lettered subsections as appropriate. The added sentence in Proposal 5-201 at the end of the structural steel provision has merit, however. Refer to this submitter’s companion comment on Proposal 5-201.

Panel Meeting Action: **Reject**

Panel Statement: There is validity to putting the bonding requirements for both the water pipe and the structural metal into one section with the coordinated reference from 250.30. See panel action and statement on Comment 5-149.

Number Eligible to Vote: 16

Ballot Results: Affirmative: 16

5-146 Log #1229 NEC-P05
(250.104(B))

Final Action: Reject

Submitter: Donald A. Ganiere Ottawa, IL
Comment on Proposal No: 5-197

Recommendation: Panel should reject this proposal.

Substantiation: The comments of Mr. Brender are correct. This is not a simple word change. The replacement of “may” with “is likely to” changes the meaning of the section. The word “may” would apply any time that it is physically possible that the piping could become energized. When you change this to “is likely to” you bring in a much higher standard, and it would be very difficult to insist that all metal water piping be bonded.

Panel Meeting Action: Reject

Panel Statement: The substantiation provided was incorrect and based on the premise that the change affected the bonding requirements on water piping, which is not true. This section only deals with “other piping systems” that are “likely to become energized”. The change made is in accordance with the NEC Style manual.

Number Eligible to Vote: 16

Ballot Results: Affirmative: 15 Negative: 1

Explanation of Negative:

BRENDER: This proposal constitutes a major change in the intent of this section. The comment should be accepted. If the word “may” is unacceptable, perhaps “is subject to” would be a better term. Use of the word “likely” introduces a much higher standard to achieve.

5-147 Log #105 NEC-P05
(250.104(C))

Final Action: Reject

Submitter: Glenn W. Zieseniss Crown Point, IN
Comment on Proposal No: 5-200

Recommendation: Add a new sentence between the existing first and second sentences to read:

“This bonding jumper shall be sized not less than the largest size as required by Section 250.50 for the system.”

Substantiation: As the text now reads, the user could chose to use a 6 AWG for a ground rod electrode instead of a 4 AWG for a 200 Amp service as the size required.

Panel Meeting Action: Reject

Panel Statement: The submitter’s concerns about bonding jumper sizes between grounding electrodes is currently covered in 250.53(C).

Number Eligible to Vote: 16

Ballot Results: Affirmative: 16

5-148 Log #1230 NEC-P05
(250.104(C))

Final Action: Accept in Part

Submitter: Donald A. Ganiere Ottawa, IL
Comment on Proposal No: 5-200

Recommendation: Panel should accept in part. The change of the word “steel” to “metal” should be accepted. The change of the word “may” to “is likely to” should be rejected.

Substantiation: The comments of Mr. Brender are correct. This is not a simple word change. The replacement of “may” with “is likely to” changes the meaning of the section. The word “may” would apply any time that it is physically possible that the piping could become energized. When you change this to “is likely to” you bring in a much higher standard, and it would be very difficult to insist that all metal water piping be bonded.

Panel Meeting Action: Accept in Part

Panel Statement: The panel has already accepted the change from “steel” to “metal” in Proposal 5-200. The panel reaffirms its position of changing “may” to “likely to” in conformance with the NEC style manual.

Number Eligible to Vote: 16

Ballot Results: Affirmative: 15 Negative: 1

Explanation of Negative:

BRENDER: See my explanation of negative vote on Comment 5-146.

5-149 Log #763 NEC-P05 **Final Action: Accept in Principle in Part**
(250.104(D) (New))

Note: The Technical Correlating Committee understands that the word “interior” as proposed in the panel action text in 250.104(D) is to be deleted to be consistent with the action taken on Comment 5-150.

Submitter: Michael J. Johnston Plano, TX

Comment on Proposal No: 5-201

Recommendation: The panel should reconsider the action on this proposal and move to accept in part.

Substantiation: This proposal was part of the work of the task group to reorganize and revise Section 250.30 under Proposal 5-78. The structural metal member bonding requirements previously located in 250.30(A)(3)(d) were intended to be located to this section as a result of the work of the task group.

The provisions 250.104(A)(4) were located to this section by the panel accepting proposal 5-196. If this proposal (5-201) is rejected the structural steel bonding requirement for bonding that currently exists for separately derived systems will be removed from the Code. The technical change proposed addresses the word “interior” in similar fashion to how the word interior was revised in the 2002 NEC cycle. The panel should consider to accept the part of the proposal that relocates existing information relative to bonding in this location and address the word “interior” issue separately.

Panel Meeting Action: Accept in Principle in Part

The panel did not accept removal of the word “interior” as proposed in the proposal. The panel accepts the relocation of the text related to metal piping and structural metal bonding requirements from 250.30(A)(3)(d) to new section 250.104(D) as proposed. The panel also accepts relocating the bonding provisions for separately derived systems of 250.104(A)(4) to this new section to place these requirements in the same location. This action completes the work of the task group relative to reorganizing 250.30.

Revise new Section 250.104(D) as follows:

(D) Separately Derived Systems. Metal water piping systems and structural metal steel that is interconnected to form a building frame shall be bonded to separately derived systems in accordance with the following:

(1) Metal Water Piping System(s) The grounded conductor of each separately derived system shall be bonded to the nearest available point of the interior metal water piping system(s) in the area served by each separately derived system. This connection shall be made at the same point on the separately derived system where the grounding electrode conductor is connected. Each bonding jumper shall be sized in accordance with Table 250.66 based on the largest ungrounded conductor of the separately derived system.

Exception No. 1: A separate bonding jumper to the metal water piping system bonding jumper shall not be required where the effectively grounded metal water piping system frame of a building or structure is used as the grounding electrode for the a separately derived system and is bonded to the metallic water piping in the area served by the separately derived system.

Exception No. 2: A separate water piping bonding jumper shall not be required where the metal frame of a building or structure is used as the grounding electrode for a separately derived system and is bonded to the metal water piping in the area served by the separately derived system.

(2) Structural Metal Steel. Where exposed structural metal 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 grounded conductor of each separately derived system, grounding electrode conductor in accordance with 250.104. This connection shall be made at the same point on the separately derived system where the grounding electrode conductor is connected. Each bonding jumper shall be sized in accordance with Table 250.66 based on the largest ungrounded conductor of the separately derived system.

Exception No. 1: A separate bonding jumper to the building structural metal shall not be required where the effectively grounded metal frame of a building or structure is used as the grounding electrode for the separately derived system.

Exception No. 2: A separate bonding jumper to the building structural metal shall not be required where the water piping of a building or structure is used as the grounding electrode for a separately derived system and is bonded to the building structural metal in the area served by the separately derived system.

(3) Common Grounding Electrode Conductor. Where a common grounding electrode conductor is installed for multiple separately derived systems as permitted by Section 250.30(A)(4), and exposed structural metal steel that is interconnected to form the building frame or interior metal piping exists in the area served by the separately derived system, the metal piping and the structural metal member shall be bonded to the common grounding electrode conductor.

Exception: A separate bonding jumper from each derived system to metal water piping and to structural metal members shall not be required where the metal water piping and the structural metal members in the area served by the separately derived system are bonded to the common grounding electrode conductor.

Panel Statement: The panel concludes that the relocation of the metal water pipe and structural metal bonding requirements to this new section is appropriate and provides clarity as reorganized.

Number Eligible to Vote: 16

Ballot Results: Affirmative: 16

Comment on Affirmative:

MELLO: The panel statement should be corrected to state: “The panel did accept the removal of the word “interior” as proposed in the proposal. “ The present panel statement is inconsistent with the panel action as shown in the accompanying text revisions. The word “interior” is struck out which is consistent with the panel action.

5-150 Log #2150 NEC-P05
(250.104(D) (New))

Final Action: Accept in Part

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

Comment on Proposal No: 5-201

Recommendation: Accept the proposal in principle and in part. Accept the deletion of the word “interior” from present 250.104(A)(4); reject the relocation of material to the new lettered subsection. Use the wording of the proposed 250.104(D)(2) as the revised wording of 250.104(C), but correct the interior

cross-reference of the last sentence to 250.30(A)(4) to reflect the reorganization within Proposal 5-78.

Substantiation: The present organization of 250.104 is quite logical, and more logical to this reader than that of the proposal. Simply making the revised wording in (D)(2) as proposed the replacement for present (C) correlates all the requirements. CMP 5 should resist endless relocations and reorganizations of material unless there is a clear benefit. Proposal 5-78 meets this test, but this proposal does not.

Panel Meeting Action: Accept in Part

The panel accepts the deletion of the word “interior.” The panel does not accept the rejection of relocating the material to 250.104(D).

Panel Statement: See panel action and statement on Comment 5-149.

Number Eligible to Vote: 16

Ballot Results: Affirmative: 16

Comment on Affirmative:

JOHNSTON: The panel did accept the relocation of provisions of 250.104(A)(4) to form a new 250.104(D) that includes the structural metal and water pipe bonding requirements associated with separately derived systems.

5-151 Log #1204 NEC-P05
(250.110)

Final Action: Reject

Submitter: Jeffrey Boksiner, Telcordia Technologies

Comment on Proposal No: 5-44

Recommendation: Revise as follows:

Equipment Fastened in Place or Connected by Permanent Wiring Methods (Fixed). Exposed non-current-carrying metal parts of fixed equipment likely to become energized shall be grounded connected to an equipment grounding conductor under any of the following conditions

Substantiation: The significant and pervasive changes to Article 250 in this proposal are not needed and do not improve the clarity of the NEC. Instead, this comment is one of a series to address a few specific instances in Article 250 where the term “grounded” could be misinterpreted. This comment clarifies what is meant by “grounded” in 250.110.

Panel Meeting Action: Reject

Panel Statement: The panel has determined that the concepts in Proposal 5-44 require further study. See the panel action and statement on Comment 5-1.

Number Eligible to Vote: 16

Ballot Results: Affirmative: 16

Comment on Affirmative:

BOKSINER: See my comment on affirmative on Comment 5-1.

5-152 Log #1205 NEC-P05
(250.110 Exception No. 3)

Final Action: Reject

Submitter: Jeffrey Boksiner, Telcordia Technologies

Comment on Proposal No: 5-44

Recommendation: Revise as follows:

Exception No. 3: Listed equipment protected by a system of double insulation, or its equivalent, shall not be required to be grounded-connected to an equipment grounding conductor. Where such a system is employed, the equipment shall be distinctively marked.

Substantiation: The significant and pervasive changes to Article 250 in this proposal are not needed and do not improve the clarity of the NEC. Instead, this comment is one of a series to address a few specific instances in Article 250 where the term “grounded” could be misinterpreted. This proposal clarifies what is meant by “grounded” in 250.110 Exception 3.

Panel Meeting Action: Reject

Panel Statement: The panel has determined that the concepts in Proposal 5-44 require further study. See the panel action and statement on Comment 5-1.

Number Eligible to Vote: 16

Ballot Results: Affirmative: 16

Comment on Affirmative:

BOKSINER: See my comment on affirmative on Comment 5-1.

5-153 Log #59 NEC-P05
(250.112)

Final Action: Accept

Submitter: Michael V. Glenn, Longview Fibre Co.

Comment on Proposal No: 5-202

Recommendation: Reject the proposal.

Substantiation: Mr. Rappaport is correct when he says the present wording is clear. This proposal has complicated the article and would require each item listed in 250.112 to have a separate grounding conductor run to the service or separately derived system grounding point. The submitter did not supply any substantiation that there is a problem with the present wording. There are ample articles that prescribe the method of grounding. The present language stating the equipment needs to be grounded is adequate. Be it grounded or effectively grounded both definitions in Article 100 are clear and understand-

able. I request the panel reconsider this action and reject the proposal.

Panel Meeting Action: Accept

Panel Statement: The panel understands that the language of 250.112 will revert to the 2002 text. The panel concludes that the subject is related to changes of Proposal 5-44. The panel has determined that the concepts in Proposal 5-44 require further study. See the panel action and statement on Comment 5-1.

Number Eligible to Vote: 16

Ballot Results: Affirmative: 16

5-154 Log #1207 NEC-P05
(250.112)

Final Action: Reject

Submitter: Jeffrey Boksiner, Telcordia Technologies

Comment on Proposal No: 5-202

Recommendation: CMP 5 is urged to reconsider the action on this proposal and, instead, revise the existing NEC text as follows:

Fastened in Place or Connected by Permanent Wiring Methods (Fixed) - Specific. Exposed, non-current-carrying metal parts of the kinds of equipment described in 250.112(A) through (K), and non-current-carrying metal parts of equipment and enclosures described in 250.112(L) and (M), shall be grounded bonded together and connected to an equipment grounding conductor regardless of voltage.

Substantiation: The Panel action on this proposal is inconsistent with the Panel’s rejection of 5-1. The submitter is correct that a clarification of how the equipment is to be grounded is needed. The wording originally proposed by the submitter accomplishes this goal more clearly than the accepted language.

This comment provides wording that is similar to the submitter’s and is consistent with the wording provided in several companion comments that address instances in Article 250 where the term “grounded” could be misinterpreted.

Panel Meeting Action: Reject

Panel Statement: The panel understands that the language of 250.112 will revert to the 2002 text. The panel concludes that the subject is related to changes of Proposal 5-44. The panel has determined that the concepts in Proposal 5-44 require further study. See the panel action and statement on Comment 5-1.

Number Eligible to Vote: 16

Ballot Results: Affirmative: 16

Comment on Affirmative:

BOKSINER: See my comment on affirmative on Comment 5-1.

5-155 Log #2151 NEC-P05
(250.112)

Final Action: Accept

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

Comment on Proposal No: 5-202

Recommendation: Reject the proposal.

Substantiation: This comment is in support of the comments in the voting. In addition, the proposal submitter seems to have overlooked what part of the article this section occurs in, namely, Part VI, “Equipment Grounding and Equipment Grounding Conductors.” The part opens with what needs to have an equipment grounding connection, and then describes how to make those connections. There is no evidence of field problems or confusion as to what is intended by these requirements.

Panel Meeting Action: Accept

Panel Statement: The panel understands that the language of 250.112 will revert to the 2002 text. The panel concludes that the subject is related to changes of Proposal 5-44. The panel has determined that the concepts in Proposal 5-44 require further study. See the panel action and statement on Comment 5-1.

Number Eligible to Vote: 16

Ballot Results: Affirmative: 16

Comment on Affirmative:

BOKSINER: See my comment on affirmative on Comment 5-1.

5-156 Log #2960 NEC-P05
(250.112)

Final Action: Reject

Submitter: Melvin K. Sanders, TECo., Inc.

Comment on Proposal No: 5-202

Recommendation: Revise text to read as follows:

250.112 Fastened in Place or Connected by Permanent Wiring Methods (Fixed) - Specific. Exposed, non-current-carrying metal parts of the kinds of equipment described in 250.112(A) through (K), and non-current-carrying metal parts of equipment and enclosures described in 250.112(L) and (M), shall be provided with an equipment grounding conductor bonded regardless of voltage.

Substantiation: Mr. Rappaport’s negative comment is correct. The proposed wording could lead one to assume a separate equipment grounding conductor would be permitted (since we cannot seem to agree when to switch from grounding something to when we are really bonding something, but that is another story).

The suggested change to the original text from 2002 NEC on page 111 will tell us in plain English what we are expected to do.

Panel Meeting Action: Reject

Panel Statement: The panel understands that the language of 250.112 will revert to the 2002 text. The panel concludes that the subject is related to changes of Proposal 5-44. The panel has determined that the concepts in Proposal 5-44 require further study. See the panel action and statement on Comment 5-1.

Number Eligible to Vote: 16

Ballot Results: Affirmative: 16

Comment on Affirmative:

BOKSINER: See my comment on affirmative on Comment 5-1.

5-157 Log #2152 NEC-P05
(250.112(F), 250.112(I))

Final Action: Reject

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

Comment on Proposal No: 5-203

Recommendation: Accept the proposal in principle and in part. Continue to reject any change to 250.112(I) as insufficiently substantiated. Revise 250.112(I) to read as follows:

(I) ~~Power-Limited Remote Control, Signaling, and Fire Alarm Circuits. Equipment supplied by Class 1 power-limited circuits and shall be grounded. Equipment supplied by Class 1 power-limited circuits, Class 2, and Class 3 remote control and signaling circuits, and by fire alarm circuits, shall be grounded where system grounding is required by Part II or Part VIII of this article.~~

Substantiation: The proposal correctly points out that an ungrounded 480-volt (or 600-volt) Class 1 control circuit need not be system-grounded, and therefore by the literal text of this section, need not carry an equipment grounding conductor. This submitter, who has installed such circuits, finds that unthinkable. Remember also that 250.21(3) recognizes omission of system grounding on some control circuits that operate at hazardous voltages. This comment requires equipment grounding in such cases. It does not, as the proposal does, throw out the baby with the bathwater. There is no need to carry an equipment grounding conductor to a doorbell escutcheon, which would be a literal consequence of accepting the original proposal.

