

(Log #1468)

4-4 - (225-3): Accept in Principle  
SUBMITTER: William M. Lewis, Eli Lilly and Co.  
RECOMMENDATION: Change 225-3 to read:

3. Sizing of Outdoor Conductors  
a. 600 volt nominal or less  
The sizing of conductors for outdoor branch circuits shall be based on load as determined by Section 220-3. The sizing of conductors for outdoor feeders shall be based on load as determined by Part B of Article 220.

b. Over 600 volts nominal  
The sizing of conductors for outdoor branch circuits shall be based on load as determined by Section 220-3.

Sizing of conductors for outdoor feeders shall be determined by Section 225-49 (New).  
SUBSTANTIATION: This proposal must be considered in concert with companion proposals to add Sections 225-48 and 225-49. It has long been the practice at utilities and at supervised installations to size feeder conductors based on connected transformer capacity and load characteristics. This proposal addresses these accepted practices.

This proposal was developed by the Task Group based on the Task Group's review and discussion of the current requirements of Articles 225, 230, 100, 110, 240, and 250. This proposal is one of 14 which makes up the Task Group's response to a recommendation by a Task Group on usability in 1995. In considering the needed proposals, emphasis was placed on including in the NEC, practices which are recognized in the electrical industry as necessary for safe installation of over 600 volt systems. This is to provide guidance and direction for installation of these facilities which have not historically been included in the NEC.

The Task Group participants consisted of William M. Lewis (CMP 4); committee chair; Carl J. Fredericks (CMP 10); Tom Adams (CMP 4); John Beck (Chairman CMP 4); Mark Sumrall (CMP 4); Barry Hornberger (CMP 13); William T. Beutler, P.E.; William Long, NEMA.

Interested persons (nonparticipants): Robert J. Pollock (CMP 4 and TCC); Merton Bunker (NFPA); Mark Earley (NFPA)  
PANEL ACTION: Accept in Principle.

Change title of Section 225-3 to read:  
"Calculation of Loads 600 Volts Nominal or Less."

Retain the existing wording of this section.  
PANEL STATEMENT: The change in title clearly identifies that Section 225-3 applies only to calculating loads for systems 600 volts or less. Calculation of loads for systems over 600 volts has been incorporated into Part C (III) of Article 225.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11  
VOTE ON PANEL ACTION:  
AFFIRMATIVE: 11

(Log #2800)

4-5 - (225-3(b)): Reject  
SUBMITTER: George Ritchie, City of Phoenix, AZ  
RECOMMENDATION: Revise text to read:

"Feeder conductors shall have an ampacity not less than required to supply the load as computed in Parts B, C, and D of Article 220."  
SUBSTANTIATION: This would allow the same optional calculations and method for computing farm loads as is already allowed by Article 215-2(a). Currently the NEC does not allow "outside" feeders the same latitude as feeders covered in Article 215 with regard to load calculations.

PANEL ACTION: Reject.  
PANEL STATEMENT: The existing text of 220-10 adequately addresses the submitter's concern.  
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11  
VOTE ON PANEL ACTION:  
AFFIRMATIVE: 11

(Log #708)

4-6 - (225-4 and Exception No. 2 (New)): Reject  
SUBMITTER: Dan Leaf, Palmdale, CA  
RECOMMENDATION: Revise to read as follows:

Conductor Covering. Where within 10 ft (3.05 m) of any building or structure other than supporting poles or towers, open individual (aerial) conductors shall be insulated or covered. Conductors in cables or raceways, except Type MI cable, shall be of the rubber-covered type or thermoplastic type, and, in wet locations, shall comply with Section 310-8. Conductors for festoon lighting shall be of the rubber-covered or thermoplastic type.

Exception No. 1: No change.  
Exception No. 2: Bare conductors shall be permitted in accordance with Section 411-5(c).

SUBSTANTIATION: There is no code table which references open single "covered" conductor data for temperature rating, sunlight resistance, wet location, dimension, material, etc., and they are apparently not a listed product. This creates a problem with Sections 110-2, 110-3, 110-11, 240-3, 310-8, 310-11, raceway fill tables, etc. I believe "covered" conductors in the past applied to one individually encased in asphaltic-impregnated material and commonly referred to as "weatherproof", when the majority of insulated conductors was Type R. This type conductor was widely used for overhead distribution but is seldom used today, and may not even be available. If a covered conductor does not provide insulating qualities why should it be an optional choice for insulation?

Deletion of "in cables or raceways" removes a limitation of insulation type and wet location requirements and implies the requirements to the open individual conductors and also festoon conductors (open or cables) which are not literally covered. It becomes a general requirement which makes the last sentence superfluous.

Exception No. 2 removes a conflict With Section 411-5(c).  
PANEL ACTION: Reject.  
PANEL STATEMENT: There are ampacities provisions for covered conductors in Table 310-21 and Section 310-15(b) (3). Covered conductors are used for installations over 600 volts. The conductors described in the proposed exception are not branch circuit conductors per the Article 100 definition, therefore are not covered in Article 225.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11  
VOTE ON PANEL ACTION:  
AFFIRMATIVE: 11

(Log #352)

4-7 - (225-5): Accept in Principle  
SUBMITTER: Kenneth W. Birringer, University of Michigan/Rep. Univ. of Michigan Facilities Planning and Design  
RECOMMENDATION: Revise to read as follows:

"The ampacity of outdoor branch-circuit and feeder conductors shall be in accordance with Sections 310-15 and 310-60 based on loads ... of Article 220.

SUBSTANTIATION: The existing wording only addresses conductors rated 0-2000 volts. The proposed wording extends the ampacity requirements to conductors rated 2001 to 35,000 volts which often exist in nonutility, inter-building power distribution systems at multi-building campus-style complexes including universities and industrial complexes.  
PANEL ACTION: Accept in Principle.

PANEL STATEMENT: The submitter's concerns have been addressed by the panel's actions on Proposals 4-7a and 4-40b.  
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11  
VOTE ON PANEL ACTION:  
AFFIRMATIVE: 11

(Log #CP401)

4-7a - (225-5): Accept  
SUBMITTER: CMP 4  
RECOMMENDATION: Change title of Section 225-5 to read "Size of Conductors 600 Volts, Nominal or Less."  
Retain the existing wording of this section.

SUBSTANTIATION: The change in title clearly identifies that Section 225-5 applies only to determining conductor ampacities for systems 600 volts or less. Determination of conductor ampacity for systems over 600 volts has been incorporated into Part C (III) of Article 225.  
PANEL ACTION: Accept.  
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11  
VOTE ON PANEL ACTION:  
AFFIRMATIVE: 11

(Log #1051)

4-8 - (225-6): Accept

SUBMITTER: James M. Daly, BICC General

RECOMMENDATION: Revise 225-6(a) as follows:

(1) For 600 volts, nominal, or less, ~~No. 10~~ 10 AWG copper or ~~No. 8~~ 8 AWG aluminum for spans up to 50 ft (15.2 m) in length and ~~No. 8~~ 8 AWG copper or ~~No. 6~~ 6 AWG aluminum for a longer span, unless supported by a messenger wire

(2) For over 600 volts, nominal, ~~No. 6~~ 6 AWG copper or ~~No. 4~~ 4 AWG aluminum where open individual conductors and ~~No. 8~~ 8 AWG copper or ~~No. 6~~ 6 AWG aluminum where in cable  
225-6(b) - change "No. 12" to "12 AWG".

SUBSTANTIATION: To provide consistency throughout the Code. The term "No." is not used in any of the Tables in Chapter 3.

AWG and kcmil are trade size designators specifically authorized for use with the SI system of units in North America. Also, industry practice is to use AWG or kcmil only.