Panel Meeting Action: Reject

Panel Statement: No substantiation was provided to require equipment supplied by all Class 1 circuits to be grounded where the voltage is less than 50 volts.

Number Eligible to Vote: 16

Ballot Results: Affirmative: 15 Negative: 1

Explanation of Negative:

HAMMEL: Equipment supplied by a Class 1 circuit should be grounded, regardless whether the system is grounded or not. The technical reasons for grounding the non-current carrying part of equipment are clearly stated in 250.4(A)(2) for a grounded system, and 250.4(B)(1) for an ungrounded system.

5-158 Log #1208 NEC-P05
(250.112(K))

Final Action: Reject

Submitter: Jeffrey Boksiner, Telcordia Technologies

Comment on Proposal No: 5-44

Recommendation: Revise as follows:

Permanently mounted electrical equipment and skids shall be ~~grounded~~ bonded to an equipment grounding conductor with an equipment bonding jumper sized as required by 250.122.

Substantiation: The significant and pervasive changes to Article 250 in this proposal are not needed and do not improve the clarity of the NEC. Instead, this comment is one of a series to address a few specific instances in Article 250 where the term “grounded” could be misinterpreted. This proposal clarifies what is meant by “grounded” in 250.112(K).

Panel Meeting Action: Reject

Panel Statement: The panel has determined that the concepts in Proposal 5-44 require further study. See the panel action and statement on Comment 5-1.

Number Eligible to Vote: 16

Ballot Results: Affirmative: 16

Comment on Affirmative:

BOKSINER: See my comment on affirmative on Comment 5-1.

5-159 Log #1211 NEC-P05
(250.114)

Final Action: Reject

Submitter: Jeffrey Boksiner, Telcordia Technologies

Comment on Proposal No: 5-44

Recommendation: Revise as follows:

Equipment Connected by Cord and Plug. Under any of the conditions described in (1) through (4), exposed non-current-carrying metal parts of cord-and-plug-connected equipment likely to become energized shall be ~~grounded bonded together and connected to an equipment grounding conductor.~~

Exception: Listed tools, listed appliances, and listed equipment covered in (2)

through (4) shall not be required to be ~~grounded~~ connected to an equipment grounding conductor where protected by a system of double insulation or its equivalent. Double insulated equipment shall be distinctively marked.

Substantiation: The significant and pervasive changes to Article 250 in this proposal are not needed and do not improve the clarity of the NEC. Instead, this comment is one of a series to address a few specific instances in Article 250 where the term “grounded” could be misinterpreted. This proposal clarifies what is meant by “grounded” in 250.114.

Panel Meeting Action: Reject

Panel Statement: The panel has determined that the concepts in Proposal 5-44 require further study. See the panel action and statement on Comment 5-1.

Number Eligible to Vote: 16

Ballot Results: Affirmative: 16

Comment on Affirmative:

BOKSINER: See my comment on affirmative on Comment 5-1.

5-160 Log #1303 NEC-P05
(250.114)

Final Action: Reject

Submitter: Frank Martucci Fort Lee, NJ

Comment on Proposal No: 5-204

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: In rejecting my proposal, the panel violates Article 90.1 (A) The entire purpose of the NEC, the practical safeguarding of persons and property from hazards arising from the use of electricity.

Responsible agencies protect us with “what-if” safeguards. Seals are installed on all containers to prevent the willful poisoning of our food and medical products.

Seat belts and air bags are installed because “what-if” we become involved in a collision?

We fly with two, three, and four engines because “what-if” an engine fails in flight? Even two black recording boxes because “what-if” one of them is lost or destroyed. Responsible agencies rely on them to seek out the cause of plane crashes and to correct any design defects responsible for the accident.

Second and third, redundant, electrical systems, computers, and other devices make space flight safe. Because “what-if” the primary system fails.

Responsible engineers always utilize the redundancy safeguard in the design of bridges buildings, cars, trains etc, to prevent to provide more than enough protection whenever lives are at stake.

Code panels apparently do not believe in “what-if” safeguards. In fact, as far as redundancy goes, they have actually established exemptions that reduce the life protecting grounding conductor in cords up to 66 percent.

The code panel rejected my proposal because my substantiation failed to prove electrocutions, and fiery deaths, are caused by incorrect wiring, loss of grounding, or line drop. Well, how else can anyone become electrocuted or shocked? The only possible way is the loss of grounding or line voltage drop. And how do you prevent this? Simply add another grounding conductor in all cords.

And if code panels would make ‘what if’ tests of the six ways cord components can be wired, they will discover another hazard in the cord and plug connected grounding system. The grounding system itself can energize a device.

Further what-if tests will disclose that a miswired cord, or cordset, will cause current to flow through inappropriate outlet screws, boxes, and bx connectors, inside the walls. Massive current from a heater, for example, will cause “unseen” fires inside walls. Fires that rage until hot enough to flash over into rooms with temperatures that kill within seconds.

Then “what-if” test my system and see how the second ground shunts the current back to the proper conductor preventing massive current to flow through raceways.

Then test my system and see how the second ground prevents the exposed metal parts of devices from ever becoming energized. The second ground will remove the charge by blowing the fuse or tripping the circuit breaker.

It is impossible for me to substantiate the true amount of electrocutions and fiery deaths because most electrocutions are covered up. I was severely reprimanded for not covering up the electrocution, necessitating the change of the coroner’s report from heart attack to electrocution.

And Ralph Nader, alluding to an article in the 1970 Federal Register, stated that doctors electrocute 5000 patients each year and cover them up. And that was before the ten fold increase of devices now used on patients.

The proven fact that electrocutions can be covered up, or mistaken, as heart attacks, should be enough substantiation needed to provide the grounding redundancy and wiring safeguards needed to prevent them. And especially with the cords now flooding the market without color coded conductors,

And the proven fact that miswired cords can cause massive current to flow through inappropriate, screws, outlet boxes, connectors, and raceways, should

be enough substantiation for the need of a wiring safeguard, whether it be my safeguard, or others.

No one should ever die in fires where smoke alarms are installed and yet they do. The USFA states that over 4000 lives are lost in fires each year. That is more than lost in the World Trade Center. They die without memorials, financial assistance, and in vain because the National Fire Protection Agency refuses to provide the wiring safeguard needed to prevent undetectable fires inside walls.

The panel, except Mr. Hammell, feels assured grounding test programs are just as important as redundancy. Well, you better pray, when you, and your loved ones, lie in a motorized, grounded, hospital bed, that the tiny #18, rarely tested, grounding conductor on the medical devices, being attached, or inserted into your bodies. are sound enough to prevent your demise. I would rather have a second, redundant, grounding conductor protecting me than any assurance that a single undersized grounding conductor tested OK a week or two ago.

The panel thinks GFCIs provide as good protection as a redundant ground. Not so, because a GFCI will give you a painful shock, and could possibly fibrillate a weakened heart, before it activates. I, for one, after many attempts, cannot trip a GFCI because of the excruciating pain. OSHA, in an IBEW article, stated workers were becoming seriously injured from shocks as small as 3 milliamperes, much less than the 6 milliamperes needed to trip GFCIs.

The panel says double, REDUNDANTLY, insulated devices are another answer to double grounding. It is strange that the panel recognizes the need for REDUNDANCY when eliminating the need for grounding, yet rejects the use of grounding redundancy even though previous code panels reduced the equipment grounding conductor up to 66 percent of that required in the original electric code.

Yes, double insulated devices enhance electrical safety, but only because the present grounding system lacks the double grounding and wiring safeguards to make it safe. But, the hundreds of millions of devices now in use are not double insulated and cords, and cordsets, powering them do not have the redundancy and wiring safeguards to make them safe. And even a double insulated electric heater can cause fires inside walls if attached to a three conductor extension cord inadvertently wired with reversed green and white conductors..

The panel rejects my system because I did not prove the loss of grounding, or miswiring of cord components, caused any associated casualties. The only proof I have is the electrocution of a patient on March 15, 1956. The patient died because qualified workers miswired a surgical device with reversed green and white conductors and an explosion-proof receptacle with reversed polarity.

Horrified that it could happen again, especially after two harrowing days of interrogation by the homicide division, and a severe reprimand from my supervisor for not covering it up, I replaced three conductor cords on medical devices with four conductor cords to provide a wiring safeguard that prevents miswiring from causing electrocutions, and "unseen" fires inside walls. I have photos for proof.

I had the system patented but code panels rejected it, and rightly so, because it required extensive physical changes in cord components and outlets.

So I experimented and discovered I could make existing components electrocution proof, and fireproof, by simply utilizing the other side of the ground wire clamp as a fourth wiring site. Code panels reject my system because it "requires the manufacture of special hardware." This is not true. I convert most of the components by simply drilling a hole in the plastic next to the ground pole to utilize the other half of the wire clamp.

Conclusion: While we dicker back and forth, every three years, thousand of men, women, and children are dying. I invented a wiring safeguard for cord components 15 years ago that would have saved most of those lives but it requires a change in the code; mandating that all cords require a second, redundant, ground installed in them.

I expected immediate approval by code committees because there is a dire need for a second grounding conductor in all cords. The grounding conductor in most cords are undersized, rarely tested, and do not compensate for line voltage drop as required in the original code. They are also sized the same as the circuit conductors, a hazard increasing the loss of the grounding path during massive shorts.

And if code panels did indeed mandate the use of two grounding conductors, the no cost, additional wiring site on existing cord components would then provide the wiring safeguard needed to prevent shock, electrocution, and fiery deaths due to human error.

It is obvious that code panels continue to be subservient to paradigms. They are ingrained in the "we always do it this way philosophy." How can anything be wrong with a standard in use for almost 100 years? Why change a proven standard on the say so of only one person in our entire nation?

If someone electrocutes themselves, or burns their house down, due to miswiring, shame on them; and as one code panel recommended "only qualified electrical workers should repair cords." Then why are cord components sold without background checks to see if they qualify, or instructions, and warnings, that they should only be installed by qualified electricians? And how come the electrocution rate at construction sites have not gone down despite using skilled electricians and assured grounding programs?

I keep sending in my proposals hoping to find a code panel with individuals who are not locked into rigid thinking about changing a standard, even one in use for almost 100 years.

Failing to do so violates the Good Samaritan laws. I know how to save thousands of men, women, and children each, and every, year and making no attempt to do so is a crime. It also makes me a participant in their demise.

I am so sure my system will save lives I continue to offer the first code person one thousand dollars if he, or she, can wire the four wiring sites of my components so as to cause an electrocution, or fiery death due to fires inside walls

And I offer the same thousand dollars to the first code member who can prove miswiring existing cord components will not cause shock, electrocution, or fiery deaths.

Do what is right and provide our men, women, and children with the safeguards as mandated in Article 90.1 (A).

Or at the very least, approve a code exception permitting the use of my system. With NEC listing, and UL approval, I will be able to market my electrocution-proof and fireproof system for those who seek the redundancy, and wiring safeguards, needed to protect their families from electrocutions and fiery deaths.

Panel Meeting Action: Reject

Panel Statement: The panel maintains its position on rejecting Proposal 5-204 as indicated in the panel statement. See panel statement below:

The panel has again reviewed the submitter's substantiation and reaffirms its previous statements on the subject. The panel concludes that the substantiation fails to provide convincing evidence that the mentioned fires and associated casualties were the result of miswired extension cords or that the proposed methods of redundant grounding would have prevented these occurrences from taking place. This proposal would completely eliminate the present method of grounding cord- and plug-connected equipment and would mandate the implementation of an equipment grounding system utilizing two grounding conductors. If adopted, this proposal would necessitate the manufacture of special hardware including new multiconductor cords that contain redundant grounding conductors, and new plugs and connectors that can terminate these multi-conductor cords. The panel recognizes that redundancy can enhance the reliability of some systems under some conditions. However, redundancy is not the only effective means of achieving enhanced protection against electric shock. Other effective means which are now required or permitted, such as ground-fault circuit protection, double insulation, and assured equipment grounding conductor connections, have all attributed to the decline in accidental electrocutions in recent years despite the increased use of electrical devices.

Number Eligible to Vote: 16

Ballot Results: Affirmative: 16

5-161 Log #1568 NEC-P05
(250.114)

Final Action: Reject

Submitter: John Bredin Hoboken, NJ

Comment on Proposal No: 5-204

Recommendation: Please accept this proposal for a redundant ground.

Substantiation: I witnessed a demonstration of the two ground wiring safeguard. Each time the second ground was connected, the shock hazard disappeared.

Each time the second green conductor was connected the arcing inside the mockup wall stopped.

I was appalled at the small size of the grounding conductor on an appliance compared to the size required in the code book.

This proposal should be adopted.

Panel Meeting Action: Reject

Panel Statement: See panel action and statement on Comment 5-160.

Number Eligible to Vote: 16

Ballot Results: Affirmative: 16

5-162 Log #3233 NEC-P05
(250.114)

Final Action: Accept

Submitter: Michael I. Callanan, IBEW

Comment on Proposal No: 5-204

Recommendation: This Panel action to reject this proposal is correct.

Substantiation: We agree the Affirmative Comment of Mr. Hammel. The Panel statement is not correct to infer that there is evidence that the assured equipment grounding conductor program has attributed to a decline in accidental electrocutions. In fact, a review of previous ROP and ROC documents will show that the basis for the action of CMP-3 in severely restricting the use of such programs was on the basis of their ineffectiveness.

This Comment represents the official position of the International Brotherhood of Electrical Workers Codes & Standards committee.

Panel Meeting Action: Accept

Number Eligible to Vote: 16

Ballot Results: Affirmative: 16

5-163 Log #1209 NEC-P05
(250.114(2) Exception No. 1 and 2)

Final Action: Reject

Submitter: Jeffrey Boksiner, Telcordia Technologies

Comment on Proposal No: 5-44

Recommendation: Revise as follows:

Exception No. 1: Motors, where guarded, shall not be required to be grounded connected to an equipment grounding conductor.

Exception No. 2: Metal frames of electrically heated appliances, exempted by special permission, shall not be required to be grounded connected to an equipment grounding conductor, in which case the frames shall be permanently and effectively insulated from ground.

Substantiation: The significant and pervasive changes to Article 250 in this proposal are not needed and do not improve the clarity of the NEC. Instead, this comment is one of a series to address a few specific instances in Article 250 where the term “grounded” could be misinterpreted. This proposal clarifies what is meant by “grounded” in 250.112(2) Exception 1 and 2.

Panel Meeting Action: **Reject**

Panel Statement: The panel has determined that the concepts in Proposal 5-44 require further study. See the panel action and statement on Comment 5-1.

Number Eligible to Vote: 16

Ballot Results: Affirmative: 16

Comment on Affirmative:

BOKSINER: See my comment on affirmative on Comment 5-1.

5-164 Log #1210 NEC-P05
(250.114(4) Exception)

Final Action: Reject

Submitter: Jeffrey Boksiner, Telcordia Technologies

Comment on Proposal No: 5-44

Recommendation: Revise as follows:

Exception: Tools and portable handlamps likely to be used in wet or conductive locations shall not be required to be grounded connected to an equipment grounding conductor where supplied through an isolating transformer with an ungrounded secondary of not over 50 volts.

Substantiation: The significant and pervasive changes to Article 250 in this proposal are not needed and do not improve the clarity of the NEC. Instead, this comment is one of a series to address a few specific instances in Article 250 where the term “grounded” could be misinterpreted. This proposal clarifies what is meant by “grounded” in 250.114(4) Exception.

Panel Meeting Action: **Reject**

Panel Statement: The panel has determined that the concepts in Proposal 5-44 require further study. See the panel action and statement on Comment 5-1.

Number Eligible to Vote: 16

Ballot Results: Affirmative: 16

Comment on Affirmative:

BOKSINER: See my comment on affirmative on Comment 5-1.

5-165 Log #1212 NEC-P05
(250.116)

Final Action: Reject

Submitter: Jeffrey Boksiner, Telcordia Technologies

Comment on Proposal No: 5-44

Recommendation: Revise as follows:

Nonelectric Equipment. The metal parts of nonelectric equipment described in this section shall be grounded bonded together and connected to an equipment grounding conductor.