This is one of a series of proposals to make this change throughout the Code.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #15)

4-9 - (225-8): Reject

NOTE: The following proposal consists of Comment 4-4 on Proposal 4-10a in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. The recommendation in Proposal 4-10a was: Revise Section 225-8 to read as follows:

225-8. More than One Building or Other Structure.

(a) Number of Supplies. Where more than one building or other structure is on the same property and under single management, each building or other structure served shall be supplied by one feeder or branch circuit. For the purpose of this section a multiwire branch circuit shall be considered a single circuit.

Exception No. 1: For fire pumps.

Exception No. 2: For emergency, legally required standby, optional standby, or parallel power production systems.

Exception No. 3: By special permission, in multiple-occupancy buildings where there is no available space for supply equipment accessible to all occupants.

Exception No. 4: Where the capacity requirements are in excess of 2000 amperes at a supply voltage of 600 volts or less, or by special permission.

Exception No. 5: By special permission, for a single building or other structure sufficiently large to make two or more supplies necessary.

Exception No. 6: For different characteristics, such as for different voltages, frequencies, or phases, or for different uses, such as for different rate schedules.

Exception No. 7: For large capacity multibuilding industrial installations under single management, where it is ensured that the disconnecting can be accomplished by establishing and maintaining safe switching procedures.

(b) Disconnecting Means. Means shall be provided for disconnecting all ungrounded conductors supplying or passing through the building or structure.

(c) Location. The disconnecting means shall be installed either inside or outside of the building or structure served or where the conductors pass through the building or structure. The disconnecting means shall be at a readily accessible location nearest the point of entrance of the conductors.

Exception No. 1: For large capacity multibuilding industrial installations under single management, where it is ensured that the disconnecting can be accomplished by establishing and maintaining safe switching procedures, the disconnecting means shall be permitted to be located elsewhere on the premises.

Exception No. 2: Buildings or other structures qualifying under the provisions of Article 685.

Exception No. 3: Poles or groups of poles used as lighting standards where disconnecting means are remote.

(d) Maximum Number of Disconnects.

(1) General. The disconnecting means for each supply permitted by (a) above shall consist of not more than six switches or six circuit breakers mounted in a single enclosure, in a group of separate enclosures, or in or on a switchboard. There shall be no more than six disconnects per supply grouped in any one location.

Exception: For the purpose of this section, disconnecting means used solely for the control circuit of the ground-fault protection system, installed as part of the listed equipment, shall not be considered a supply disconnecting means.

(2) Single-Pole Units. Two or three single-pole switches or breakers, capable of individual operation, shall be permitted on multiwire circuits, one pole for each ungrounded conductor, as one multipole disconnect, provided they are equipped with "handle ties" or a "master handle" to disconnect all conductors of the supply with no more than six operations of the hand.

(e) Grouping of Disconnects.

(1) General. The two to six disconnects as permitted in (d) above shall be grouped. Each disconnect shall be marked to indicate the load served.

Exception: One of the two to six disconnecting means permitted in (d) above, where used only for a water pump also intended to provide fire protection, shall be permitted to be located remote from the other disconnecting means.

(2) Additional Disconnecting Means. The one or more additional disconnecting means for fire pumps or for emergency, legally required standby, or optional standby supplies permitted by (a) above shall be installed sufficiently remote from the one to six disconnecting means for normal supply to minimize the possibility of simultaneous interruption of supply.

(3) Access to Occupants. In a multiple-occupancy building, each occupant shall have access to the occupant's supply disconnecting means.

Exception: In a multiple-occupancy building where electric supply and electrical maintenance are provided by the building management and where these are under continuous building management supervision, the disconnecting means supplying more than one occupancy shall be permitted to be accessible to authorized management personnel only.

(f) Suitable for Service Equipment. The disconnecting means specified in (b) above shall be suitable for use as service equipment.

Exception: For garages and outbuildings on residential property, a snap switch or a set of 3-way or 4-way snap switches suitable for use on branch circuits shall be permitted as the disconnecting means.

(g) Identification. Where a building or structure is supplied by more than one feeder or branch circuit, or by any combination of branch circuits, feeders, and services, a permanent plaque or directory shall be installed at each feeder and branch circuit disconnect location denoting all other services, feeders, and branch circuits supplying that building or structure and the area served by each. See Section 230-2(b).

Exception No. 1: A plaque or directory shall not be required for large capacity multibuilding industrial installations under single management, where it is ensured that disconnection can be accomplished by establishing and maintaining safe switching procedures.

Exception No. 2: This identification shall not be required for branch circuits installed from a dwelling unit to a second building or structure.

SUBMITTER: Dan Leaf, Palmdale, CA

RECOMMENDATION: Accept in principle revised as follows:

~~More than One or More Buildings or Other Structures. Where more than one building or other structure is on the same property and under single management, each building or other structure served shall be supplied by not more than one feeder or one branch circuit. For the purpose of this section, a multiwire branch circuit shall be considered a single circuit.~~

SUBSTANTIATION: The requirements of this section do not apply where there is only one building or structure supplied from a remote service such as pedestal type or unit substation, nor where a second building is supplied from one under a different management such as a leased or rented second building.

PANEL ACTION: Reject.

PANEL STATEMENT: The submitter's concerns are covered in the panel's actions on Proposals 4-18 and 4-17a. The panel reaffirms that the concept of single management means the responsible party for the electrical supply system and does not agree that multiple leases or tenants conflicts with the term "single management."

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

NFPA 70 — May 2001 ROP — Copyright 2000, NFPA

(Log #709)

4- 10 - (225-10): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:
Wiring on Buildings. The installation of outside wiring on surfaces of building or other structures shall be permitted for circuits of not over 600 volts, nominal, as open wiring on insulators, as multiconductor Type UF, Type SE Type MC cable, as Type MI cable, as messenger supported wiring...
(remainder unchanged)
SUBSTANTIATION: "Multiconductor cable" is not specific; it can include Type UF and SE, but specificity would be better for code users (see my proposals for Sections 338-3 and 339-3).
PANEL ACTION: Reject.
PANEL STATEMENT: The requirements for the specific wiring methods in Chapter 3 provide adequate guidance and the proposed additional wording does not enhance the understanding of this requirement.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

from windows that are designed to be opened, doors, porches, balconies, ladders, stairs, fire escapes, or similar locations.
Exception: Conductors run above the top level of a window shall be permitted to be less than the 3 ft (914 mm) requirement above.
(2) Vertical Clearance. The vertical clearance of final spans above, or within 3 ft (914 mm) measured horizontally of, platforms, projections, or surfaces from which they might be reached shall be maintained in accordance with Section 225-18.
(3). Building Openings. The overhead branch-circuit and feeder conductors shall not be installed beneath openings through which materials may be moved, such as openings in farm and commercial buildings, and shall not be installed where they will obstruct entrance to these building openings."
Delete the existing Fine Print Note.
SUBSTANTIATION: The panel action is to comply with the NFPA NEC Style Manual. The deletion of the FPN is a result of the panel's action on Proposals 4-44 and 4-45.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #CP410)

4- 10a - (225-18): Accept
SUBMITTER: CMP 4
RECOMMENDATION: In Section 225-18 make the clearance references list items (1)-(4) in accordance with the NFPA NEC Style Manual.
Delete the existing Fine Print Note.
SUBSTANTIATION: The panel action is to comply with the NFPA NEC Style Manual. The deletion of the FPN is a result of the panel's action on Proposals 4-44 and 4-45.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #4100)

4- 11 - (225-18): Reject
SUBMITTER: Robert E. Molde, Northern States Power Co./Rep. Wisconsin Utilities Assn.
RECOMMENDATION: Add new text as follows:
225-18. Clearance from Ground. The vertical clearances of all branch circuit and feeder conductors shall be based on conductor temperature of 60°F (15°C), no wind, with final unloaded sag in the wire, conductor, or cable. Overhead spans of open conductors and open multiconductor cables of not more than 600 volts, nominal, shall conform to the following:
SUBSTANTIATION: It is clear that the clearance requirements for this section is shared with Rule 230-24 Clearances for Service Drop Conductors. The conditions under which measurements are based should be stated in 225-18 as they are in 230-24. To promote consistency within the code, the above wording should be added to eliminate any confusion when installing and tensioning outside branch circuits or feeders.
PANEL ACTION: Reject.
PANEL STATEMENT: The proposed text is not enforceable. The similar wording has been removed from Section 230-24, see panel action on Proposal 4-68a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #CP411)

4- 11a - (225-19(d)): Accept
NOTE: The Technical Correlating Committee understands that the metric values are those accepted in Proposal 4-2.
SUBMITTER: CMP 4
RECOMMENDATION: In Section 225-19(d) amend as follows:
"(D) Final Spans. Final spans of feeders or branch circuits shall comply with (1), (2) and (3).
(1) Clearance From Windows. Final spans to the building they supply or from which they are fed shall be permitted to be attached to the building, but they shall be kept not less than 3 ft (914 mm)

(Log #2912)

4- 12 - (225-19(d)): Reject
SUBMITTER: Donald A. Ganiere, Ottawa, IL
RECOMMENDATION: Delete text as follows:
(d) Final Spans. Final spans of feeders or branch circuits to a building they supply or from which they are fed shall be permitted to be attached to the building, but they shall be kept not less than 3 ft (914 mm) from windows that are designed to be opened, doors, porches, balconies, ladders, stairs, fire escapes, or similar locations. Vertical clearance of final spans above, or within 3 ft (914 mm) measured horizontally of, platforms, projections, or surfaces from which they might be reached shall be maintained in accordance with Section 225-18.
SUBSTANTIATION: Windows are used for fire department access whether they are designed to open or not. Fire departments need clear access to windows for victim rescue, building ventilation, and application of fire streams. Conductors are permitted to be installed in locations that unduly interfere with fire department operations by the existing code wording. Keeping conductors at least 3 ft away from all windows will increase fire fighter safety and will make the placement of ladders for emergency rescue and fire fighting faster.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel reaffirms its position that this section does not apply to fixed glass assemblies. There has been no technical substantiation provided to conclusively support that the placement of the final spans within three feet of windows, which are designed not to be opened, is unsafe.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #710)

4- 13 - (225-21): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Delete this section or revise:
Multiconductor Cables on Exterior Surfaces of Buildings. Supports for multiconductor cables. Cables on exterior surfaces of buildings or other structures shall be supported in accordance with the applicable cable article, as provided in Section 230-51.
SUBSTANTIATION: Editorial. The support requirements for cables, interior or exterior, are specified in the applicable cable articles, as are the requirements for raceways, which are not noted. Present wording does not cover single-conductor cables such as Type MI, nor structures which are not buildings. This article cover feeders and branch circuits; Section 230-51 applies to service conductors.
PANEL ACTION: Reject.
PANEL STATEMENT: The current requirements cover the similar applications between Article 225 and Article 230 for multiconductor cables. The proposal goes beyond editorial and the panel affirms that 230-51 does apply to outside feeders and branch circuits.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

COMMENT ON AFFIRMATIVE:

SUMRALL: I agree with the Panel's Action and statement on this proposal. Over the course of 4 days we, the Panel, addressed 37 such proposals from this submitter. I kept the time expended on this submitter's proposals. Six hours and forty-seven minutes were expended to debate the concerns this submitter asked us to consider. 24.4 percent of all our issues came from this one submitter. Several times, 15 to 25 minutes were used to debate superfluous, smirching proposals.

(Log #121)

(Log #707)

4- 14 - (225-22): Accept in Principle in Part

SUBMITTER: Dan Leaf, Palmdale, CA

RECOMMENDATION: Revise to read as follows:

Raceways on Exterior Surfaces of Building or Other Structures. Raceways, boxes, fittings, and other enclosures in wet locations on exterior surfaces of buildings or other structures shall be raintight and arranged to drain.

SUBSTANTIATION: Raceways on exterior surfaces may be in a damp location rather than wet, per Article 100 definitions of damp and wet locations. Exposed to weather and unprotected will normally be a wet location. The inference is that boxes and fittings are required to be raintight to assure the raintight requirement for raceways. The proposal would correlate with Section 370-15 which requires boxes, conduit bodies, and other fittings to be listed for use, where in wet locations, but does not apply that requirement for damp locations. The proposal would correlate with that section. Other structures are included to apply the requirements to other than buildings.

PANEL ACTION: Accept in Principle in Part.

The panel accepts the addition of the words "or Other Structures" to the title and text of the section.

The panel rejects the remainder of the proposed wording. PANEL STATEMENT: Acceptance of the change to the title and text clarifies the application of this section. It is not necessary to reiterate the requirements of Article 370 for boxes and fittings installed in wet locations.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

4- 16 - (225-26): Accept in Principle

NOTE: It was the action of the Technical Correlating Committee that this Proposal be reconsidered for correlation with the action on Proposal 3-132. This action will be considered by the Panel as a Public Comment.

NOTE: The following proposal consists of Comment 4-35 on Proposal 4-44d in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. The recommendation in Proposal 4-44d was: Delete the exception in its entirety.

SUBMITTER: James T. Pauley, Square D Co.

RECOMMENDATION: The Panel should reject the proposal and keep the exception.

SUBSTANTIATION: The Panel Statement makes note that Article 305 does not provide a variation to the rule. Article 305 never needed a rule to state this because 225-26 had the exception. By deleting the exception the panel has removed the entire permission for this practice without any justification. It is common to run temporary wiring through vegetation and the panel should keep the exception.

PANEL ACTION: Accept in Principle.

Revise this section to read:

"225.26. Vegetation as Support. Vegetation, such as trees, shall be permitted only for the support of temporary wiring, as covered in Article 305."

PANEL STATEMENT: The revised wording incorporates the exception into the main requirement. The panel intends that vegetation be used for support of only temporary branch circuits and feeders.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 10

NEGATIVE: 1

EXPLANATION OF NEGATIVE:

SUMRALL: In the era of temporary this and temporary that, many exceptions to the reference of Chapter 3 are extended beyond the time tables. This will eventually cause 90-1 to become ineffective for the Authority Having Jurisdiction and cause injury to wandering children and uninformed adults.

(Log #1488)

(Log #120)

4- 15 - (225-26): Reject

NOTE: It was the action of the Technical Correlating Committee that this Proposal be reconsidered for correlation with the action on Proposal 3-132. This action will be considered by the Panel as a Public Comment.

NOTE: The following proposal consists of Comment 4-34 on Proposal 4-44d in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. The recommendation in Proposal 4-44d was:

Delete the exception in its entirety.

SUBMITTER: Melvin K. Sanders, TECo., Inc.

RECOMMENDATION: CMP 3 Task Group supports the Panel Action of CMP 4 to delete the present Exception.

SUBSTANTIATION: It is the position of CMP 3 Task Group Raymond W. Weber, Richard P. Owen and Melvin K. Sanders, Secretary, on ROP 4-44(d) that it is within the purview of CMP 4 to determine the support requirements for wiring methods in Article 225.

PANEL ACTION: Reject.

PANEL STATEMENT: The panel affirms its position that there are applications under the purview of Article 305 where the support of temporary branch circuits or feeders by vegetation is appropriate.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

4- 17 - (225-26, Exception): Reject

NOTE: It was the action of the Technical Correlating Committee that this Proposal be reconsidered for correlation with the action on Proposal 3-132. This action will be considered by the Panel as a Public Comment.