Substantiation: The significant and pervasive changes to Article 250 in this proposal are not needed and do not improve the clarity of the NEC. Instead, this comment is one of a series to address a few specific instances in Article 250 where the term “grounded” could be misinterpreted. This proposal clarifies what is meant by “grounded” in 250.116.

Panel Meeting Action: **Reject**

Panel Statement: The panel has determined that the concepts in Proposal 5-44 require further study. See the panel action and statement on Comment 5-1.

Number Eligible to Vote: 16

Ballot Results: Affirmative: 16

Comment on Affirmative:

BOKSINER: See my comment on affirmative on Comment 5-1.

5-166 Log #1232 NEC-P05
(250.118)

Final Action: Reject

Submitter: Donald A. Ganiere Ottawa, IL

Comment on Proposal No: 5-207

Recommendation: Panel should accept in principle and add the new wording as exceptions to 250.118(2), 250.118(3) and 250.118(4).

The exceptions shall all read: Exception: Where the raceway is installed in direct contact with the earth, in concrete slabs or floors poured on earth, or in exterior concrete below grade walls, it shall be augmented with a supplemental equipment grounding conductor identified in 250.118(1). This supplemental conductor shall be sized in accordance with 250.122. An aluminum equipment grounding conductor used for this purpose shall be insulated.

Substantiation: The problem of the continuity of the metallic underground raceway is a real one. This requirement to provide a supplemental EGC would ensure that the load end equipment is properly bonded and the corrosion of the raceway will not disrupt this bond. The panel took similar action in placing an

exception to the use of EMT as an equipment grounding conductor on roof tops in the action of proposal 2-211.

Panel Meeting Action: **Reject**

Panel Statement: The described raceways are required to be installed in accordance with 300.6. The UL Electrical Construction Equipment Directory also provides information for corrosion protection. Proper use of the raceway is the issue. Corrosion does not occur in all cases as proposed, and this exception will require equipment grounding conductors in all cases.

Number Eligible to Vote: 16

Ballot Results: Affirmative: 14 Negative: 2

Explanation of Negative:

BRENDER: The term “raceway” includes EMT, which may not be suitable as a grounding conductor in this application. Use of a supplemental grounding conductor will ensure continuity of the ground path. The panel should accept this comment, and reject the proposal.

RAPPAPORT: Every code cycle, for as long as I can remember, there have been proposals similar to Proposal 5-207. Every cycle the code panel indicates that there is no technical justification because this is a workmanship issue. The fact that this item is brought up each time by different individuals in different parts of the country, indicates that it is a safety issue that should be addressed by the code. It may be difficult to accept but steel raceways (not only conduit) are being installed in the earth and buried in concrete without regard to the corrosion limitations in the UL information. Comments by panel members have indicated that where corrosion is known to be an issue, supplemental corrosion protection is required. How many contractors and inspectors are aware of the soil characteristics or the additives that have been added to the concrete? The original Proposal 5-207 should be accepted.

5-167 Log #2006 NEC-P05
(250.118)

Final Action: Reject

Submitter: Julian R. Burns, Burns Electrical/Quality Power Solutions, Inc.

Comment on Proposal No: 5-210

Recommendation: We agree with CMP-5 action of Proposal 5-210.

Substantiation: Review of Proposal was per the request of the TCC.

Panel Meeting Action: **Reject**

Panel Statement: The panel rejected Proposal 5-210 by action on Comment 5-179. CMP 5 concurs with CMP 9 that conductive enclosures are required to be bonded so as to be an effective portion of the fault current path and, therefore, need not be recognized as an equipment grounding conductor.

Number Eligible to Vote: 16

Ballot Results: Affirmative: 16

5-168 Log #2007 NEC-P05
(250.118)

Final Action: Accept

Submitter: Julian R. Burns, Burns Electrical/Quality Power Solutions, Inc.

Comment on Proposal No: 5-211

Recommendation: CMP-5 should have rejected proposal 5-211. Inefficient substantiation and too restrictive. We agree with the comments on the negative votes.

Substantiation: Review of Proposal was per the request of the TCC.

Panel Meeting Action: **Accept**

Number Eligible to Vote: 16

Ballot Results: Affirmative: 14 Negative: 2

Explanation of Negative:

BRENDER: The original proposal has identified a safety issue that could be easily addressed. This comment should be rejected, and the original proposal accepted, as the panel did originally. Safety is enhanced with an equipment grounding conductor installed in raceway.

RAPPAPORT: It is regrettable that, after many years of proposals indicating that there is a real problem on roof tops, code panel 5 should finally agree that there is a problem that needs fixing and then reverse itself based upon negative comments from those not associated with the use and installation of raceways. The regret is that no comments were received from those happy to see the code panel take a stand on a safety issue that is imposed by the manufacturers and listers of the raceways. The fact that this item is brought up each code cycle by different individuals in different parts of the country, indicates that it is a safety issue that should be addressed by the code and will not go away.

5-169 Log #2008 NEC-P05
(250.118)

Final Action: Accept

Submitter: Julian R. Burns, Burns Electrical/Quality Power Solutions, Inc.

Comment on Proposal No: 5-214

Recommendation: We agree with CMP-5 action.

Substantiation: Review of Proposal was per the request of the TCC.

Panel Meeting Action: **Accept**

Number Eligible to Vote: 16

Ballot Results: Affirmative: 16

5-170 Log #2550 NEC-P05
(250.118 (New))

Final Action: Accept

Submitter: Vince Baclawski, National Electrical Manufacturers Association (NEMA)

Comment on Proposal No: 5-207

Recommendation: Continue to reject this proposal.

Substantiation: Mr. Brett and Mr. Skuggevig are correct in their affirmative votes. Where unusual corrosion is anticipated, the appropriate action is to comply with Section 300.6 and with the requirements of the UL Electrical Construction and Equipment Directory. This directory contains information on supplementary protection for metal conduit/tubing when installed in concrete or when direct-buried and whether or not it is required or recommended.

The submitter has not submitted technical information to support this drastic change in the Code. The proposed requirement is contrary to the long-standing provisions of many Code sections and the UL listings. The historical position of the NEC is to require documentation of a specific problem in a code complying installation, or statistical data supporting the change this has not been done and this proposal should continue to be rejected regardless of the location in the Code.

Panel Meeting Action: Accept

Number Eligible to Vote: 16

Ballot Results: Affirmative: 14 Negative: 2

Explanation of Negative:

BRENDER: The term "raceway" includes EMT, which may not be suitable as a grounding conductor in this application. Use of a supplemental grounding conductor will ensure continuity of the ground path.

RAPPAPORT: See my explanation of negative vote on Comment 5-166.

5-171 Log #2551 NEC-P05
(250.118 (New))

Final Action: Accept

Submitter: Vince Baclawski, National Electrical Manufacturers Association (NEMA)

Comment on Proposal No: 5-208

Recommendation: Continue to reject this proposal.

Substantiation: Mr. Brett and Mr. Skuggevig are correct in their affirmative votes. Where unusual corrosion is anticipated, the appropriate action is to comply with Section 300.6 and with the requirements of the UL Electrical Construction and Equipment Directory. This directory contains information on supplementary protection for metal conduit/tubing when installed in concrete or when direct-buried and whether or not it is required or recommended.

The submitter has not submitted technical information to support this drastic change in the Code. The proposed requirement is contrary to the long-standing provisions of many Code sections and the UL listings. The historical position of the NEC is to require documentation of a specific problem in a code complying installation, or statistical data supporting the change this has not been done and this proposal should continue to be rejected regardless of the location in the Code.

Panel Meeting Action: Accept

Number Eligible to Vote: 16

Ballot Results: Affirmative: 14 Negative: 2

Explanation of Negative:

BRENDER: See my explanation of negative vote on Comment 5-170.

RAPPAPORT: See my explanation of negative vote on Comment 5-166.

5-172 Log #2870 NEC-P05
(250.118 (New))

Final Action: Accept

Submitter: William A. Wolfe, Steel Tube Institute of North America

Comment on Proposal No: 5-207

Recommendation: Continue to reject this proposal.

Substantiation: There is no technical substantiation for requiring an equipment grounding conductor in metal raceway when buried or in concrete. The submitter only states that metal raceways installed below grade are corroding excessively. Current code requirements already cover suitability of materials for the application and corrosion protection of metal raceways in 300.6 as well as in the individual raceway articles. The UL Electrical Construction Equipment Directory provides requirements as to when supplementary corrosion protection is necessary for metal raceways.

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

Panel Meeting Action: Accept

Number Eligible to Vote: 16

Ballot Results: Affirmative: 14 Negative: 2

Explanation of Negative:

BRENDER: See my explanation of negative vote on Comment 5-170.

RAPPAPORT: See my explanation of negative vote on Comment 5-166.

5-173 Log #2871 NEC-P05
(250.118 (New))

Final Action: Accept

Submitter: William A. Wolfe, Steel Tube Institute of North America

Comment on Proposal No: 5-208

Recommendation: Continue to reject this proposal.

Substantiation: There is no technical substantiation for requiring an equipment grounding conductor in metal raceway when buried or in concrete. The submitter only states that metal raceways installed below grade are corroding excessively. Current code requirements already cover suitability of materials for the application and corrosion protection of metal raceways in 300.6 as well as in the individual raceway articles. The UL Electrical Construction Equipment Directory provides requirements as to when supplementary corrosion protection is necessary for metal raceways.

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

Panel Meeting Action: Accept

Number Eligible to Vote: 16

Ballot Results: Affirmative: 14 Negative: 2

Explanation of Negative:

BRENDER: See my explanation of negative vote on Comment 5-170.

RAPPAPORT: See my explanation of negative vote on Comment 5-166.

5-174 Log #3892 NEC-P05
(250.118)

Final Action: Accept

Submitter: Julian R. Burns, Burns Electrical/Quality Power Solutions, Inc.

Comment on Proposal No: 5-211

Recommendation: CMP-5 should have rejected proposal 5-211.

Substantiation: Review of Proposal was per the request of the TCC.

CMP-5 Should have rejected proposal 5-211. Inefficient substantiation and too restrictive. We agree with the comments on the negative votes.

Panel Meeting Action: Accept

Number Eligible to Vote: 16

Ballot Results: Affirmative: 14 Negative: 2

Explanation of Negative:

BRENDER: The original proposal has identified a safety issue that could be easily addressed. Use of a supplemental grounding conductor will ensure continuity of the ground path.

RAPPAPORT: See my explanation of negative vote on Comment 5-168.

5-175 Log #536 NEC-P05
(250.118 Exception)

Final Action: Accept

Submitter: Gregory J. Steinman, Thomas & Betts Corporation

Comment on Proposal No: 5-211

Recommendation: Delete this Exception.

Substantiation: The technical substantiation provided by the submitter included an installation scenario that was not in compliance with 300.7(B). Where extreme temperature changes are encountered, 300.7(B) requires the installation of expansion fittings. Properly installed, metallic raceway systems are good equipment grounding paths.

Panel Meeting Action: Accept

Number Eligible to Vote: 16

Ballot Results: Affirmative: 14 Negative: 2

Explanation of Negative:

BRENDER: See my explanation of negative vote on Comment 5-174.

RAPPAPORT: See my explanation of negative vote on Comment 5-168.

5-176 Log #3025 NEC-P05
(250.118 Exception)

Final Action: Reject

Submitter: Monte Ewing, State of Wisconsin

Comment on Proposal No: 5-210

Recommendation: Revised text:

Where metallic conduit is installed on rooftops, in direct contact with earth, in concrete slabs, floors, or walls that are in contact with earth, an equipment grounding conductor of the types specified in 250.118(1) shall be provided within the raceway and shall be sized per Section 250.122.

Substantiation: While I agree with the concept that there are raceways with exterior corrosion resistance and some interior corrosion resistance (as long as moisture doesn't sit in it constantly). The corrosion seems to remove the metal from within the nonmetallic protection to the point that what was a metal raceway ground path no longer exists (you learn this when you dig it up years after the equipment grounding was lost). So to follow the IBEW approach, these raceways are subject to movement structurally and from earth movement due to expansion and contraction, ground settling, frost raising, earthquakes and temperature changes. We go to great measures to assure a continuous ground fault path in the NEC and reliance on a deteriorating raceway that is concealed as well as a raceway that may pull apart in the heat or wind the installation of

an equipment grounding conductor is a small price to assure the ground fault path remains although the raceway may have failed.

Panel Meeting Action: Reject

Panel Statement: The panel understands the referenced Proposal is 5-211. Properly installed, metallic raceway systems are effective equipment grounding paths.

Number Eligible to Vote: 16

Ballot Results: Affirmative: 15 Negative: 1

Explanation of Negative:

BRENDER: See my explanation of negative vote on Comment 5-174.

5-177 Log #2154 NEC-P05
(250.118(11))

Final Action: Reject

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

Comment on Proposal No: 5-209

Recommendation: Accept the proposal in principle and in part. Accept the principle that interlocking tape is not a sheath but a form of armor, and accept the principle that the metallic armor of conventional MC cable is not an equipment grounding conductor. Reject the part of the proposal that excludes any possibility of the armor qualifying as an equipment grounding conductor because of the recent listing activity recognized in the panel statement. Finally, correlate the language in this rule with the fact that the TCC has decided to retain the term "equipment grounding conductor" throughout the NEC. Reword 250.118(11) as follows:

(11) Type MC cable where listed and identified for grounding in accordance with the following:

a. The combined metallic sheath armor and enclosed equipment grounding conductor of interlocked metal tape-type MC cable

b. The combined metallic armor and enclosed bonding conductor of interlocked metal tape-type MC cable where specifically listed for equipment grounding without an enclosed equipment grounding conductor.

c. The metallic sheath or the combined metallic sheath and equipment grounding conductors of the smooth or corrugated tube type MC cable.

Substantiation: The proposal is correct in terms of terminology, and that there remains much confusion over the proper application of this cable. The submitter just completed a minor wiring addition at a local school and discovered an entire computer lab ostensibly wired per 250.146(D) with 12-2 interlocking type MC cable, exactly as noted in comments in the voting. However, now that there is a new cable construction very close to a listing, there is no alternative but to step out of its way, since it will be safe, and correlate this section accordingly. We cannot exclude a safe wiring method just because it will cause difficulty for trainers such as this submitter.

Panel Meeting Action: Reject

Panel Statement: The proposed text does not add clarity. The panel does not accept new material that is inconsistent with the product standard UL 1569, Section 6.1.5, which requires an equipment grounding conductor to be installed in MC cables of the interlocking metal tape-type MC cables.

Number Eligible to Vote: 16

Ballot Results: Affirmative: 16

5-178 Log #3232 NEC-P05
(250.118(11))

Final Action: Reject

Submitter: Michael I. Callanan, IBEW

Comment on Proposal No: 5-209

Recommendation: This proposal should be Accepted.

Substantiation: We agree with Mr. Hammel's negative vote that states that many electricians have misinterpreted this section. Consider the installation of an isolated receptacle, as permitted in 250-146(D), installed in a metal box. MC cable of the interlocked metal-tape type, that contained only one EGC, would not provide the required EGC and the permitted isolated EGC. MC cable of the interlock metal tape type, that contained multiple EGC, is manufactured for this purpose.

Acceptance of this Proposal would clear up the confusion as to whether or not the metallic sheath could be used as an EGC.

This Comment represents the official position of the International Brotherhood of Electrical Workers Codes & Standards Committee.

Panel Meeting Action: Reject

Panel Statement: The proposed text does not add clarity. Section 250.118(11)(a) identifies that where interlocked metal tape-type cable is used as a equipment grounding conductor, it is the "combined metallic sheath and grounding conductor."

Number Eligible to Vote: 16

Ballot Results: Affirmative: 15 Negative: 1

Explanation of Negative:

HAMMEL: The panel statement does not contain any technical reason to continue to include the term "combined metallic sheath and grounding conductor". Stating that the combined sheath and grounding conductor is an equipment grounding conductor can lead to a misinterpretation of a very important code section. Is the sheath of interlocking metal tape type MC cable an effective ground fault path? No. The panel statement did not refer to any current product standard that has evaluated the sheath to be an effective ground fault path.

Where interlocking metal tape type MC cable is installed, the conductor contained is the only equipment-grounding conductor present. The code should state this fact.

5-179 Log #752 NEC-P05
(250.118(13))

Final Action: Accept

Submitter: Timothy M. Croushore, Allegheny Power

Comment on Proposal No: 5-210

Recommendation: Reject this proposal.