SUBMITTER: Craig Schumann, Dept. of Energy

RECOMMENDATION: The exception should be deleted in that there is nothing in Article 305 that discusses vegetation.

SUBSTANTIATION: There is nothing in Article 305 that discusses vegetation.

PANEL ACTION: Reject.

PANEL STATEMENT: The panel affirms its position that there are applications under the purview of Article 305 where the installation of temporary branch circuits or feeders in vegetation is appropriate.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #CP402)

4- 17a - (225-30): Accept

SUBMITTER: CMP 4

RECOMMENDATION: Modify Section 225-30 to read:

"Where more than one building or other structure is on the same property and under single management, each additional building or other structure served, that is on the load side of the service disconnecting means, shall be supplied by one feeder or branch circuit unless permitted in (a) through (e). For the purpose of this section, a multiwire branch circuit shall be considered a single circuit."

SUBSTANTIATION: The panel's action clarifies that assemblies such as service pedestals, substations, or similar equipment are considered to be structures. Structures are an assembly of parts or components arranged in a logical form or manner for a useful purpose. This action also clarifies that this section is applicable to buildings or other structures supplied by circuits on the load side of the service disconnecting means.

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**PANEL ACTION:** Accept.  
**NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE:** 11  
**VOTE ON PANEL ACTION:**  
**AFFIRMATIVE:** 11

(Log #711)

4- 18 - (225 Part B, and 225-30): Reject  
**NOTE:** The Technical Correlating Committee directs that the Panel clarify the Panel Action on this Proposal. This action will be considered by the Panel as a Public Comment.  
**SUBMITTER:** Dan Leaf, Palmdale, CA  
**RECOMMENDATION:** Revise to read as follows:

**Part B. More than One or More Buildings or Other Structures.**  
Number of Supplies. ~~Where more than one building or structure is on the same property and under single management each~~ Each building or structure served, other than a service or meter pedestal, unit substation, or the like, shall be supplied by one feeder or branch circuit unless otherwise permitted in (a) through (e) below. For the purpose of this section a multiwire branch circuit shall be considered a single circuit.

**SUBSTANTIATION:** The requirements of this section do not apply where there is only one building or structure on the property, nor where a second building is supplied from one under different management, such as a leased second building, nor where one of the buildings is on different property. The requirement for single management and same property do not appear to be relevant to electrical safety if other pertinent code rules are observed, and such considerations may be better left to other codes and regulations.

In Comment 4-4 in the 1998 ROC, the panel indicated service pedestals and structures. Literally true perhaps, but not in the context of apparent intent of this section. They would be electrically served, but if the supply is service conductors, not served by one feeder or branch circuit.

**PANEL ACTION:** Reject.  
**PANEL STATEMENT:** The panel actions on Proposals 4-9 and 4-17a address the submitter's concerns. The panel clarifies through its action that Part A covers a single structure and Part B covers multiple structures, including service pedestals and similar electrical equipment. The submitter's concerns are adequately covered by the existing text in Part B of Article 225.

**NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE:** 11  
**VOTE ON PANEL ACTION:**  
**AFFIRMATIVE:** 11

(Log #CP416)

4- 18a - (225-30(a)(4)): Accept  
**NOTE:** The Technical Correlating Committee directs that the Panel clarify the Panel Action on this Proposal. There is presently no definition for "Standby Systems." This action will be considered by the Panel as a Public Comment.

**SUBMITTER:** CMP 4  
**RECOMMENDATION:** Amend the text in 225-30(a)(4) to read:  
(4) Standby systems.

**SUBSTANTIATION:** The panel's action clarifies that a standby system is permissible. This action eliminates the confusion with Article 702 requirements.

**PANEL ACTION:** Accept.  
**NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE:** 11  
**VOTE ON PANEL ACTION:**  
**AFFIRMATIVE:** 11

(Log #4398)

4- 19 - (225-30(a)(6) (New) ): Reject  
**SUBMITTER:** Monte R. Ewing, State of Wisconsin  
**RECOMMENDATION:** Add new paragraph (6) to read as follows:

(6) Multi-occupancy buildings or structures related in use to multi-family dwellings shall be permitted to have one set of branch circuit conductors installed from a dwelling unit to the second building or structure's occupied space.

**SUBSTANTIATION:** This has always been common practice for individual dwelling branch circuits to be installed to the matching detached garage stall in compliance with NEC 210-25. The present language in 225-30 does not provide for this common wiring method. The provision in 225-30(b)(1) would only apply when

there is no common place on the building where the tenant disconnects could be grouped. With detached garages that is almost never the problem. The problem to avoid is multiple branch circuits and disconnects all being grouped at one place rather than one per tenant space similar to service conductors NEC 230-40 Exception No. 1. The provision to install individual branch circuit conductors to respective detached garage units has been incorporated into the State of Wisconsin Electrical Code and I feel that it needs to be addressed in the National Electrical Code.  
**PANEL ACTION:** Reject.

**PANEL STATEMENT:** To permit this application without limitation on the number of branch circuits to a building or structure raises concerns over the location of multiple individual disconnecting means. The submitter's proposed language implies that the disconnecting means will be located in the individual spaces in the detached structure. This type of installation could pose a problem for emergency personnel where it is necessary to disconnect all power.

**NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE:** 11  
**VOTE ON PANEL ACTION:**  
**AFFIRMATIVE:** 11

(Log #2171)

4- 20 - (225-30(b)): Accept  
**SUBMITTER:** Roland L. Comeau, Intermountain Power Service Corp.  
**RECOMMENDATION:** Revise to read as follows:

By special permission, additional feeders or branch circuits shall be permitted for the following:

**SUBSTANTIATION:** This is not a complete sentence like 225-30(a). Revise the subsection to make it a complete sentence. This change will also provide parallel construction in accordance with the NEC Style Manual 3.3.5 which states, "Parallel Construction means stating similar requirements in similar ways for greater consistency."

**PANEL ACTION:** Accept.  
**NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE:** 11  
**VOTE ON PANEL ACTION:**  
**AFFIRMATIVE:** 11

(Log #4169)

4- 21 - (225-30(e)): Reject  
**SUBMITTER:** Frederic P. Hartwell, Hartwell Electrical Services, Inc./Rep. Massachusetts Electrical Code Advisory Committee  
**RECOMMENDATION:** Revise as follows:

"Additional feeders or branch circuits shall be permitted to supply large capacity multibuilding industrial or institutional installations under single management where documented safe switching procedures are established and maintained for disconnection."

**SUBSTANTIATION:** The new 1999 NEC rule allows multiple supplies on a far broader range of buildings and structures that was ever properly substantiated, the only limitation being safe switching procedures as interpreted by the authority having jurisdiction. The concept in the original proposal simply involved expanding industrial to industrial plus institutional, which was appropriate. The 1999 NEC is far too broad given the multiplicity of jurisdictions subject to the NEC. Note that the use of this language to justify additional sources of supply [new Section 225-30(e)] is a new concept that goes beyond the traditional allowance for remote switching (to be in Section 225-32 Exception No. 2). This limitation has been in the Massachusetts Electrical Code for ten months with no reported objections.

**PANEL ACTION:** Reject.  
**PANEL STATEMENT:** The submitter has not provided sufficient technical substantiation to disallow or not permit applications of these requirements wherever documented safe switching procedures are established and maintained.

**NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE:** 11  
**VOTE ON PANEL ACTION:**  
**AFFIRMATIVE:** 11

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(Log #3937)

4- 22 - (225-30(f)): Reject

SUBMITTER: William F. Laidler, South Shore Voc Tech School  
RECOMMENDATION: Add a new paragraph (f) to read as follows:

(f) One and Two Family Dwellings. For one and two family dwellings additional feeders or branch circuits shall be permitted to supply other buildings (such as garages and outbuildings) on the property. Where such installations comply with Section 250-32(a) and do not exceed six branch circuits the documented safe switching procedures of Section 225-30(e) need not be established. SUBSTANTIATION: The present wording is commonly interpreted to restrict multiple branch circuits from supplying out buildings on residential property such as garages and sheds. Section 250-32(a) recognizes the practice of one or more branch circuits supplying a second building without regard to type of occupancy. Under these situations if only one branch circuit supplies a structure and has provisions for equipment grounding a grounding electrode is not required. For residential properties it is very common to add branch circuits to such structures over a period of time. Limiting this practice (without reported safety issues) would be economically restrictive.

PANEL ACTION: Reject.

PANEL STATEMENT: The submitter has not substantiated that the existing Code text has had a limiting effect for these types of structures. The installation of a feeder with subsequent redistribution is a commonly used option. The panel intends that there be a limit on the number of branch circuits to a detached building or structure.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #CP404)

4- 22a - (225-31 and 225-32): Accept

NOTE: The Technical Correlating Committee directs that the word "utilized" be changed to "used" in accordance with the NEC Style Manual.

SUBMITTER: CMP 4

RECOMMENDATION: Combine Sections 225-31 and 225-32. The revised text incorporates the accepted actions in Proposals 4-24, 4-25, and 4-27.

Revise text to read:

"225-31. Disconnecting Means. Means shall be provided to disconnect all ungrounded conductors that supply or pass through a building or structure in accordance with (1) and (2).

(1) Readily Accessible Location. The branch circuit or feeder disconnecting means shall be installed at a readily accessible location in accordance with (a) or (b).

(a) Outside. Where the branch circuit or feeder disconnecting means is installed outside a building or structure it shall be on or within sight of the building or structure supplied.

(b) Inside. Where the branch circuit or feeder disconnecting means is installed inside, it shall be nearest the point of entrance of the supply conductors.

(2) Conductors Considered Outside. For the purposes of this section, the requirements of Section 230-6 shall be permitted to be used."

Modify Exception No. 1 (Proposal 4-25), maintain existing Exceptions Nos. 2-4, and add new Exception No. 5 (Proposal 4-27).

SUBSTANTIATION: The proposed wording provides clarity, resolves concerns relative to the location of disconnects and resolves the issue that conductors considered outside of a building per 230-6 do not require a disconnect.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 10

NEGATIVE: 1

EXPLANATION OF NEGATIVE:

CARRICK: This Panel's intent for outside locations was that the disconnect should be within sight of the building and within 50 ft. It was thought that the definition of "within sight of" would specify the 50 ft limit; however, the definition in Article 100 is for two pieces of equipment. A building is usually not considered a piece of equipment. This proposal would be acceptable if the words "and within 50 ft" were added after "within sight".

(Log #2054)

4- 23 - (225-31, Exception): Accept in Principle

SUBMITTER: Joel A. Rencsok, Scottsdale, AZ

RECOMMENDATION: Add an Exception to read as follows:

Exception: Where the ungrounded conductors comply with Section 230-6.

SUBSTANTIATION: Fire pump feeders or services that pass under or through a building should not have disconnects or overcurrent protection installed in the feeder or service where large complexes need these requirements.

Emergency power circuits should have this same exception.

By allowing the exception requirements in section 225-32 does not allow exception to 225-31.

The compliance to Article 695-4 will be complied with out having a conflict since this article does not exempt Article 225.

See also Section 695-4(b) for only supervised systems.

PANEL ACTION: Accept in Principle.

PANEL STATEMENT: The panel action on Proposal 4-22a

adequately address the submitter's concerns.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #1818)

4- 24 - (225-32): Accept in Principle

NOTE: The Technical Correlating Committee directs that the Panel clarify the Panel Action on this Proposal as it relates to Proposal 4-22a. This action will be considered by the Panel as a Public Comment.

SUBMITTER: Brad Spencer, Burgess & Niple, Ltd.

RECOMMENDATION: Revise to read as follows:

The disconnecting means shall be installed either inside or outside of the building or structure served or where conductors pass through the building or structure or inside nearest the point of entrance of the conductors. The disconnecting means shall be at a readily accessible location nearest the point of entrance of the conductors. For the purposes of this section, the requirements in Section 230-6 shall be permitted to be utilized.

SUBSTANTIATION: The existing text leads one to conclude that the disconnecting means, if installed outside, must be located nearest the point of entrance of the conductors. Situations sometimes arise in which the best location for the outdoor disconnecting means is not necessarily nearest the best point of entrance of the conductors. For example, one may want to place a disconnecting means on the front of a structure but run the conductors along the outside of the structure and enter from another side. The current wording unnecessarily restricts the designer or installer from doing this. Furthermore, the proposed change to the text will make it similar to Article 230, Section 70(a) which deals with the location of service equipment disconnecting means.

PANEL ACTION: Accept in Principle.

Amend the proposal to read:

"The disconnecting means shall be installed at a readily accessible location either outside of the building or structure or inside nearest the point of entrance of the conductors. For the purposes of this section, the requirements of Section 230-6 shall be permitted to be utilized."

PANEL STATEMENT: The panel agrees in principle with the submitter's proposed text and has reworded it to enhance clarity.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #2326)

4- 25 - (225-32 Exception No. 1): Accept

NOTE: The Technical Correlating Committee directs that the Panel clarify the Panel Action on this Proposal as it relates to Proposal 4-22a. This action will be considered by the Panel as a Public Comment.

SUBMITTER: Mark Ptashkin, City of Phoenix, AZ

RECOMMENDATION: Add the following underlined text.

Exception No. 1: For installations under single management, where documented safe switching procedures are established and maintained for disconnection, and where the installation is monitored by qualified individuals, the disconnecting means shall be permitted to be located elsewhere on the premises.

**SUBSTANTIATION:** The exception was modified in the last code cycle to include any facility that could establish safe switching procedures. Prior to this change, only industrial facilities enjoyed this benefit, mainly due to its having a staff of qualified individuals that were familiar with the installation and could ensure that safe switching procedures were followed. Unfortunately it does not appear that same criteria carried over from the previous code. Generally speaking, for a facility to qualify for this exception prior to the 1999 NEC, it would have had a staff of qualified individuals. Presently there is no requirement for a qualified staff, which could quite easily lead to unsafe switching procedures or none at all. To assure safe switching procedures it is crucial for a qualified individual to be on staff at all times, otherwise there is no mechanism to assure that any procedure could be followed by an individual not familiar with the installation.  
**PANEL ACTION:** Accept.  
**NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE:** 11  
**VOTE ON PANEL ACTION:**  
**AFFIRMATIVE:** 11

(Log #4170)

4-26 - (225-32 Exception No. 1): **Reject**  
**SUBMITTER:** Frederic P. Hartwell, Hartwell Electrical Services, Inc./Rep. Massachusetts Electrical Code Advisory Committee  
**RECOMMENDATION:** Revise as follows:  
"For large capacity multibuilding industrial or institutional installations under single management where documented safe switching procedures are established and maintained for disconnection, the disconnecting means shall be permitted to be located elsewhere on the premises."  
**SUBSTANTIATION:** The major 1999 NEC expansion of the rule allows multiple supplies on a far broader range of buildings and structures that was ever properly substantiated, the only limitation being safe switching procedures as interpreted by the AHJ. The concept in the original proposal simply involved expanding industrial to industrial plus institutional, which was appropriate. The 1999 NEC is far too broad given the multiplicity of jurisdictions subject to the NEC. It potentially reaches a single-family house with a detached garage, which is rather far afield from the limitation to "large capacity multibuilding industrial," a limitation that had been in the Code since it first appeared in the 1984 edition. This limitation has been in the Massachusetts Electrical Code for ten months with no reported objections.  
**PANEL ACTION:** **Reject.**  
**PANEL STATEMENT:** The submitter has not provided sufficient technical substantiation to disallow or not permit applications of these requirements wherever documented safe switching procedures are established and maintained.  
**NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE:** 11  
**VOTE ON PANEL ACTION:**  
**AFFIRMATIVE:** 11

(Log #434)

4-27 - (225-32 Exception No. 5 (New) ): **Accept**  
**NOTE:** The Technical Correlating Committee directs that the Panel clarify the Panel Action on this Proposal as it relates to Proposal 4-22a. This action will be considered by the Panel as a Public Comment.  
**SUBMITTER:** C. John Beck, Pacific Gas & Electric Co.  
**RECOMMENDATION:** Add new Exception No. 5 to 1999 NEC Section 225-32, to read as follows:  
Exception No. 5: For outdoor emergency, legally required standby, or optional standby generator sets, the disconnecting means, when listed as suitable for use as service equipment, shall be permitted to be located at the generator set.  
**SUBSTANTIATION:** A98 ROC Comment 4-14 was held in accordance with Section 3-4.6.2.2 NFPA Regulations Governing Committee Projects. The Technical Correlating Committee requested that a Task Group of members of Panels 4 and 15 review this issue and develop an agreed upon proposal for the 2002 NEC Development Cycle. The above proposal was developed by the Task Group based on the Task Group's review and discussion of the current requirements of Article 225 regarding location and suitability for use as service equipment, NEC Section 225-32, the original Comment 4-14 (NFPA 70-A98 ROC), and the State of Wisconsin documentation (as submitted by Mr. Bey to NFPA). The above proposal is the Task Group's response to Comment 4-14

(NFPA 70 - A98 ROC), identifies and addresses the issues raised by both Mr. Bey and the state of Wisconsin, maintains consistency with the current requirements of Article 225, and fulfills the direction of the Technical Correlating Committee. The proposal recognizes the need to permit a disconnecting means to be located at an outdoor generator set and establishes the requirement for that installation.  
The Task Group participants consisted of:  
Tom Adams (CMP 4); Peter Amos (CMP 15); John Beck (Chairman CMP 4 & Task Group Chair); Bob Duncan (Chairman, CMP 15); John Kovacic (CMP 15); Bill Lewis (CMP 4); and, Mark Sumrall (CMP 4).  
Note: Supporting material is available for review at NFPA Headquarters.  
**PANEL ACTION:** **Accept.**  
**NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE:** 11  
**VOTE ON PANEL ACTION:**  
**AFFIRMATIVE:** 11

(Log #712)

4-28 - (225-33(a), Exception): **Accept**  
**SUBMITTER:** Dan Leaf, Palmdale, CA  
**RECOMMENDATION:** Revise to read as follows:  
Exception: For the purposes of this section, disconnecting means used solely for the control circuit of the ground-fault protection system, or the control circuit of the power-operated supply disconnecting means, installed as part of the listed equipment, shall not be considered a supply disconnecting means.  
**SUBSTANTIATION:** Disconnects for control circuits of power-operated supply disconnecting means are a reasonable inclusion with GFPE system disconnects.  
**PANEL ACTION:** **Accept.**  
**NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE:** 11  
**VOTE ON PANEL ACTION:**  
**AFFIRMATIVE:** 11

(Log #16)

15-3 - (225-34(b)): **Accept in Principle in Part**  
**NOTE:** It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 4 for information.  
**NOTE:** The following proposal consists of Comment 4-14 on Proposal 4-10a in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. The recommendation in Proposal 4-10a was:  
Revise Section 225-8 to read as follows:  
225-8. More than One Building or Other Structure.  
(a) Number of Supplies. Where more than one building or other structure is on the same property and under single management, each building or other structure served shall be supplied by one feeder or branch circuit. For the purpose of this section a multiwire branch circuit shall be considered a single circuit.  
Exception No. 1: For fire pumps.  
Exception No. 2: For emergency, legally required standby, optional standby, or parallel power production systems.  
Exception No. 3: By special permission, in multiple-occupancy buildings where there is no available space for supply equipment accessible to all occupants.  
Exception No. 4: Where the capacity requirements are in excess of 2000 amperes at a supply voltage of 600 volts or less, or by special permission.  
Exception No. 5: By special permission, for a single building or other structure sufficiently large to make two or more supplies necessary.  
Exception No. 6: For different characteristics, such as for different voltages, frequencies, or phases, or for different uses, such as for different rate schedules.  
Exception No. 7: For large capacity multibuilding industrial installations under single management, where it is ensured that the disconnecting can be accomplished by establishing and maintaining safe switching procedures.  
(b) Disconnecting Means. Means shall be provided for disconnecting all ungrounded conductors supplying or passing through the building or structure.  
(c) Location. The disconnecting means shall be installed either inside or outside of the building or structure served or where the

conductors pass through the building or structure. The disconnecting means shall be at a readily accessible location nearest the point of entrance of the conductors.

Exception No. 1: For large capacity multibuilding industrial installations under single management, where it is ensured that the disconnecting can be accomplished by establishing and maintaining safe switching procedures, the disconnecting means shall be permitted to be located elsewhere on the premises.

Exception No. 2: Buildings or other structures qualifying under the provisions of Article 685.

Exception No. 3: Poles or groups of poles used as lighting standards where disconnecting means are remote.

(d) Maximum Number of Disconnects.

(1) General. The disconnecting means for each supply permitted by (a) above shall consist of not more than six switches or six circuit breakers mounted in a single enclosure, in a group of separate enclosures, or in or on a switchboard. There shall be no more than six disconnects per supply grouped in any one location.

Exception: For the purpose of this section, disconnecting means used solely for the control circuit of the ground-fault protection system, installed as part of the listed equipment, shall not be considered a supply disconnecting means.

(2) Single-Pole Units. Two or three single-pole switches or breakers, capable of individual operation, shall be permitted on multiwire circuits, one pole for each ungrounded conductor, as one multipole disconnect, provided they are equipped with "handle ties" or a "master handle" to disconnect all conductors of the supply with no more than six operations of the hand.

(e) Grouping of Disconnects.

(1) General. The two to six disconnects as permitted in (d) above shall be grouped. Each disconnect shall be marked to indicate the load served.

Exception: One of the two to six disconnecting means permitted in (d) above, where used only for a water pump also intended to provide fire protection, shall be permitted to be located remote from the other disconnecting means.

(2) Additional Disconnecting Means. The one or more additional disconnecting means for fire pumps or for emergency, legally required standby, or optional standby supplies permitted by (a) above shall be installed sufficiently remote from the one to six disconnecting means for normal supply to minimize the possibility of simultaneous interruption of supply.

(3) Access to Occupants. In a multiple-occupancy building, each occupant shall have access to the occupant's supply disconnecting means.

Exception: In a multiple-occupancy building where electric supply and electrical maintenance are provided by the building management and where these are under continuous building management supervision, the disconnecting means supplying more than one occupancy shall be permitted to be accessible to authorized management personnel only.

(f) Suitable for Service Equipment. The disconnecting means specified in (b) above shall be suitable for use as service equipment.

Exception: For garages and outbuildings on residential property, a snap switch or a set of 3-way or 4-way snap switches suitable for use on branch circuits shall be permitted as the disconnecting means.

(g) Identification. Where a building or structure is supplied by more than one feeder or branch circuit, or by any combination of branch circuits, feeders, and services, a permanent plaque or directory shall be installed at each feeder and branch circuit disconnect location denoting all other services, feeders, and branch circuits supplying that building or structure and the area served by each. See Section 230-2(b).