Substantiation: This proposal was forwarded to Code-Making Panel 9 for information and/or comment. The task group responding is comprised of Fred Hartwell and Tim Croushore.

The new text as modified by Code-Making Panel 5 could create more confusion than clarity. The new text [(13) Other electrically continuous metal enclosures, raceways, and auxiliary gutters listed for grounding.] may be interpreted that the electrically continuous metal provisions now only applies to enclosures rather than raceways. Also, a field ganged metal device box made up of single boxes ganged together, may be considered non-continuous because it was not manufactured as a continuous metal enclosure.

Code-Making Panel 9 views conductive enclosures as something to be grounded (bonded), as covered comprehensively in 250.112, as opposed to a wiring method that runs with or encloses the circuit conductors. Code-Making Panel 9 is aware that the walls of any conductive enclosure will generally constitute a portion of the equipment grounding conductor return path for most circuits, but prefers that the list in 250.118 retain its existing limitation to wiring methods. Code-Making Panel 9 also opposes a generic "listed for grounding" requirement for enclosures, because it would be a requirement for all enclosures within its jurisdiction to be listed for grounding. Code-Making Panel 9 just rejected a proposal for such a requirement on pull boxes (Proposal 9-60).

Panel Meeting Action: Accept

Number Eligible to Vote: 16

Ballot Results: Affirmative: 16

5-180 Log #565 NEC-P05
(250.118(14))

Final Action: Accept

Submitter: Technical Correlating Committee on National Electrical Code®

Comment on Proposal No: 5-210

Recommendation: The Technical Correlating Committee directs that the panel clarify the panel action on this proposal and clearly indicate if the requirement for listing applies to all of the items listed or if it only applies to auxiliary gutters. This action will be considered by the panel as a public comment. The Technical Correlating Committee directs that this proposal be referred to Code-Making Panels 8 and 9 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 Meeting Action: Accept

Editorially revise existing (14) and add a new (15) to read as follows:

(14) Other listed electrically continuous metal raceways and listed auxiliary gutters.

(15) Surface metal raceways listed for grounding.

Panel Statement: The panel accepts the direction of the TCC to clarify 250.118(14) of the 2002 NEC. The clarification is contained in the panel action.

Number Eligible to Vote: 16

Ballot Results: Affirmative: 15 Negative: 1

Explanation of Negative:

BRENDER: Panel rewording of section 250.118 violates 4.4.5 of the regulations, and the new item 15 is new material that has not had public review.

Comment on Affirmative:

BOKSINER: Although the change goes beyond purely grammatical modifications, the revised wording increases clarity and was determined by the panel to be technically more correct than the previous wording.

5-181 Log #1231 NEC-P05
(250.118(14))

Final Action: Reject

Submitter: Donald A. Ganiere Ottawa, IL

Comment on Proposal No: 5-207

Recommendation: Panel should accept in principle and replace the word "conduit" with the word "raceway" in the proposed new exception.

Substantiation: The problem with broken rooftop raceways occurs most often in electrical metallic tubing and the proposed exception as written would not apply to EMT.

Panel Meeting Action: Reject

Panel Statement: The panel understands the referenced Proposal is 5-211. Properly installed, metallic raceway systems are effective equipment grounding paths.

Number Eligible to Vote: 16

Ballot Results: Affirmative: 14 Negative: 2

Explanation of Negative:

BRENDER: The original proposal has identified a safety issue that could be easily addressed. Use of a supplemental grounding conductor will ensure continuity of the ground path.

RAPPAPORT: See my explanation of negative vote on Comment 5-166.

5-182 Log #80 NEC-P05
(250.118(14) Exception (New))

Final Action: Accept

Submitter: Dan Leaf Rancho Santa Margarita, CA

Comment on Proposal No: 5-211

Recommendation: Reject proposal.

Substantiation: The proposal only covers metal conduit, not EMT. Is a raceway installed along the side of a parapet or in or on equipment or structure for equipment to be literally ON the roof top? Raceways on the side of a structure are also subject to extreme temperature change and weather conditions where this proposed requirement would not apply.

Panel Meeting Action: Accept

Panel Statement: The panel does not necessarily agree with the submitter's substantiation.

Number Eligible to Vote: 16

Ballot Results: Affirmative: 14 Negative: 2

Explanation of Negative:

BRENDER: See my explanation of negative vote on Comment 5-181.

RAPPAPORT: See my explanation of negative vote on Comment 5-168.

5-183 Log #514 NEC-P05
(250.118(14) Exception (New))

Final Action: Accept

Submitter: Richard E. Loyd Sun Lakes, AZ

Comment on Proposal No: 5-211

Recommendation: Reject this proposal.

Substantiation: Raceways have been installed and have performed without problems outside in many locations including roof tops in facilities such as refineries, industrial plants, and factories for over 100 years. The submitter only said a problem may arise. A change of this magnitude must be substantiated with data to support changing the code. The submitter of Proposal 5-211 provided no substantiation that metallic conduit does not perform in accordance with the requirements in Articles 342, 344 and 358 and UL 797. It can be said that any product improperly installed may be a shock hazardous if-if-if.

Millions of feet (miles) of EMT have been installed and have provided a safe raceway since it was first recognized by the NEC over 60 years ago. The panel should take this into consideration as well as the comments in the negative Comments on Votes by panel members Mr. Dobrowsky, Mr. Skuggevig, Mr. Steinman and Mr. Brett. Reconsider and reject this proposal.

Panel Meeting Action: Accept

Number Eligible to Vote: 16

Ballot Results: Affirmative: 14 Negative: 2

Explanation of Negative:

BRENDER: See my explanation of negative vote on Comment 5-181.

RAPPAPORT: See my explanation of negative vote on Comment 5-168.

5-184 Log #2547 NEC-P05
(250.118(14) Exception (New))

Final Action: Accept

Submitter: Vince Baclawski, National Electrical Manufacturers Association (NEMA)

Comment on Proposal No: 5-211

Recommendation: This proposal should have been rejected.

Substantiation: Metallic raceways have been effectively used on rooftops for years without the requirement for a supplementary equipment grounding conductor. The submitter has not provided any substantiation to make the proposed change. He only states "the conduit may lose electrical continuity" but provides no technical support for his opinion.

Not all rooftops are created equal. If the conditions mentioned in the submitter's substantiation exist on a particular rooftop, there are several existing code requirements to govern that type of installation:

Section 90.1(C) states that the NEC is not a design manual. There is nothing in the code that would prohibit the installation of an equipment grounding conductor, if desired.

The submitter mentions exposure to "extreme temperature changes". Section 300.7(B) requires the use of expansion fittings "where necessary to compensate for thermal expansion and contraction."

The submitter also mentions exposure to extreme "weather conditions". Section 300.6 requires metal raceways, etc. to be of "materials suitable for the environment in which they are to be installed." Metallic raceway articles require that when they are installed in areas subject to severe corrosive influences they be "protected by corrosion protection and judged suitable for the condition." (See Article 344 Rigid Metal Conduit, Section 344.10(B) Corrosion Environment; Article 342 Intermediate Metal Conduit, Section 342.10(B) Corrosion Environments; and Article 358 Electrical Metallic Tubing, Section 342.10(B) Corrosion Environments.) If the rooftop environment is a corrosive environment, the metal conduit/tubing may require supplementary corrosion protection as Panel member Mr. Skuggevig from UL suggests: the "metal raceway must be made more resistant to failure in the harsh environment if it is to be used in this environment" and if it is "there is nothing wrong with the metal raceway's ability to serve as the sole grounding path." Metallic raceways can be PVC coated, taped, or painted when installed in severely corrosive environments and this is already required in the Code.

The Panel Statement that "the problem being identified really relates to an unsuitable use and installation of the wiring method leading to these conditions" is contrary to the action taken by the Panel. Rigid metal conduit and intermediate metal conduit are permitted "under all atmospheric conditions and occupancies."

Electrical Metallic Tubing is permitted to be used exposed and concealed, indoors and outdoors. Per Section 358.12(1) it is not permitted to be used "where, during installation or afterward, it will be subject to severe physical damage." The code already covers the appropriate use of these products. Since the Panel apparently agrees that the product was used unsuitably and improperly installed, they should have rejected the proposal.

In addition to the code requirements listed above, Section 110.12 requires electrical equipment to be installed "in a neat and workmanlike manner". Sections 342.30, 344.30 and 358.30 Securing and Supporting cover the important requirements for adequately securing and supporting the conduit/tubing. We support the negative comments of Mr. Brett, Mr. Skuggevig, Mr. Dobrowsky, and Mr. Steinman that provide numerous technical reasons for rejecting this proposal. Comments from Mr. Dobrowsky and Mr. Skuggevig concerning the fact that the same conditions could damage a supplementary equipment grounding conductor are particularly noteworthy. Adding a supplementary equipment grounding conductor is not the answer; following current code requirements is.

Panel Meeting Action: Accept

Number Eligible to Vote: 16

Ballot Results: Affirmative: 14 Negative: 2

Explanation of Negative:

BRENDER: See my explanation of negative vote on Comment 5-181.

RAPPAPORT: See my explanation of negative vote on Comment 5-168.

5-185 Log #2872 NEC-P05
(250.118(14) Exception (New))

Final Action: Accept

Submitter: William A. Wolfe, Steel Tube Institute of North America

Comment on Proposal No: 5-211

Recommendation: Reject this proposal.

Substantiation: We support the negative comments of Mr. Brett, Mr. Dobrowsky, Mr. Skuggevig and Mr. Steinman. This proposal represents a substantial change in the code and has not been technically substantiated. The submitter only states that metal conduit on rooftops is subject to severe weather conditions and may lose electrical continuity. Section 300.6 covers corrosion protection and already requires that materials be suitable for the environment in which they are to be installed. As Mr. Skuggevig notes: "the problem of dealing with a harsh environment cannot be solved by simply adding another vulnerable and marginally protected component into the harsh environment. The metal raceway must be made more resistant to failure in the harsh environment if it is to be used in this environment." The proposal requires a supplementary equipment grounding conductor in all types of metal conduit on all types of rooftops, regardless of whether or not that rooftop is in Las Vegas or Minnesota. This is a design consideration. If installed in a harsh environment, the conduit can be PVC coated, wrapped or protected with a bitumastic paint. If the rooftop is in an environment that is subject to extreme temperature changes, the code already requires the use of expansion fittings. The NEC is a minimum requirement and does not prohibit a supplementary equipment grounding conductor from being installed if the designer/specifying engineer so chooses.

Panel Meeting Action: Accept

Number Eligible to Vote: 16

Ballot Results: Affirmative: 14 Negative: 2

Explanation of Negative:

BRENDER: See my explanation of negative vote on Comment 5-181.

RAPPAPORT: See my explanation of negative vote on Comment 5-168.

5-186 Log #53 NEC-P05
(250.118(4) Exception (New))

Final Action: Accept

Submitter: Michael V. Glenn, Longview Fibre Co.

Comment on Proposal No: 5-211

Recommendation: Reject this proposal.

Substantiation: I request the panel reconsider and reject the proposal. Mr. Brett's negative comment is most appropriate and true. The submitter did not provide any technical substantiation or refer to any present code inadequacy requiring such a drastic change. The submitter's substantiation was only an inflammatory all-inclusive statement that may or may not be true depending on many factors such as climate, conduit installation methods, workmanship, installed per the NEC, and many other extenuating circumstances. Properly NEC installed conduit installations are more than adequate for roof top installations without requiring an equipment grounding conductor. Revisions to an already adequate Code should be based on actual code deficiency not poor workmanship, improper design, inadequate installation inspections, or unsubstantiated ideas and comments. At our Longview Washington pulp and paper mill we have over 80 acres under roof with many different types of conduits running over these roofs on conduit and pipe bridges. Many of these conduits are medium voltage feeders ranging up to 1000 mcm in size. Requiring an equipment grounding conductor solely because someone says it is hot on the roof is an unnecessary expense when the NEC already adequately requires proper installation and provides adequate grounding. In the thirty plus years I have been an engineer at this mill, I can only think of a few roof top conduits that needed repair and in each case these repairs were because of other types of physical damage not failure due to heat. Climatic conditions in the Longview area do not pose undue heat on rooftops. Our pipe bridges are designed and elevated from the rooftop to provide for ventilation, air circulation, and proper cooling. We use listed grounding expansion devices as now stipulated by the NEC Article 300.7(B). I strongly recommend the panel reconsider and reject this all inclusive proposal based on insufficient substantiation as to a real code grounding deficiency and as an unnecessary additional expense when the existing code already provides for a safe installation and grounding. Statistics at our mill suggest that properly NEC installed rooftop conduits are adequate for grounding in the Longview Area.

Panel Meeting Action: Accept

Number Eligible to Vote: 16

Ballot Results: Affirmative: 14 Negative: 2

Explanation of Negative:

BRENDER: See my explanation of negative vote on Comment 5-181.

RAPPAPORT: See my explanation of negative vote on Comment 5-168.

5-187 Log #2156 NEC-P05
(250.118(4) Exception (New))

Final Action: Accept

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

Comment on Proposal No: 5-211

Recommendation: Reject the proposal.

Substantiation: The substantiation points to abuse after installation that could befall any wiring method. I am also troubled by the continuing willingness to see a separate equipment grounding conductor as a panacea. A separate grounding conductor run in a magnetic enclosure will see substantial impedance if the enclosure (run of EMT in this case) opens in the middle because it will no longer be bonded at both ends. There could easily be a very long length of EMT involved, resulting in a significant magnetic choke. The industry would do much better to continually strive to make sure the steel return path doesn't inadvertently open. If for some reason this cannot be done reliably (which this submitter doubts), then the wiring method should be excluded from this location.

Panel Meeting Action: Accept

Number Eligible to Vote: 16

Ballot Results: Affirmative: 14 Negative: 2

Explanation of Negative:

BRENDER: See my explanation of negative vote on Comment 5-181.

RAPPAPORT: See my explanation of negative vote on Comment 5-168.

5-188 Log #3234 NEC-P05
(250.118(5))

Final Action: Accept

Submitter: Michael I. Callanan, IBEW

Comment on Proposal No: 5-215

Recommendation: This Panel action to accept this proposal is correct.

Substantiation: We agree with the Affirmative Comment of Mr. Johnston that this Proposal involves a safety issue directly related to equipment grounding. Situations up to six feet in length are covered in 250.118(6). This removes any doubt about using flexible metal conduit being in lengths longer than six feet for equipment grounding purposes.

This Comment represents the official position of the International Brotherhood of Electrical Workers Codes & Standards committee.

Panel Meeting Action: Accept

Number Eligible to Vote: 16

Ballot Results: Affirmative: 16

5-189 Log #60 NEC-P05
(250.118(6))

Final Action: Reject

Submitter: Michael V. Glenn, Longview Fibre Co.

Comment on Proposal No: 5-216

Recommendation: Reject the proposal.

Substantiation: I request the panel reconsider its action and reject this proposal. The existing language is adequate and clear and needs no further explanation. The submitter's substantiation about it not being clear that and equipment grounding conductor is needed is questionable. If the flexible conduit under this section can not be used for grounding then a grounding conductor would be required by default. The submitter did not reference any and field installation problems where the flexible conduit is being used incorrectly. The panel's use of equipment bonding conductor is in conflict with the panel's rejection of 5-1.

Panel Meeting Action: Reject

Panel Statement: See panel action and statement for Comment 5-41.

Number Eligible to Vote: 16

Ballot Results: Affirmative: 16

5-190 Log #1024 NEC-P05
(250-118(6)(D) and 7(E))

Final Action: Accept in Principle

Submitter: Noel Williams, Noel Williams Consulting

Comment on Proposal No: 5-206

Recommendation: This proposal should have been accepted or accepted in principal with the following change: "The conduit is not installed to provide for flexibility after the connected equipment is in use."

Substantiation: This issue needs to be addressed. The language and intent of this section should be clear enough for reasonably uniform interpretation. That is not the case with the current language. (paragraph) I understand the panel statement to say that the meaning is purposely vague to allow "flexibility" for the AHJ. Perhaps the problem is with the proposed language: "flexibility while the connected equipment is in use." The comments of Panel 8 do not make any sense in this regard unless they are thinking "in use" means "while operating and energized." As proposed, "in use" was intended to mean "after installed and connected." The point was that the code does not intend to require an equipment grounding conductor to be in the conduit while the conduit is being installed or just because the conduit is used for flexibility during installation. The code panel has already stated previously that the issue was not vibration, and I assumed that meant "vibration after being connected," or "vibration while operating." The revised proposed language in this comment would address the possibility that equipment might be moved around after being connected but while not "in use" - such as for maintenance or cleaning.

Panel Meeting Action: Accept in Principle

The results of action on this comment are incorporated in panel action taken on Comment 5-41.

Panel Statement: See panel action and statement for Comment 5-41.

Number Eligible to Vote: 16

Ballot Results: Affirmative: 16

5-191 Log #1134 NEC-P05
(250-118(6)(d) and (7)(e))

Final Action: Accept in Principle

Submitter: Paul Dobrowsky Holley, NY

Comment on Proposal No: 5-206

Recommendation: Accept the proposal in principle. Incorporate the proposal and additionally change the word "required" to "necessary".

Substantiation: The submitter has a valid point. The existing language does not indicate whether the additional conductor is to be installed where the wiring method is flexed during use or during the installation. Changing the term required to necessary is appropriate because the wiring method is usually selected "where necessary" instead of by "requirement".

Panel Meeting Action: Accept in Principle

The results of action on this comment are incorporated in panel action taken on Comment 5-41.

Panel Statement: See panel action and statement for Comment 5-41.

Number Eligible to Vote: 16

Ballot Results: Affirmative: 16

5-192 Log #3582 NEC-P05 **Final Action: Accept**
(250.118(6)e.)

Submitter: Frederick L. Carpenter, Lithonia Lighting
Comment on Proposal No: 5-218

Recommendation: Change the wording of 250.118(6)(e) as revised by the panel to read, "Where used to connect equipment where flexibility is required necessary after installation, an equipment bonding-grounding conductor shall be installed."

Substantiation: Change needed to be consistent with 250.118(5). Please see my comment to Proposal 5-216.

Panel Meeting Action: Accept

Panel Statement: The panel understands that this comment relates to 250.118(6)(e) of the 2005 ROP Draft.

Number Eligible to Vote: 16

Ballot Results: Affirmative: 16

5-193 Log #61 NEC-P05 **Final Action: Reject**
(250-118(7)(e))

Submitter: Michael V. Glenn, Longview Fibre Co.

Comment on Proposal No: 5-218

Recommendation: Reject the proposal.

Substantiation: I request the panel reconsider its action and reject this proposal. The existing language is adequate and clear and needs no further explanation. The submitter's substantiation about it not being clear that an equipment grounding conductor is needed is questionable. If the flexible conduit under this section can not be used for grounding then a grounding conductor would be required by default. The submitter did not reference any and field installation problems where the flexible conduit is being used incorrectly. The panel's use of equipment bonding conductor is in conflict with the panel's rejection of 5-1.

Panel Meeting Action: Reject

Panel Statement: See panel action and statement for Comment 5-41.

Number Eligible to Vote: 16

Ballot Results: Affirmative: 16

5-194 Log #3593 NEC-P05 **Final Action: Accept**
(250.118(D))

Submitter: Frederick L. Carpenter, Lithonia Lighting

Comment on Proposal No: 5-216

Recommendation: Change the wording of 250.118(5)(d) as revised by the panel to read, "Where used to connect equipment where flexibility is required necessary after installation, an equipment grounding conductor shall be installed."

Substantiation: Recessed fluorescent troffers are often supplied with flexible metal conduit containing tap conductors for ease of installation. Once these products are installed, the conduit and conductors are no longer subjected to flexing. It should not be necessary to provide a separate equipment ground conductor in installations where utilization equipment isn't subjected to movement after installation.

Panel Meeting Action: Accept

Panel Statement: The panel understands that this comment relates to 250.118(5)(d) of the 2005 ROP Draft.

Number Eligible to Vote: 16

Ballot Results: Affirmative: 16

5-195 Log #62 NEC-P05 **Final Action: Reject**
(250.119)

Submitter: Michael V. Glenn, Longview Fibre Co.

Comment on Proposal No: 5-220

Recommendation: Reject the proposal.

Substantiation: I request the panel reconsider its action and reject this proposal. The panel's use of equipment bonding conductor is in conflict with the panel's rejection of 5-1.

Panel Meeting Action: Reject

Panel Statement: The panel affirms its original action to accept the proposal and not change the term "equipment grounding conductor" to "equipment bonding conductor" as a result of the voting action on Proposal 5-1.

Number Eligible to Vote: 16

Ballot Results: Affirmative: 16

5-196 Log #385 NEC-P05 **Final Action: Accept in Principle**
(250.119)

Submitter: Dan Leaf Rancho Santa Margarita, CA

Comment on Proposal No: 5-220

Recommendation: Revise last sentence:

Conductors with insulation or individual covering that is green, green with one or more yellow stripes, or otherwise identified as permitted by this section shall be used only as an equipment bonding conductor.

Exception: Grounding electrode conductors shall be permitted to be identified in accordance with this section.

Substantiation: Since this section encompasses individual covered conductors, they should be covered by the proposal. Many installers employ green covering, marking, or stripping for grounding electrode conductors, though not required or prohibited by present Code, which provides a degree of identification from circuit conductors, especially where installed with other conductors in the same raceway or enclosure. Though this section relates to equipment grounding (bonding) conductors the wording appears applicable as a general rule.

Panel Meeting Action: Accept in Principle

Revise 250.119 to read as follows:

"250.119 Identification of Equipment Grounding Conductors.

Unless required elsewhere in this Code, equipment grounding conductors shall be permitted to be bare, covered, or insulated. Individually covered or insulated equipment grounding conductors shall have a continuous outer finish that is either green or green with one or more yellow stripes except as permitted in this section. Conductors with insulation or individual covering that is green, green with one or more yellow stripes, or otherwise identified as permitted by this section shall not be used for ungrounded or grounded circuit conductors."

Sections 250.119(A), (B), and (C) to remain unchanged.

Panel Statement: This meets the submitter's intent. The prohibition against the use of green for any conductor other than an EGC is too broad. It prohibits the use of green for all grounding conductors other than EGC, such as GEC, intersystem-bonding conductor, etc.

Number Eligible to Vote: 16

Ballot Results: Affirmative: 16

5-197 Log #1233 NEC-P05 **Final Action: Accept in Principle**
(250.119)

Submitter: Donald A. Ganiere Ottawa, IL

Comment on Proposal No: 5-220

Recommendation: Panel should accept in principle and add the words "or as a grounding electrode conductor" at the end of the proposed new sentence.

Substantiation: The wording as submitted reserves both the color green and any other type of identification permitted in this section for exclusive use as identification for equipment grounding conductors. The use of "bare" conductors is permitted as a means of identification for equipment grounding conductors and, therefore, if the proposed section becomes part of the code, "bare" conductors would no longer be permitted to be used as grounding electrode conductors.

Panel Meeting Action: Accept in Principle

Panel Statement: See panel action and statement on Comment 5-196.

Number Eligible to Vote: 16

Ballot Results: Affirmative: 16

5-198 Log #91 NEC-P05 **Final Action: Reject**
(250.120(C))

Submitter: Dan Leaf Rancho Santa Margarita, CA

Comment on Proposal No: 5-223

Recommendation: Accept proposal as revised:

Where not run with the circuit conductors in a raceway, cable, or flexible cord equipment grounding conductors smaller than 6 AWG shall be protected from physical damage by an approved raceway or cable armor, except where run in the hollow spaces of construction or where not likely to be subject to physical damage (such as elevation) or otherwise protected from physical damage, and securely fastened to the construction.

Substantiation: This section appears intended to apply to separately run (open) conductors such as in 250.130(C), 250.134(B), Exception No. 2, 225.6, 225.14, 225.18, 225.19, 394.10, 396.2, and 398.2. It literally includes equipment grounding conductors in nonmetallic sheathed cables and flexible cords.

Panel Meeting Action: Reject

Panel Statement: The submitter's concerns are already covered in 250.120(A), and the suggested text does not add clarity.

Number Eligible to Vote: 16

Ballot Results: Affirmative: 16

5-199 Log #1136 NEC-P05 **Final Action: Accept**
(250.122(D))

Submitter: Paul Dobrowsky Holley, NY

Comment on Proposal No: 5-229

Recommendation: Reject the proposal.

Substantiation: The resulting text does not clearly describe how to size the conductor. Table 250.122 is based on an overcurrent device and the revised text

would be interpreted to require a conductor sized at 125 percent of an instantaneous trip circuit breaker. The concept proposed might work if provisions were added to correct this.

Panel Meeting Action: Accept

Retain the 2002 NEC language for 250.122(D).

Panel Statement: Panel rejects Proposal 5-229. The panel does not necessarily agree with the comment substantiation. Acceptance of this comment will result in keeping the language of 2002 NEC.

Number Eligible to Vote: 16

Ballot Results: Affirmative: 16

5-200 Log #1605 NEC-P05 **Final Action: Reject**
(250.122(D))

Submitter: Jim Pauley, Square D Company

Comment on Proposal No: 5-229

Recommendation: Revise the proposed language as follows:

(D) Motor Circuits. The equipment grounding conductor size shall not be smaller than determined using Table 250.122. ~~The ampere rating used to select a conductor size from Table 250.122 shall be based upon 125 percent of the motor full-load current as determined according to 430.6(A)(1).~~

Substantiation: This comment offers a revision to clear up what is used to select a conductor from the table. The language as accepted in the ROP is confusing because it does relate the 125% calculation to the fact that it becomes the "ampere rating" used to select a conductor from the table. The revised wording of this comment should make it clear how the sizing applies.

Panel Meeting Action: Reject

Retain the 2002 NEC language for 250.122(D).

Panel Statement: Panel rejects Proposal 5-229. The proposed reduction in size of the equipment grounding conductor for most motor branch circuits that are protected by fuses or an inverse time circuit breaker is without adequate substantiation.

Number Eligible to Vote: 16

Ballot Results: Affirmative: 16

5-201 Log #2158 NEC-P05 **Final Action: Reject**
(250.122(D))

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

Comment on Proposal No: 5-229

Recommendation: Accept the proposal in part. Accept the deletion of the language proposed for deletion in the proposal, thereby deleting the entire paragraph. Reject the new sentence.

Substantiation: This submitter has been arguing this point since this allowance first came into the NEC. The present wording allows the highest rated overcurrent devices to have the smallest equipment grounding conductors, since ITCBs can have grounding conductors sized by entering Table 250.122 at 125% (typically) of motor current, but the grounding conductors with conventional overcurrent protection enter the table sized at 175% or 250% of motor current. The proposal exacerbates the problem by letting all short-circuit and ground-fault protective devices for motor circuits have the same artificially diminished grounding conductors. Remember that the basic function of Table 250.122 is to provide suitable equipment grounding conductors under ground-fault conditions, and the protective device ratings used to enter Table 250.122 on motor circuits are in part ground-fault protective devices.

Please refer to Proposal 5-297 and comment 5-215 in the 1999 cycle for more information. Please review in particular the exhaustive explanation of negative vote offered by Mr. Rappaport in support of this effort, as follows:

"RAPPAPORT: When this paragraph was originally proposed for the 1993 NEC, the Panel assumed that a 100 ampere ITCB (instantaneous trip circuit breaker) that will trip at 1200 percent of rating was, in fact, a 1200 ampere overcurrent device. Thus, for a 25 horsepower three phase motor at 208 volts, Table 250-95 would (according to CMP 5) require a #3/0 copper equipment grounding conductor instead of a #6 which would be required with short circuit protection rated at 175 percent of the motor full load current Exception No. 2 of Section 250-95 would have limited the equipment grounding conductor to a #2 copper.

"Application of paragraph 5 now permits a #8 copper equipment ground which is smaller than that required using normal fuse or circuit breaker short circuit protection. The intent of Table 250-95 is to provide a sufficiently low impedance for ground fault current so as to permit an overcurrent device to operate and clear the fault. The use of a #8 instead of a #6 will limit the fault current and, if the fault is an arcing fault to ground, may not provide sufficient fault current to operate the ITCB. The use of a #8 in this case is less than the minimum size presently required for the same motor with different short circuit protection and there has never been any substantiation that the deviation is safe. If this exception applies for ITCB, why should it not apply for fuses and inverse time circuit breakers?

"A review of manufacturer's catalog information for ITCBs indicates that they are, in fact, rated in nominal amperes with an additional rating of "adjustable trip range". Thus an ITCB rated for 100 amperes can be obtained with an adjustable trip range of 150 to 580 amperes (150 to 580 percent or 300 to 1100 amperes (300 to 1100 percent). The CMP should recognize that motor overloads are not intended or designed for operation at fault current levels and

are only intended for protection against persistent overcurrent for a sufficient length of time to protect equipment from dangerous overheating.

"This fifth paragraph should be deleted as proposed in order to insure that adequate fault current will flow during a fault. The panel statement is without foundation and technical basis. Adequate technical substantiation has been provided by the submitter in Proposal 5-297."

Panel Meeting Action: Reject

Retain the 2002 NEC language for 250.122(D).

Panel Statement: Panel rejects Proposal 5-229. The proposed reduction in size of the equipment grounding conductor for most motor branch circuits that are protected by fuses or an inverse time circuit breaker is without adequate substantiation.

Number Eligible to Vote: 16

Ballot Results: Affirmative: 16

5-202 Log #2160 NEC-P05 **Final Action: Accept in Principle**
(250.122(E))

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

Comment on Proposal No: 5-230

Recommendation: Accept the proposal in principle; accept as written except change "when" to "where".

Substantiation: This comment is in support of the comments in the voting. The minor edit is to conform to usual NEC practice, because the requirement is not a condition of time.

Panel Meeting Action: Accept in Principle

Revise the text of 250.122(E) to read as follows:

(E) Flexible Cord and Fixture Wire. The equipment grounding conductor in a flexible cord with the largest circuit conductor 10 AWG or smaller, and the equipment grounding conductor used with fixture wires of any size in accordance with 240.5, shall not be smaller than 18 AWG copper and shall not be smaller than the circuit conductors. The equipment grounding conductor in a flexible cord with a circuit conductor larger than 10 AWG shall be sized in accordance with Table 250.122.

Panel Statement: The panel concludes that the revised wording adds clarity. See the submitter's substantiation on Comment 5-204.

Number Eligible to Vote: 16

Ballot Results: Affirmative: 16

5-203 Log #2553 NEC-P05 **Final Action: Accept in Principle**
(250.122(E))

Submitter: Vince Baclawski, National Electrical Manufacturers Association (NEMA)

Comment on Proposal No: 5-230

Recommendation: The Panel should accept the proposal as originally submitted.

Substantiation: NEMA does not agree with the panel action to reject the proposal and supports the negative comments of Mr. Skuggevig and Mr. Steinman.

Panel Meeting Action: Accept in Principle

The action of this comment is in the panel action of Comment 5-202.

Panel Statement: See the panel action and statement for Comment 5-202.

Number Eligible to Vote: 16

Ballot Results: Affirmative: 16

5-204 Log #3368 NEC-P05 **Final Action: Accept in Principle**
(250.122(E))

Submitter: Austin D. Wetherell, Underwriters Laboratories, Inc.

Comment on Proposal No: 5-230

Recommendation: Accept the proposal.

Substantiation: The submitter of Proposal 5-230 is correct and is attempting to remedy a discrepancy between the NEC and the product standards. The Panel statement that "The product safety standards already establish the minimum equipment grounding conductor requirements for listed cords" misses the point (this may have been caused by the proposal being called "added text" when, in fact, it is "revised text"). The product safety standards, as they are currently worded, are in conflict with the NEC. For many years, the larger flexible cord sizes (No. 8 and larger) have been permitted by the product standards to have a reduced equipment grounding conductor sized in accordance with Table 250.122. These flexible cords have demonstrated satisfactory performance with this construction for many years and in many applications. By not permitting the same construction in the NEC requirements, the NEC will be inconsistent with the product standards of UL/ANSI, CSA, and ANCE, creating a disharmony among North American Standards. UL knows of no field/safety problems that would necessitate creating such a disharmony. Proposal 5-230 should be accepted.

Panel Meeting Action: Accept in Principle

Panel Statement: See the revised text in Comment 5-202.

Number Eligible to Vote: 16

Ballot Results: Affirmative: 16

5-205 Log #1248 NEC-P05
(250.122(F)(2)1.)

Final Action: Reject

Submitter: Charles M. Trout, Maron Electric Co. Inc.