Exception No. 1: A plaque or directory shall not be required for large capacity multibuilding industrial installations under single management, where it is ensured that disconnection can be accomplished by establishing and maintaining safe switching procedures.

Exception No. 2: This identification shall not be required for branch circuits installed from a dwelling unit to a second building or structure.

SUBMITTER: Lawrence A. Bey, Onan Corp.

RECOMMENDATION: Add new text to read:

Exception No. 4: Outdoor emergency and legally required standby generator sets where disconnecting means are located at the generator set.

SUBSTANTIATION: Where emergency and standby generators are outdoors and have circuit breakers at the generator, an additional disconnecting means nearest the point of entrance of the conductors introduces a single point of failure. Standard practice for the reliability of a simple system is to feed a distribution panel or automatic transfer switch directly from the generator. Most outdoor generator sets are located close to the building they serve, typically

within 25 feet. Refer to the letter from the State of Wisconsin, Safety and Building Division.

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

PANEL ACTION: Accept in Principle in Part.

Add new text to 225-32 read:

Exception No. 5: For outdoor emergency, legally required standby, or optional standby generator sets, the disconnecting means when listed as being suitable for use as service equipment, shall be permitted to be located at the generator set.

PANEL STATEMENT: The panel agrees with the revised text as developed by the joint CMP 4 and CMP 15 task group. The revised text meets the intent of the submitter. The intent of the exception is to permit the disconnect to be located at the generator provided that the location is readily accessible nearest the point of entrance of the conductors.

The part rejected is the location of the code. The requirement belongs in 225-32 not 225-34.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21

VOTE ON PANEL ACTION:

AFFIRMATIVE: 21

(Log #3147)

4-29 - (225-36): Reject

SUBMITTER: Michael Krumnauer, Vasso, MI

RECOMMENDATION: Add to the end of the first section:

"Where the supply conductors are not protected on the supply end with overcurrent protection meeting the requirements of Section 240-3."

SUBSTANTIATION: There is no need to place a restrictive condition on a disconnect on the load end of a feeder just because it supplies another building.

PANEL ACTION: Reject.

PANEL STATEMENT: Section 225-36 does not require redundant overcurrent protection for the supply conductors at the building disconnecting means. This section only requires a specific listing of the equipment. The term "suitable for use as service equipment" does not imply that overcurrent protection is mandatory.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #4286)

4-30 - (225-36): Accept

SUBMITTER: Charles F. Mello, Milwaukie, OR

RECOMMENDATION: Revise as follows:

Where the installation is made in accordance with Section 250-32(b)(2) †The disconnecting means specified in Section 225-31 shall be suitable for use as service equipment.

SUBSTANTIATION: The standard to qualify a disconnecting means as suitable for service equipment has basically three provisions. First there must be a barrier between the unfused "service" conductors and the conductors protected by the "service overcurrent protection." This is commonly referred to as separation of unfused with protected conductors or wire. Second, is that provisions are provided for connecting a grounding electrode conductor and third is that provisions are made to bond the grounded circuit conductor to the enclosure and equipment grounding conductors with a "main bonding jumper." When the definition of service was changed in the 1987 code, then the circuit to a second building became a feeder all the way and was no longer a "service." This required many of the requirements from Article 230 to be moved to Article 225 over several code cycles since this circuit was a feeder. In making these revisions and with the confusion on how the old Section 250-24 was written, the requirement to make the disconnect rated as suitable for service equipment had some reason. With the 1999 Section 250-32 clarifying when grounding and bonding is required on the grounded circuit conductor, this section needs to be updated. With regard to what the rated equipment provides: 1) the feeder conductors are in fact not "unfused" like a service since they must be protected as required by the NEC. In addition, the product standards for disconnects (fused switches and enclosed circuit breakers) have a line side lug barrier provided. The ability to install a grounding electrode connection to the enclosure is provided in disconnecting means that are not service equipment rated. Lastly, bonding of the grounded circuit conductor (neutral) is only allowed

in limited case by Section 250-32(b)(2) in the 1999 NEC. Many incorrect installations take place because the main bonding jumper provided with service rated equipment is inadvertently installed because it was supplied. Strict enforcement of this requirement has caused many installations to purchase specially rated equipment that was not really required. For example, an industrial or commercial installation with a feeder going to a MCC in a pump building, the MCC was required to be rated for service equipment even though the feeder was only three phase three wire from a system that was high impedance grounded. Because this was caught in the field, the modification expense and then reevaluation by the testing laboratory delayed the work, caused unneeded expense and did not provide any additional safety. This modification to this section will define when equipment rated as suitable for service entrance is needed and when standard disconnecting means, not rated for service entrance can be utilized.

PANEL ACTION: Accept.  
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11  
VOTE ON PANEL ACTION:  
AFFIRMATIVE: 11

(Log #713)

4-31 - (225-36, Exception): Accept in Principle  
SUBMITTER: Dan Leaf, Palmdale, CA  
RECOMMENDATION: Revise to read as follows:

Exception: For garages and outbuildings on residential property a snap switch(es), including ~~or a set of~~ 3-way and 4-way snap switches types shall be permitted as the disconnecting means.  
SUBSTANTIATION: Editorial. Section 225-33 permits up to six switches; "a" snap switch (singular) and a "set" (singular) of 3-way or 4-way switches infer that up to six sets of single throw snap switches or six sets of 3-way/4-way switches or a combination of such switches are not permitted.

PANEL ACTION: Accept in Principle.  
PANEL STATEMENT: The submitter's concerns are addressed by the panel's action on Proposal 4-35a.  
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11  
VOTE ON PANEL ACTION:  
AFFIRMATIVE: 11

(Log #3854)

4-32 - (225-36, Exception): Reject  
SUBMITTER: J. Philip Simmons, Olympia, WA  
RECOMMENDATION: Revise as follows:

225-36. Suitable for Service Equipment. The disconnecting means specified in Section 225-31 shall be suitable for use as service equipment.

Exception: For garages and outbuildings at a ~~one-family dwelling on residential property~~, a snap switch ~~or a set of~~ 3-way or 4-way snap switches suitable for use on branch circuits shall be permitted as the disconnecting means.

SUBSTANTIATION: The term "residential property" is not defined in Article 100, is far too broad and can include large apartment complexes. Some interpret the term to apply to any property where a person may "reside" which includes hotels and motels.

It seems the present permission to use a set of 3-way or 4-way switches for the disconnecting means at a garage or outbuilding violates the concept of disconnection of power at the building for safety where one may be working on an electrical system. The 3-way or 4-way switch at a remote location can accidentally be operated which will energize the system being worked on and create a safety hazard. It should not be necessary to show a body count or history of electric shock incidents to recognize that this change in the code is necessary.

PANEL ACTION: Reject.  
PANEL STATEMENT: The submitter has not provided any accident data to support the elimination of a long standing Code requirement, nor has he provided substantiation for the limitation to one-family dwellings.  
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11  
VOTE ON PANEL ACTION:  
AFFIRMATIVE: 11

(Log #2327)

4-33 - (225-36 Exception No. 2 (New) ): Accept in Principle

SUBMITTER: Mark Ptashkin, City of Phoenix, AZ

RECOMMENDATION: Add a new Exception as follows:

Exception No 2: The disconnecting means shall not be required to be configured as service equipment.

SUBSTANTIATION: There is presently much confusion about this section's requirement to be suitable for use as service equipment. Much of it stems from why this requirement exists to how the disconnect(s) to a second building must be installed.