Comment on Proposal No: 5-231

Recommendation: This proposal should be Accepted in Principle. Do not delete as the proposal suggests but rather add a second and third paragraph to (F)(2)(1) to read:

The name(s) of the qualified person(s) shall be kept in a permanent record at the office of the establishment in charge of the completed installation and at the office of the Authority Having Jurisdiction. Notification of any changes in the employment of the designated qualified person(s) shall be made to the office of the Authority Having Jurisdiction.

A person designated as a qualified person shall possess the skills and knowledge related to the construction and operation of the electrical equipment and installation and shall have received documented safety training on the hazards involved. Documentation of their qualifications shall be on file with the office of the Authority Having Jurisdiction and the office of the establishment in charge of the completed installation.

Substantiation: It was not necessarily my desire to have the wording in Exception No. 1 deleted, if the wording could be changed to include prescriptive requirements that could ensure that qualified persons are actually performing the maintenance and supervision as required by the exception. The National Electrical Code is a prescriptive code and it is the technical committees' responsibility to ensure that prescriptive requirements are present for the Authority Having Jurisdiction to use. Contrary to the Panel Statement, there is evidence of a big problem when the requirements of the Code do not contain prescriptive requirements that the Authority Having Jurisdiction can use to enforce the Code.

It is difficult to understand how it is possible to relax requirements for safety in a Code that tells us in 90.1(B), "this Code contains provisions that are considered NECESSARY for safety." This section further states that "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." It appears to me that this tells us that these requirements are the MINIMUM requirements for safety and anything less will result in an installation that is NOT FREE FROM HAZARD.

Proponents of this travesty, knowing the truth in this, attempt to circumvent the obvious degradation of safety by using phraseology such as "the installation is under engineering supervision" or "a qualified person will monitor the system." What is monitoring the installation? What does engineering supervision mean?

I have submitted several proposals to delete these exceptions to requirements for safety but they were all rejected. Perhaps in the comment stage, enough persons will comment in favor of accepting these proposals or at least accepting them in a manner where some prescriptive requirements will be added to accurately describe what "engineering supervision" entails. What does "monitoring" the installation mean, what type of record keeping is necessary to assure compliance, what is a "monitor" or what is a "qualified person?" How is documentation of the qualifications and presence of a "qualified person" accomplished by the Authority Having Jurisdiction?

Without these prescriptive requirements, these exceptions to the requirements for safety appear to be "just another subterfuge to avoid compliance with the safety requirements of the National Electrical Code without regard to putting persons and equipment at risk."

Panel Meeting Action: Reject

Panel Statement: The proposed adjustment to this proposal does not add clarity to the exception and would likely result in inconsistent enforcement. Qualified persons referred to in the exception should not be limited by being named specifically. It is the responsibility of the owner to maintain compliance with the provisions of this exception in a manner acceptable to the authority having jurisdiction. It is not the responsibility of the authority having jurisdiction to keep track of the names of qualified persons for the purposes of utilizing the provisions of the exception.

Number Eligible to Vote: 16

Ballot Results: Affirmative: 15 Negative: 1

Explanation of Negative:

TOOMER: Accepting this comment would ensure that the provision in this section is being enforced.

5-206 Log #63 NEC-P05
(250.122(G))

Final Action: Reject

Note: The Technical Correlating Committee understands that the term "equipment bonding conductor" will be changed to "equipment grounding conductor" in 250.122(G).

See the Technical Correlating Committee action on Comment 5-1.

Submitter: Michael V. Glenn, Longview Fibre Co.

Comment on Proposal No: 5-232

Recommendation: Reject the proposal.

Substantiation: I request the panel reconsider its action and reject this proposal. The panel's use of equipment bonding conductor is in conflict with the

panel's rejection of 5-1.

Panel Meeting Action: Reject

Panel Statement: The panel affirms its original action and position on the acceptance of Proposal 5-232 and adjusts the term "equipment bonding conductor" to "equipment grounding conductor."

Number Eligible to Vote: 16

Ballot Results: Affirmative: 16

5-207 Log #781 NEC-P05
(250.126 and Figure 250-126)

Final Action: Accept in Principle

Submitter: Michael J. Johnston Plano, TX

Comment on Proposal No: 5-233

Recommendation: My initial vote was to reject but I respectfully request the panel to accept in principle and make the following revisions.

This comment is to encourage the panel to reconsider its action on Proposal 5-233. Renumber existing "Figure 250.126" as "FPN Figure 250.126" and revise the text in 250.126(3) as follows:

(3) A green pressure wire connector. If the terminal for the grounding conductor is not visible, the conductor entrance hole shall be marked with the word green or ground, the letters G or GR, or the a grounding symbol shown in Figure 250.126, or otherwise identified by a distinctive green color. If the terminal for the equipment grounding conductor is readily removable, the area adjacent to the terminal shall be similarly marked.

EPN: Figure 250.126 Here

Substantiation: 250.126(3) provides various methods of identification terminals for grounding conductors or the hole in devices or equipment intended for grounding conductor connections. Figure 250.126 is referred to from the text as another alternative method of grounding conductor terminal identification. It is recognized that there is a variety of symbols used for grounding conductor terminations by electrical product standards and other industry standards. To avoid possible confusion created (as to specific meanings), and to avoid developing a list of grounding symbols in the Code by inserting additional symbol(s) to Figure 250.126, it is recommended that Figure 250.126 be renumbered as FPN Figure 250.126. By making the figure a FPN figure, it will continue to serve as information for users and allows manufacturers to apply identification to grounding conductor terminals as specified in the rule and consistent with those identification means provided in product and industry standards without limiting the marking means to just a grounding symbol. It is appropriate to change the current figure to a FPN figure as it serves an informational purpose and is among various permitted and recognized grounding terminal identification means. This is also consistent with current provisions of 90.5(C).

Note: I served as a member of the Task Group assigned to resolve conflicting actions between CMP-05 and CMP-18 on this issue involving the grounding symbol. This comment parallels the comment submitted by the task group.

Panel Meeting Action: Accept in Principle

Panel Statement: See panel action and statement on Comment 5-208.

Number Eligible to Vote: 16

Ballot Results: Affirmative: 16

Comment on Affirmative:

SKUGGEVIG: See my Explanation of Affirmative Vote on Comment 5-208.

5-208 Log #525 NEC-P05
(250.126 & Figure 250-126)

Final Action: Accept

Note: The Technical Correlating Committee directs that the caption for the Figure be revised to read:

"FPN: This is one example of a symbol used to identify the termination point for an equipment grounding conductor."

This action is to be consistent with the Technical Correlating Committee action on Comment 18-25.

Submitter: Gregory J. Steinman, Thomas & Betts Corporation

Comment on Proposal No: 5-233

Recommendation: This comment is to encourage the panel to reconsider its action on Proposal 5-233. Renumber existing "Figure 250.126" as "FPN Figure 250.126", and revise the text in 250.126(3) as follows:

(3) A green pressure wire connector. If the terminal for the grounding conductor is not visible, the conductor entrance hole shall be marked with the word green or ground, the letters G or GR, or the a grounding symbol shown in Figure 250.126, or otherwise identified by a distinctive green color. If the terminal for the equipment grounding conductor is readily removable, the area adjacent to the terminal shall be similarly marked.

EPN: Insert Figure 250.126 Here.

Substantiation: This comment was developed by a Task Group as directed by the NEC Technical Correlating Committee. Members of the Task Group included Gregory Steinman (NEMA-CMP-5), Michael Johnston (IAEI-CMP-5), Walter Skuggevig (UL-CMP-5), Fred Carpenter (NEMA-CMP-18), Michael O'Boyle (ALA-CMP-18), and Jim Pierce (ITS-CMP-18).

250.126(3) provides various methods of identification terminals for grounding conductors or the hole in devices or equipment intended for grounding conductor connections. Figure 250.126 is referred to from the text as another alternative method of grounding conductor terminal identification. It is recognized that there is a variety of symbols used for grounding conductor terminations by electrical product standards and other industry standards. To avoid possible confusion created (as to specific meanings), and to avoid developing

a list of grounding symbols in the Code by inserting additional symbol(s) to Figure 250.126, it is recommended that Figure 250.126 be renumbered as FPN Figure 250.126. By making the figure a FPN figure, it will continue to serve as information for users and allows manufacturers to apply identification to grounding conductor terminals as specified in the rule and consistent with those identification means provided in product and industry standards without limiting the marking means to just a grounding symbol. It is appropriate to change the current figure to a FPN figure as it serves as an informational purpose and is among various permitted and recognized grounding terminal identification means. This is also consistent with current provisions of 90.5(C).

Panel Meeting Action: Accept

Panel Statement: The panel understands that the instruction in the recommendation to “insert Figure 250.126 here” includes adding the existing caption from the 2002 NEC also. This caption is mandated by the NEC style manual in Section 2.3.2.

Number Eligible to Vote: 16

Ballot Results: Affirmative: 16

Comment on Affirmative:

SKUGGEVIG: UL agrees with the panel action to Accept the comment developed by the Task Group (I was a member of the Task Group), but we are concerned that the wording “grounding symbol” for the caption of the Fine Print Note might not make it sufficiently clear that the symbol shown in the FPN Figure is not the only acceptable grounding symbol. The text of 250.126 accepted by Panel 5 states that “a grounding symbol” is one of the acceptable ways of identifying the equipment grounding terminal and the caption of the FPN figure simply says “grounding symbol”. This can be interpreted to imply that the grounding symbol shown is the only acceptable grounding symbol. We suggest that the caption of the FPN Figure should be expanded to say: “FPN: One example of a symbol used to identify the termination point for the equipment grounding conductor.”

5-209 Log #566 NEC-P05 **Final Action: Accept in Principle**
(Figure 250.126)

Submitter: Technical Correlating Committee on National Electrical Code®

Comment on Proposal No: 5-233

Recommendation: The Technical Correlating Committee notes that Code-Making Panel 18 took a different action on Proposal 18-48. The Technical Correlating Committee directs the Chair of Code-Making Panel 5 to establish a Task Group, including members from Code-Making Panel 18, to resolve the correlation issue. 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 Meeting Action: Accept in Principle

Panel Statement: See panel action and statement on Comment 5-208.

Number Eligible to Vote: 16

Ballot Results: Affirmative: 16

Comment on Affirmative:

SKUGGEVIG: See my Explanation of Affirmative Vote on Comment 5-208.

5-210 Log #2554 NEC-P05 **Final Action: Accept in Principle**
(Figure 250.126)

Submitter: Vince Baclawski, National Electrical Manufacturers Association (NEMA)

Comment on Proposal No: 5-233

Recommendation: Reject the panel action and accept this proposal.

Substantiation: IEC 60417 symbol 5019 is not universal or exclusive within the IEC as the only method utilized to identify a grounding terminal. In fact, symbol 5017 is solely specified in wiring products IEC standards 60669-1 and 60320-2-1, while both 5017 and 5019 are specified and considered equivalent in IEC 60309-1, 60309-2, and 60320-1. The 5017 symbol should be included in the NEC, because it is commonly applied to products and recognized, not only in the US, but in the international community. The lack of its inclusion in the NEC as an alternative to symbol 5019 is restrictive and will only lead to unnecessary product modifications and confusion in the market. Either symbol is accepted in the field and does not present any safety concerns.

CMP 18 unanimously accepted a similar Proposal 18-48 (Log #605) for Figure 406.9(B)(4) in the 2005 code cycle.

Panel Meeting Action: Accept in Principle

Panel Statement: See panel action and statement on Comment 5-208.

Number Eligible to Vote: 16

Ballot Results: Affirmative: 16

Comment on Affirmative:

SKUGGEVIG: See my Explanation of Affirmative Vote on Comment 5-208.

5-211 Log #1085 NEC-P05 **Final Action: Accept in Principle**
(250.142(B) Exception No. 2)

Submitter: Neil F. LaBrake, Jr., Niagara Mohawk, a National Grid Company / Rep. Edison Electric Institute

Comment on Proposal No: 5-237

Recommendation: Reject this proposal.

Substantiation: Generally, in this situation, the meter enclosure is located immediately adjacent to the main disconnect. This exception provides a reasonable option for bonding of a meter enclosure that is located on the load side of the main disconnect. The exception does not prevent running an equipment grounding conductor to the meter enclosure in the event it is installed at a distance from the main disconnect.

Panel Meeting Action: Accept in Principle

The panel accepts the insertion of the words “immediately adjacent to” in the exception as follows: (b) All meter socket enclosures are located near immediately adjacent to the service disconnecting means, and...” remainder unchanged.

Panel Statement: The panel concurs that the exception still has use in limited applications and should be retained.

Number Eligible to Vote: 16

Ballot Results: Affirmative: 16

5-212 Log #742 NEC-P05 **Final Action: Reject**
(250.146(A))

Submitter: Mark Shapiro Farmington Hills, MI

Comment on Proposal No: 5-239

Recommendation: Reject the proposal.

Substantiation: With, apparently, no evidence of a problem, why impose an extra burden on electricians? We have all seen innumerable installation problems and code violations. But, a problem with good grounding continuity between a receptacle and a surface mounted metal box is not one of them. If, theoretically, the problem was a loose connection between a receptacle and a box, removing the washer would not make it any tighter.

Panel Meeting Action: Reject

Panel Statement: Manufacturers have determined that at least one washer should be removed to ensure direct metal to metal contact.

Number Eligible to Vote: 16

Ballot Results: Affirmative: 16

5-213 Log #2556 NEC-P05 **Final Action: Accept**
(250.146(A))

Submitter: Vince Baclawski, National Electrical Manufacturers Association (NEMA)

Comment on Proposal No: 5-239

Recommendation: In lieu of the panel action, revise the existing text in the 2002 NEC Section 250.146(A) as follows:

(A) Surface Mounted Box. Where the box is mounted on the surface, direct metal-to-metal contact between the device yoke and the box or a contact yoke or device that complies with 250.146(B) shall be permitted to ground the receptacle to the box. At least one of the insulating washers shall be removed from receptacles that do not have a contact yoke or device that complies with 250.146(B) to ensure direct metal-to-metal contact. This provision shall not apply to cover-mounted receptacles unless the box and cover combination are listed as providing satisfactory ground continuity between the box and the receptacle.

Substantiation: 250.146(B) describes a self-grounding clip or yoke that is designed to insure an effective grounding circuit between a device yoke and a box. Regardless of the type of box the device is installed on, either flush or surface, this self grounding feature provides an effective grounding path when there is no direct metal to metal contact between the device yoke and the box. It is not necessary to remove the insulating washer from devices provided with the grounding means described in 250.146(B) because the grounding path is established by the self-grounding clip and the device mounting screws. If a receptacle is provided with insulating washers, it is only necessary to remove one of the washers to ensure an effective grounding path.

Panel Meeting Action: Accept

Number Eligible to Vote: 16

Ballot Results: Affirmative: 16

5-214 Log #3493 NEC-P05 **Final Action: Reject**
(250.146(A))

Submitter: Charles M. Trout, Maron Electric Co. Inc.

Comment on Proposal No: 5-239

Recommendation: This proposal should be accept in principle. Delete the words “insulating washers” and revise sentence to read:

“Device mounting screw retaining washers shall be removed to ensure direct metal-to-metal contact.

Substantiation: The device mounting screw retaining washer is not intended to be an insulating washer. Its purpose is to hold the device mounting screw in place during shipment. Part of the substantiation or supporting argument when what was then 250.74 was introduced in 1965 was that “screws and yokes currently in use were designed solely for the support of devices rather than as a part of the grounding circuit. This statement is I believe currently true. If Mr. Steinman has substantiation that the mounting screws and yokes of devices have been satisfactorily investigated as a part of the grounding circuit with positive results, then there is no reason for the bonding jumper requirement of 250.146 and this section could be deleted.

Panel Meeting Action: **Reject**

Panel Statement: The washers would not have to be removed if they were conductive.

Number Eligible to Vote: 16

Ballot Results: Affirmative: 16

5-215 Log #3579 NEC-P05
(250.146(A))

Final Action: **Reject**

Submitter: Jim F. Pierce, Intertek Testing Services

Comment on Proposal No: 5-239

Recommendation: Delete the proposed added sentence:

~~“Insulating washers shall be removed to ensure direct metal contact.”~~

Substantiation: The proposal is to instruct that insulating washers be removed from the device yoke screws before securing to the metal box.

The washers in question are the little fiber ones that may be pushed onto the mounting screws to hold them into the yoke during transit after manufacture. The metal-to-metal contact is made by the screw head contacting the yoke and the threads of the screw screwing into the metal box.

These may be washers that are made of an insulating fibrous material, but they are not insulating washers. They do not prevent the metal-to-metal contact required by this Article. There is no need to remove them to obtain metal-to-metal contact when installing a Listed receptacle into a metal box per Article 250.146(A).

Panel Meeting Action: **Reject**

Panel Statement: See panel action and statement on Comment 5-212.

Number Eligible to Vote: 16

Ballot Results: Affirmative: 16

5-216 Log #152 NEC-P05
(250.146(A), FPN (New))

Final Action: **Accept in Principle**

Submitter: David Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education

Comment on Proposal No: 5-239

Recommendation: Accept, instead, a Fine Print Note following 250.146(A) as follows:

“FPN: It may be necessary to remove nonmetallic washers to ensure sufficient contact, especially where yoke ends have been trimmed.”

Substantiation: The term, “insulating,” is confusing, as thin paper washers may not serve as significant insulation, as the CMP’s NEMA representative pointed out, but thicker plastic ones might, “nonmetallic” covers them all, without demanding that installers estimate (or allowing them to argue about) how much insulation a washer provides. Neither in this nor the previous Code cycle have hard data been brought forward demonstrating a hazard, and the line of reasoning presented is mostly relevant to yokes with the scored bits removed. There can be plenty of metal-to-metal contact if the yoke is intact, including the bits sticking out beyond the oval openings for the screws, out to each side; on the other, if you break those off, say to allow a non-flat cover to fit over the device and against the box, it reduces the metal in contact a great deal, such that even a couple of skinny composition washers might impede the operation of the overcurrent device in the event of a fault.

Panel Meeting Action: **Accept in Principle**

Panel Statement: See panel action on Comment 5-213.

Number Eligible to Vote: 16

Ballot Results: Affirmative: 16

5-217 Log #64 NEC-P05
(250.147 (New))

Final Action: **Reject**

Submitter: Michael V. Glenn, Longview Fibre Co.

Comment on Proposal No: 5-244a

Recommendation: Change “Equipment bonding conductor” to “Equipment Grounding conductor.”

Substantiation: Panel action on 5-1 rejected the equipment bonding conductor change.

Panel Meeting Action: **Reject**

Panel Statement: The Technical Correlating Committee’s action on Proposal 5-1 rejected the Proposal so the issue about changing “equipment grounding conductor” to “equipment bonding conductor” is no longer an issue.

Number Eligible to Vote: 16

Ballot Results: Affirmative: 16

5-218 Log #751 NEC-P05
(250.147 (New))

Final Action: **Reject**

Submitter: Timothy M. Croushore, Allegheny Power

Comment on Proposal No: 5-244a

Recommendation: Reject this proposal.

Substantiation: This proposal was forwarded to Code-Making Panel 9 for information and/or comment. The task group responding is comprised of Fred Hartwell and Tim Croushore.

Redundant requirements should not be introduced into different sections of the NEC. The likelihood exists for different requirements to be developed on the same subject, and the Technical Correlating Committee may not spot the conflict in time. Although a Fine Print Note could be developed for Article 250 to point to 404.9, Code-Making Panel 9 is unaware of any field problem regarding confusion over the location of snap switch grounding rules.

Responding directly to the merits of the proposal substantiation, Code-Making Panel 9 wishes to point out that there is a fundamental difference in the level of hazard between a snap switch faceplate and a receptacle that is merely the point of origin for a quasi-branch circuit extension when it is in use. That is why the grounding continuity requirements for receptacles have historically been more demanding than those for snap switches. That is also, why receptacle grounding requirements occur in 250.146 instead of Article 406.

Panel Meeting Action: **Reject**

Panel Statement: The panel affirms its original action on Proposal 5-244a to accept inserting in Article 250 grounding rules for switches that are consistent with the provisions in Article 404. Specific grounding requirements for devices should also be located within the article covering grounding and bonding, with more general information located within the other articles. The panel does not necessarily agree with all of the submitter’s substantiation with respect to the level of hazard.

Number Eligible to Vote: 16

Ballot Results: Affirmative: 16

5-219 Log #567 NEC-P05
(250.147(NEW))

Final Action: **Accept**

Submitter: Technical Correlating Committee on National Electrical Code®

Comment on Proposal No: 5-244a

Recommendation: See the Technical Correlating Committee Note on

Proposal 5-1.

The Technical Correlating Committee directs the panel to reconsider the proposal and ensure that any language used in Article 250 is consistent with 404.9. This action will be considered by the panel as a public comment.

The Technical Correlating Committee notes that the responsibility of determining how a snap switch should be grounded belongs to Code-Making Panel 9.

It was the further action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 9 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 Meeting Action: **Accept**

Panel Statement: The language is consistent.

Number Eligible to Vote: 16

Ballot Results: Affirmative: 16

5-220 Log #65 NEC-P05
(250.148)

Final Action: **Reject**

Submitter: Michael V. Glenn, Longview Fibre Co.

Comment on Proposal No: 5-248

Recommendation: Change “equipment bonding conductor” to “equipment grounding conductor”.

Substantiation: The panel action on 5-1 is in conflict with the panel’s change.

Panel Meeting Action: **Reject**

Panel Statement: The Technical Correlating Committee’s action on Proposal 5-1 rejected the proposal, so the issue about changing “equipment grounding conductor” to “equipment bonding conductor” is no longer an issue.

Number Eligible to Vote: 16

Ballot Results: Affirmative: 16

5-221 Log #93 NEC-P05 **Final Action: Reject**
(250.168)

Submitter: Dan Leaf Rancho Santa Margarita, CA

Comment on Proposal No: 5-250

Recommendation: Accept the proposal.

Substantiation: Panel statement is that 250.28(D) does not exclude DC systems. This is not clear since Part II refers numerous times to AC systems. 250.28(D) refers to Table 250.66 which covers only AC systems, which indicates 250.28 only applies to AC systems.

Panel Meeting Action: Reject

Panel Statement: Section 250.28 applies to both AC and DC systems, as is clear from the title of 250.28 and the text of 250.160. The sizing requirement for DC systems is already in 250.168.

Number Eligible to Vote: 16

Ballot Results: Affirmative: 16

5-222 Log #66 NEC-P05 **Final Action: Accept in Principle**
(250.184)

Submitter: Michael V. Glenn, Longview Fibre Co.

Comment on Proposal No: 5-253

Recommendation: Change "Equipment bonding conductor" back to "Equipment grounding conductor"

Substantiation: The panel's rejection of 5-1 makes this change necessary as equipment bonding conductor was rejected.

Panel Meeting Action: Accept in Principle

Panel Statement: The action has been incorporated in Comment 5-223. See also panel statement on Comment 5-1.

Number Eligible to Vote: 16

Ballot Results: Affirmative: 16

5-223 Log #1086 NEC-P05 **Final Action: Accept in Principle**
(250.184)

Submitter: Neil F. LaBrake, Jr., Niagara Mohawk, a National Grid Company / Rep. Edison Electric Institute

Comment on Proposal No: 5-253

Recommendation: Accept the Proposal in Principle and modify the proposed text as follows:

250.184 Solidly Grounded Neutral Systems. Solidly grounded neutral systems shall be permitted to be either single point grounded or multigrounded neutral (A) Neutral Conductor.

(1) The minimum insulation level for neutral conductors of solidly grounded systems shall be 600 volts.

Exception No. 1: Bare copper conductors shall be permitted to be used for the neutral of service entrances and the neutral of direct-buried portions of feeders.

Exception No. 2: Bare conductors shall be permitted for the neutral of overhead portions installed outdoors.

Exception No.3: The neutral grounded conductor shall be permitted to be a bare conductor if isolated from phase conductors and protected from physical damage.

FPN: See 225.4 for conductor covering where within 3.0 m (10 ft) of any building or other structure.

~~(2) The neutral grounded conductor shall be permitted to be a bare conductor if isolated from phase conductors and protected from physical damage.~~

(23) The 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.

B) Single Point Grounded System. Where a single point grounded neutral system is used, the following shall apply:

(1) A single point grounded system shall be permitted to be supplied from :

(a) a separately derived system, or
(b) a multigrounded neutral system with an equipment bonding conductor connected to the multigrounded neutral at the source of the single point grounded system.

(2) (1) A grounding electrode shall be provided for the system

(3) (2) A grounding electrode conductor shall connect the grounding electrode to the system neutral.

(4) (3) A bonding jumper shall connect the equipment bonding conductor to the grounding electrode conductor.

(5) (4) An equipment bonding conductor shall be provided to each building, structure and equipment enclosure.

(6) (5) A neutral shall only be required where phase to neutral load are supplied.

(7) (6) The neutral, where provided, shall be insulated and isolated from earth except at one location.

(8) (7) An equipment bonding conductor shall be run with the phase conductors and

(a) shall not carry continuous load

(b) may be bare or insulated; and

(c) shall have sufficient ampacity for fault current duty.

(C) Multigrounded Neutral System. Where a multigrounded neutral system is used, the following shall apply:

(1) 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:

(a) Transformers supplying conductors to a building or other structure

(b) Underground circuits where the neutral is exposed

(c) Overhead circuits installed outdoors

(2) (1) The multigrounded neutral conductor shall be grounded at each transformer and at other additional locations by connection to a made or existing electrode.

(3) (2) At least one grounding electrode shall be installed and connected to the multigrounded neutral circuit conductor every 400 m (1300 ft).

(4) (3) The maximum distance between any two adjacent electrodes shall not be more than 400 m (1300 ft).

(5) (4) In a multigrounded shielded cable system, the shielding shall be grounded at each cable joint that is exposed to personnel contact.

Substantiation: Edison Electric Institute agrees with the Panel's action on this proposal to Accept in Principle. However, in order to clearly describe and add the desired specific provisions for a single point grounded neutral system and not delete important existing specific provisions for multigrounded neutral systems, the proposed text should be modified as shown in the comment above.

Panel Meeting Action: Accept in Principle

Accept the reorganization of (A), (B), and (C). Change "equipment bonding conductor" to "equipment grounding conductor" in revised (B)(4), (B)(5), and (B)(8).

Panel Statement: The reorganization is accepted. The term "equipment bonding conductor" is changed to "equipment grounding conductor" in order to be consistent with existing terminology in Article 250. See also panel statement on Comment 5-1.

Number Eligible to Vote: 16

Ballot Results: Affirmative: 16

5-224 Log #3357 NEC-P05 **Final Action: Reject**
(250.184)

Submitter: Donald W. Zipse, Zipse Electrical Engineering, Inc.

Comment on Proposal No: 5-253

Recommendation: Delete this section.

Substantiation: Favorable verdict for the dairy farmer against the utility.

There was in that case 70 percent return current flowing over the earth. The phase conductor carried 18.5 amperes while the multigrounded neutral return conductor carried only 3.5 amperes. In other words, 15 amperes were flowing uncontrolled in magnitude and uncontrolled where it flowed. In this case, only cows were hurt - milk production cut in half.

The Wisconsin Supreme Court upheld the lower court's ruling where the utility was ordered to replace the multigrounded neutral distribution system with another system in order to stop the stray current.

These are just two of the many cases. One case in NJ has a homeowner's hot tub electrified from the local utility from stray current. I just hope it does not happen to one of you who think multigrounded electrical distribution systems are safe if not maintained and installed correctly. This type of electrical system lacks the safety that the rest of the NEC maintains. See Purpose.

I really should applaud your misguided actions as it is keeping me extremely busy writing reports, testifying, etc. In fact so busy I do not really have time to show you the errors of your actions. On the other hand, if you were to wake up and feel the stray current and delete this section, it would reduce my activity in the stray current field.

Panel Meeting Action: Reject

Panel Statement: The panel concludes that the requirements in this section are necessary for installing grounded neutral systems at 1 KV and above and should not be deleted. These requirements are not covered elsewhere in the Code.

Number Eligible to Vote: 16

Ballot Results: Affirmative: 16

7-6 Log #568 NEC-P07 **Final Action: Accept**
(250.184(A) Exception No. 3 (New))

Note: The Technical Correlating Committee understands that Proposal 5-256 continues to be Rejected, but also understands that the wiring method is not prohibited by the present code rules.

Submitter: Technical Correlating Committee on National Electrical Code®

Comment on Proposal No: 5-256

Recommendation: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 7 for action in the articles under its purview. This action will be considered by Code-Making Panel 7 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 Meeting Action: Accept

Panel Statement: The panel accepts the directive of the Technical Correlating Committee with the following comment:

The panel contends that this falls within the purview of Article 328, but the construction specification is referenced to Article 310 and 328.12 does not prohibit its use.

The panel believes the proposal could have been accepted by Code-Making Panel 5 without any adverse effects and without any action by Code-Making Panel 7.

Number Eligible to Vote: 15

Ballot Results: Affirmative: 14

Vote Not Returned: 1 ANASTASI

ARTICLE 280 — SURGE ARRESTERS

5-225 Log #400 NEC-P05 **Final Action: Accept in Principle**
(280.4)

Submitter: Kenneth J. Brown, Leviton Mfg. Co. Inc.

Comment on Proposal No: 5-261

Recommendation: Add text to read as follows:

280.4(A)(4) Surge Arrestors shall not be installed on ungrounded electrical systems less than 1kV.

Exception to (4): Surge Arrestors employing only phase to phase protection shall be permitted on ungrounded and high resistance grounded (HRG) systems.

Substantiation: Surge Arrestors designed to provide phase to phase protection function properly on both ungrounded and high resistance grounded systems.

Panel Meeting Action: Accept in Principle

Add new 280.4(A)(4) to read as follows:

“Surge arresters shall not be installed on ungrounded systems, impedance grounded systems, or corner grounded delta systems unless listed specifically for use on these systems.”

Panel Statement: The rules for surge arresters under 1000V and TVSS should be similar. This should be included in the rule and also be the same for surge arrester under 1000V.

Number Eligible to Vote: 16

Ballot Results: Affirmative: 16

5-226 Log #1583 NEC-P05 **Final Action: Reject**
(280.4(A))

Submitter: Alan Manche, Schneider Electric/Square D Co.

Comment on Proposal No: 5-261

Recommendation: The panel should reconsider and accept this proposal in principle by ensuring consistency with the action taken in proposal 5-267 for TVSS device as follows:

280.4(A)(4) A TVSS shall not be permitted on ungrounded systems.

Substantiation: The same safety issue exists with arresters and TVSS device rated 1000V and less due to the technology involved under 1000V. By rejecting proposal 5-261, which maintains permission to use arresters on ungrounded systems, and maintaining a position that TVSS can not be install on a grounded system in article 285 (proposal 5-267), the panel drives the user to install a surge arrester with the same safety concerns that established the restriction in article 285. Understanding that the panel has accepted an adjustment to the wording in 285.3, there is no product standards requirement that addresses the application safety issues on an ungrounded system, so the committee has effectively maintained its position of prohibiting surge protection on ungrounded systems. I would urge the committee to accept proposal 5-261 in principle and correlate the restriction with 285.3(2).

Panel Meeting Action: Reject

Panel Statement: Listed devices are available for this application. See panel action and statement on Comment 5-225.

Number Eligible to Vote: 16

Ballot Results: Affirmative: 16

5-227 Log #1584 NEC-P05 **Final Action: Accept**
(280.4(A))

Submitter: Alan Manche, Schneider Electric/Square D Co.

Comment on Proposal No: 5-262

Recommendation: The panel should continue to accept this proposal as modified by the panel action.

Substantiation: Continued acceptance of this proposal supports the safe installation and application of surge protection equipment.

Panel Meeting Action: Accept

Number Eligible to Vote: 16

Ballot Results: Affirmative: 16

5-228 Log #1217 NEC-P05 **Final Action: Accept**
(280.24(A)(2))

Submitter: Jeffrey Boksiner, Telcordia Technologies

Comment on Proposal No: 5-265

Recommendation: Revise the accepted text as follows:

The grounded conductor of the secondary system is a part of a multiground neutral or static system or static wire of which the primary neutral or static wire has at least four ground connections in each mile of line in addition to a ground at each service.

Substantiation: This comment provides editorial revisions so that the text refers to a “static wire” which is a defined term in the National Electric Safety Code (NEC).

Panel Meeting Action: Accept

Number Eligible to Vote: 16

Ballot Results: Affirmative: 16

ARTICLE 285 — TRANSIENT VOLTAGE SURGE SUPPRESSORS: TVSSs

5-229 Log #1585 NEC-P05 **Final Action: Reject**
(285.3)

Submitter: Alan Manche, Schneider Electric/Square D Co.

Comment on Proposal No: 5-267

Recommendation: The panel should reconsider and reject this proposal 5-267.

Substantiation: High-Impedance Grounded System

The existing wording in 285.3 does not prohibit the use of a TVSS device on a high-impedance grounded system. The committee is reminded that such an application on a high-impedance grounded neutral system in 250.36 is only permitted where “the conditions of maintenance and supervision ensure that only qualified persons service the equipment.” Surge protection devices can be applied safely on a high-impedance grounded system. A Listing requirement for the TVSS would not provide any additional safety aspects for installation on an impedance grounded system.

Ungrounded System

The committee may recall that on ungrounded systems under arcing fault conditions, the voltage can escalate to several orders of magnitude higher than the rating of the TVSS as indicated in his substantiation. A TVSS that is only equipped with phase-to-phase protection does not make it suitable for use on an ungrounded system. The escalated voltage condition sends the TVSS directly into conduction for a time period that can often be a catastrophic impact on the TVSS. The submitter has even acknowledged that such an event can occur, unfortunately his solution to add overcurrent protection to the device now falsely assumes the breaker or fuse protects the TVSS, remember the standard breaker or fuse is designed to protect wire not failing components within a TVSS which can escalate beyond the TVSS. Placing a breaker or fuse ahead of the TVSS does not afford overcurrent protection coordination with the TVSS and can still leave the TVSS and its surroundings vulnerable to a catastrophic event when the MOVs within the TVSS attempt to “open” quicker than the fuse or breaker.

The application of an ungrounded system opens the door for an increase in transients and VSDs can be vulnerable to these transients which implies that additional system designs considerations should be included in the revision of these systems to reduce transients by implementing a grounded system that accomplishes the objectives in 250.4(A) by limiting the voltage imposed by lightning and line surges by stabilizing the voltage. There has been no substantiation presented that surge protection devices can be applied safely on an ungrounded system, not to mention the substantiation that points to the contrary of viewing them as a “Fire Pump” and placing overcurrent protection ahead of them, neither of which effectively address the safety issue.

Corner Grounded Delta System

A TVSS can be safely applied in a corner grounded system when used in accordance with its Listing. The existing wording in the NEC does not prohibit such an installation. Adding a listing requirement as noted in the panel action does not provide any additional safety aspects for installation on a corner grounded system

I urge the committee to reconsider and reject proposal 5-267.

Panel Meeting Action: Reject

Panel Statement: Listed devices are available for this application.

Number Eligible to Vote: 16

Ballot Results: Affirmative: 16

5-230 Log #401 NEC-P05 **Final Action: Accept in Principle**
(285.3(2))

Submitter: Kenneth J. Brown, Leviton Mfg. Co. Inc.

Comment on Proposal No: 5-267

Recommendation: Add text to read as follows:

285.3 Exception to (2): TVSS employing only phase to phase protections shall be permitted on ungrounded and high resistance grounded (HRG) systems.

Substantiation: TVSS designed to provide phase to phase protection function properly on both ungrounded and high resistance grounded systems.

Panel Meeting Action: Accept in Principle

Revise 285.3(2) from the ROP Draft to read as follows:

“A TVSS device shall not be installed on ungrounded systems, impedance grounded systems, or corner grounded delta systems unless listed specifically for use on these systems.”

Panel Statement: Listed devices are available for this application. Other text was deleted because it was unnecessary and is covered by the listing requirements.

Number Eligible to Vote: 16

Ballot Results: Affirmative: 16

5-231 Log #3356 NEC-P05 **Final Action: Reject**
(285.11)

Submitter: Mark Wingate, MVC

Comment on Proposal No: 5-269

Recommendation: Modify the proposal to the following:

“285.11 Location. TVSS active components shall be permitted to be...”

Substantiation: The TVSS device should be accessible but the active components of the TVSS device need not, and in fact should not be accessible. The words “active components” need to be added. We feel that there is an interpretation concern here. A TVSS is a device whose active components need to be inaccessible; however, the TVSS device itself is in most cases installed in an accessible location, and by design is only capable of being installed in accessible locations. This design has been allowed for over 20 years. There are literally hundreds of thousands of these devices already installed in accessible locations.

Panel Meeting Action: Reject

Panel Statement: The NEC has no control over the components of listed products. This is an issue for the product standards.

Number Eligible to Vote: 16

Ballot Results: Affirmative: 16

5-232 Log #16 NEC-P05 **Final Action: Reject**
(285.21(A))

Submitter: James E. Koryta, Indiana University

Comment on Proposal No: 5-273

Recommendation: The Panel Statement in the ROP that “Section 250.21(A) items (1), (2), and (3) provide sufficient provisions...” is in error.

Substantiation: The section referenced deals with “systems of 50V to 1000V not grounded”? Perhaps the panel meant 250.20? Regardless, Article 285 only speaks to service supplied buildings, feeder supplied buildings, or separately derived systems. The code says nothing about the installation of a TVSS at a branch circuit panel, except via 110.3.B. “Other locations” meant those locations not addressed by Article 285 at present.

Panel Meeting Action: Reject

Panel Statement: The submitter was correct that the reference to 250.21 is incorrect. The correct reference should have been 250.20(A)(1),(2), and (3).

The present Code text is clear and no further revision is needed. For 285.21(A)(1), this means that the TVSS can be anywhere in the building that is supplied by a “service” on any feeder or branch circuit, but it cannot be connected to the line side of the service disconnecting means.

Section 285.21(A)(2), means that the TVSS can be anywhere in the building that is supplied by a “feeder” as permitted by Article 225 on any feeder or branch circuit, but it cannot be connected to the line side of the main feeder disconnecting means that is for the supply at that building.

Section 250.21(A)(3) means that the TVSS can be anywhere on the premises wiring system supplied by a “separately derived system” as provided in 250.30 on any feeder or branch circuit, but it cannot be connected to the line side of the main disconnect for the separately derived system.

Number Eligible to Vote: 16

Ballot Results: Affirmative: 16

5-233 Log #43 NEC-P05 **Final Action: Reject**
(285.21(A))

Submitter: James E. Koryta, Indiana University

Comment on Proposal No: 5-273

Recommendation: The Panel Statement that “Section 250.21(A) items (1), (2), and (3) provide sufficient provisions...” is in error. The section referenced deals with “Systems of 50 Volts to 1000 Volts Not Required to be Grounded”? Perhaps the panel meant Section 250.20? Regardless, Art 285 only speaks to Service supplied building, Feeder supplied building, or Separately Derived system. The Code is saying nothing about the installation of a TVSS at a branch circuit panel. No requirements are given except via 110.3.B The “other locations” meant those not addressed by Art 285 A(1), (2) and (3).

Substantiation: This is a defense of the original rejected recommendation.

Panel Meeting Action: Reject

Panel Statement: See panel action and statement on Comment 5-232.

Number Eligible to Vote: 16

Ballot Results: Affirmative: 16

(Note: The sequence nol 5-234 was not used)

5-235 Log #1586 NEC-P05 **Final Action: Accept**
(285.21(A)(1))

Submitter: Alan Manche, Schneider Electric/Square D Co.

Comment on Proposal No: 5-272

Recommendation: The panel should continue to accept this proposal (5-272).
Substantiation: This proposal correlates the action taken by CMP 4 in the ROP.

Panel Meeting Action: Accept

Number Eligible to Vote: 16

Ballot Results: Affirmative: 16

5-236 Log #1587 NEC-P05 **Final Action: Accept**
(285.21(A)(4))

Submitter: Alan Manche, Schneider Electric/Square D Co.

Comment on Proposal No: 5-274

Recommendation: The panel should continue to reject this proposal (5-274).

Substantiation: This comment will serve to support the panel action and comment that this is a product standard issue. Article 285 requires the TVSS to be listed. The rationale for this proposal would imply that TVSS products fail; therefore the device should be prohibited from being placed in a metal enclosure, which would contain such an event, and instead be mounted to the combustible wall next to the steel enclosure. Control panels are a specific example where various components are installed together in a single enclosure including overcurrent protection, motor controllers, surge protection, power supplies,... The substantiation does not support a logically avenue to achieve a safe installation solution and such a safety issue should be addressed in the product standard.

The panel should continue to reject this proposal.

Panel Meeting Action: Accept

Number Eligible to Vote: 16

Ballot Results: Affirmative: 16

5-237 Log #3438 NEC-P05 **Final Action: Reject**
(285.21(A)(4))

Submitter: Matthew Wakeham, Leviton Manufacturing Co Inc.

Comment on Proposal No: 5-274

Recommendation: Add text to read as follows:

285.21 Service Equipment and Branch Circuit Enclosures. TVSS shall not be located within service equipment or branch circuit enclosures that contain over-current protective devices.

Substantiation: 285.21 Service Equipment and Branch Circuit Enclosures. Despite UL 1449 test requirements, it has been experienced over the years that failure conditions of TVSS are not consistent and that it is possible to have expulsion of combustible materials from failed TVSS which may result in arcing and carbon tracking.

Panel Meeting Action: Reject

Panel Statement: CMP 5 reaffirms that this is a product standards issue.

Number Eligible to Vote: 16

Ballot Results: Affirmative: 16

5-238 Log #3453 NEC-P05 **Final Action: Reject**
(285.21(A)(4) and 280-11)

Submitter: Antony J. Surtees, ERICO Inc.

Comment on Proposal No: 5-274

Recommendation: Add text to read as follows:

285.21 Service Equipment and Branch Circuit Enclosures.

TVSS shall not be located within service equipment or branch circuit enclosures that contain over-current protective devices due to the combustible materials used in the construction of surge protective devices.

280.11 Surge Arrestors shall be permitted indoors or outdoors. Surge Arrestors shall be made inaccessible to unqualified persons, unless listed for installation in accessible locations.

(A) Service Equipment or Branch Circuit Enclosures. Surge Arrestors shall not be contained within service equipment or branch circuit enclosures containing over-current protective devices. Surge Arrestors.

Substantiation: 285.21 Service Equipment and Branch Circuit Enclosures Circuits Enclosures. If an SPD fails, the deposition of metalized material and the expulsion of conductive gases may cause short circuit of over-current protective device. TVSS devices shall be installed in a separate enclosure on the load side of the over-current device.

Surge Arrestors shall not be contained within service equipment or branch circuit enclosures containing over-current protective devices.

Surge Arrestors are not safety tested to determine their failure mode under abnormal over voltage conditions and are not required to have internal overcurrent or thermal disconnectors.

Panel Meeting Action: Reject

Panel Statement: The recommendation to revise 280.11 is rejected because it is not related to a Proposal 5-274. The recommendation to revise 285.21 is rejected because the panel reaffirms its position that this is a product standards issue.

Number Eligible to Vote: 16

Ballot Results: Affirmative: 16

5-239 Log #104 NEC-P05
(285.21(A)(4) and 280.11)

Final Action: Reject

Submitter: Kenneth J. Brown, Leviton Mfg. Co. Inc.

Comment on Proposal No: 5-274

Recommendation: Add text to read as follows:

285.21 Service Equipment and Branch Circuit Enclosures. TVSS shall not be located within service equipment or branch circuit enclosures that contain over-current protective devices. TVSS devices contain combustible materials that shall not be located internal to service equipment or branch circuit enclosures.

280.11 Surge Arrestors shall be permitted indoors or outdoors. Surge Arrestors shall be made inaccessible by unqualified persons, unless listed for installation in accessible locations.

(A) Service Equipment or Branch Circuit Enclosures. Surge Arrestors shall not be contained within service equipment or branch circuit enclosures containing overcurrent protective devices. Surge Arrestors contain combustible materials that shall not be located internal to enclosures containing overcurrent protective devices.

Substantiation: 285.21 Service Equipment and Branch Circuit Enclosures Circuits Enclosures. If an SPD failed, the combustible material or the conductive gases could cause ignition of the over-current protective device. TVSS devices shall be placed in a separate enclosure on the load side of an over-current protective device. UL 1449 allows the expulsion of conductive gases in the existing pass/fail criteria. Surge Arrestors shall not be contained within service equipment or branch circuit enclosures containing overcurrent protective devices. Surge Arrestors are not safety tested for abnormal over voltages. Surge Arrestors are not typically protected with a thermal cut-off, current limiting fuse or other disconnect.

During the first review of Proposal 5-274, it was noted that this proposal is a "product standard issue" "Section 285.5 required TVSS devices to be listed. The appropriate requirements for TVSS devices and their suitability for use in their intended location are addressed in the product standard."

In the scope of UL 1449 section 1.4 "These requirements cover cord-connected and direct plug-in TVSS intended for indoor use and permanently connected TVSS intended for indoor and outdoor use in accordance with the National Electrical Code, ANSI/NFPA 70, and are intended for installation on the load side of the main overcurrent protection."

The UL 1449 Scope does not specifically address TVSS located inside service equipment or branch circuit enclosures.

The new submitted comment also includes Secondary Surge Arrestors located inside service equipment and Secondary Surge Arrestors are outside the scope of UL 1449.

The existing UL 1449 does not include Abnormal Overvoltage Limited Current Tests higher than 5 amps. The MOV's do not typically ignite until 15 amps or above are applied. The MOV in the related article ignited with 240 VAC 15 amps applied. The NEMA 5VS Technical Committee responded to a request from UL for temporary overvoltage testing and assistance with the short circuit current rating test. The recommendations include higher levels of limited current testing including 100 amps, 500 amps and 1000 amps due to concerns from manufacturers.

UL has not completed the investigation of Abnormal Overvoltage High Current Test or completed the short circuit current rating test specification.

Secondary Surge Arrestors are not included in the UL 1449 standard and they do not meet the same safety requirements as UL 1449 product. Secondary Surge Arrestors do not need to have a disconnect device to pass current UL Standards.

This proposal should be given further consideration.

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

Panel Meeting Action: Reject

Panel Statement: The recommendation to revise 280.11 is rejected because it is not related to a Proposal 5-274. The recommendation to revise 285.21 is rejected because the panel reaffirms its position that this is a product standards issue.

Number Eligible to Vote: 16

Ballot Results: Affirmative: 16

5-240 Log #201 NEC-P05
(285.21(A)(4) and 280.11)

Final Action: Reject

Submitter: Kenneth J. Brown, Leviton Mfg. Co. Inc.

Comment on Proposal No: 5-274

Recommendation: Add text to read as follows:

285.21 Service Equipment and Branch Circuit Enclosures. TVSS shall not be located within service equipment or branch circuit enclosures that contain over-current protective devices. TVSS devices contain combustible materials that shall not be located internal to service equipment or branch circuit enclosures.

280.11 Surge Arrestors shall be permitted indoors or outdoors. Surge Arrestors shall be made to be inaccessible to unqualified persons, unless listed for installation in accessible locations.

(A) Service Equipment or Branch Circuit Enclosures. Surge Arrestors shall not be contained within service equipment or branch circuit enclosures containing over-current protective devices. Surge Arrestors contain combustible materials that shall not be located internal to enclosures containing over-current protective devices.

Substantiation: 285.21 Service Equipment and Branch Circuit Enclosures circuits enclosures. If an SPD failed the combustible material or the conductive gases could cause ignition of the over-current protective device. TVSS devices shall be placed in a separate enclosure on the load side of an over-current protective device. UL 1449 allows the expulsion of conductive gases in the existing pass/fail criteria. Surge Arrestors shall not be contained within service equipment or branch circuit enclosures containing over-current protective devices. Surge Arrestors are not safety tested for abnormal over voltages. Surge Arrestors are not typically protected with a thermal cut-off, current limiting fuse or other disconnect.

Panel Meeting Action: Reject

Panel Statement: The recommendation to revise 280.11 is rejected because it is not related to a Proposal 5-274. The recommendation to revise 285.21 is rejected because the panel reaffirms its position that this is a product standards issue.

Number Eligible to Vote: 16

Ballot Results: Affirmative: 16

5-241 Log #202 NEC-P05
(285.21(A)(4) and 280.11)

Final Action: Reject

Submitter: Bryan Cole, Control Concepts

Comment on Proposal No: 5-274

Recommendation: I support Ken Brown's text as submitted.

Substantiation: I think that it may be more appropriate to locate this in 285.3, Uses not Permitted. Regardless of where the detail is finally determined, I believe that it is not a good practice to install a TVSS device in a panelboard or a switchboard. All TVSS devices should be installed external to areas that incorporate the power distribution systems over-current protective devices. The spacings within a panelboard are determined by UL 67.

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

Panel Meeting Action: Reject

Panel Statement: See panel action and statement on Comment 5-237.

Number Eligible to Vote: 16

Ballot Results: Affirmative: 16