Many manufacturers, designers, and code officials believe this section requires the disconnect(s) at a second building must be installed as if it were a service. In some aspects this is correct, such as the electrodes at the second building, but in many situations this does not make sense. As an example; A 277/480 volt wye electrical service entrance section with a 3000 ampere main switch with Ground Fault Protection (GFP) serves a 1600 amp feeder to a second building disconnect. The disconnect at the second building must be suitable for use as service equipment, but does it mean that it must have GFP (because it must be installed as service equipment) at that second building in spite of 215-10? The installation of GFP at the second building would not seem to be required due to 215-10, but since the equipment must be suitable for use as service equipment, many believe that if it were to have a single main, the main must have GFP because of requirements of 230-95 for services. It also has been argued that the nationally recognized test labs will not label such a piece of equipment to be suitable for use as service equipment without the main having GFP.

Requiring GFP in this example does not seem to provide any additional safety to the electrical system, in fact it may harm the system by nullifying the upstream GFP if it is not installed correctly, or a designer may elect to use the six switch rule to be used. In either case it seems that these two situations may be less desirable than having a single main without GFP.

Is it the intent of the present article to require all disconnects for a second building/structure to have all of the miscellaneous parts required by the manufacturer for a service to be installed, or was it the intent that this equipment was to merely be suitable for use as service equipment so that any and all necessary and or required equipment could easily be added at the time of installation?

The intent of this proposal is to show that the equipment must be suitable for use as service equipment, the disconnecting means is not mandated to have all of the requisite equipment to be used as service equipment. If the proposal is rejected it will show that the intent of this article is to require all of the equipment that falls under it, to be installed as service equipment.

PANEL ACTION: Accept in Principle.  
PANEL STATEMENT: The submitter's concern has been addressed by the panel's action on Proposal 4-30. The requirement is now required only under the conditions specified by Section 250-32(b)(2).

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11  
VOTE ON PANEL ACTION:  
AFFIRMATIVE: 11

(Log #2328)

4-34 - (225-36 Exception No. 2 (New) ): Reject

SUBMITTER: Mark Ptashkin, City of Phoenix, AZ

RECOMMENDATION: Add a new Exception as follows:

Exception No. 2: Ground Fault Protection shall not be required where ground-fault protection of equipment is provided on the supply side of the feeder.

SUBSTANTIATION: Ground Fault Protection should not be required at this disconnect if it already has protection upstream. This would parallel the exceptions in 215-10 and 240-13.

PANEL ACTION: Reject.  
PANEL STATEMENT: The submitter's concerns are currently addressed by Sections 215-10 Exception No. 3 and 240-13 (2).  
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11  
VOTE ON PANEL ACTION:  
AFFIRMATIVE: 11

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(Log #CP408)

4- 34a - (225-37): Accept  
SUBMITTER: CMP 4

RECOMMENDATION: In Section 225-37 delete the last sentence  
"See Section 230-2(e)."

SUBSTANTIATION: The action is taken to comply with the NFPA  
NEC Style Manual.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #714)

4- 35 - (225-37): Reject

SUBMITTER: Dan Leaf, Palmdale, CA

RECOMMENDATION: Revise to read as follows:

Identification. Where a building or structure is supplied by more than one feeder or branch circuit has or any combination of feeders, branch circuits, or services passing through it or supplying it, a permanent plaque or directory shall be installed at each feeder or branch-circuit disconnect location specified in Section 225-32 (excluding the exceptions) denoting all other services feeders, or branch circuits supplying that building or structure and the area served by each. See Section 230-2(e).

This section shall not apply to disconnect locations immediately adjacent to each other.

Exception No. 1: No change.

Exception No. 2: This identification shall not be required for branch circuits from a dwelling unit to a second building or structure.

SUBSTANTIATION: Editorial. The first sentence is revised to conform to the clearer wording of the 1996 NEC; two or more branch circuits may not be interpreted as a combination.

Reference to Section 225-32 would clarify the identification plaque is intended for disconnects at the building served (where provided) and not at the locations permitted by the exception for Section 225-32. If those exceptions relieve the requirements for a disconnect at the building served, it appears the safety consideration would also not merit a plaque at these locations. Identification is required by other code rules.

Service conductors (unprotected) are not permitted by Section 230-3 to pass through buildings unless encased in concrete or brick per Section 230-6. This is not a common procedure but if employed does not appear to warrant a disconnect any more than open service conductors passing over the roof or attached to the eaves or side of the building, which would not require the disconnect.

This section appears related to occupant or firefighter awareness of existence and location of multiple power source disconnect means. It is possible and feasible to locate all different supply disconnects at one location since the limitation to six applies to each supply. If so grouped they are readily discernible and there are no remote locations to warrant the plaque requirement. Such disconnects are required to be identified by Section 110-22.

In Exception No. 2, the limitation to branch circuits still applies plaque requirements to feeders, services, or combinations. Many second buildings may have a feeder or service in addition to a branch circuit, such as a 240 volt 2-wire service for a workshop welder. Since the occupant of a dwelling unit is likely to be fully aware of these supplies a plaque does not seem warranted.

PANEL ACTION: Reject.

PANEL STATEMENT: The proposed revision does not enhance the clarity of this section and proposes more than editorial changes. The present Code wording adequately addresses the identification requirements.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #CP405)

4- 35a - (225-38): Accept

SUBMITTER: CMP 4

RECOMMENDATION: Modify Section 225-38 by adding the following text:

"225-38. Disconnect Construction. Disconnecting means shall meet the requirements of (a) through (d).

Exception: For garages and outbuildings on residential property, snap switches or sets of 3-way or 4-way snap switches shall be

permitted as the disconnecting means"

Delete the existing exception to 225-36.

SUBSTANTIATION: The additional text clarifies that all of the requirements of this section apply to disconnecting means. The relocation of the existing exception places it in a more appropriate section and exempts these devices from the requirements to be indicating and simultaneously open all poles. The wording of the exception has been modified to permit multiple snap switches and multiple sets of three-way or four-way switches as disconnecting means.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #715)

4- 36 - (225-38(b), (d) Exception (New) ): Accept in Principle in Part

SUBMITTER: Dan Leaf, Palmdale, CA

RECOMMENDATION: Revise to read as follows:

(b) Simultaneously Opening of Poles. Each building or structure disconnecting means disconnect shall simultaneously disconnect all ungrounded supply conductors that it controls, from the building or structure wiring system.

(d) Indicating. The building or structure disconnecting means shall plainly indicate whether it is in the open or closed position.

Exception: Three-way and 4-way snap switches permitted in the exception for Section 225-36 shall not be required to be indicating.

SUBSTANTIATION: Editorial. The disconnecting means of (a) may consist of up to six devices. It is not practical to have six devices comply with the rule.

The exception is proposed for correlation with Section 225-36.

PANEL ACTION: Accept in Principle in Part.

Reject the revision to the first sentence of the requirement. The panel accepts the concept of the proposed exception.

PANEL STATEMENT: The term "disconnecting means" is the correct terminology. The submitter's concerns have been addressed by the panel's action on Proposal 4-35a.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #716)

4- 37 - (225-39): Reject

SUBMITTER: Dan Leaf, Palmdale, CA

RECOMMENDATION: Revise to read as follows:

Rating of Disconnect. The feeder or branch circuit building or structure disconnecting means shall have a rating not less than the maximum computed load to be carried, as determined in Article 220. In no case shall the rating be lower than specified in (a), (b), (c), or (d) below.

(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.

Branch circuit Installation. Where the supply conductors consist of one or more branch circuits each disconnect shall have a rating of not less than 15 amperes.

(b) Two Circuit Installations. For installations consisting of not more than two 2-wire branch circuits, the feeder or branch circuit disconnecting means shall have a rating of not less than 30 amperes.

Feeder Installations. Where the supply conductors consist of one or more feeders each disconnect shall have a rating of not less than 30-amperes where (1) two or more 2-wire branch circuits are supplied by a 2-wire feeder; (2) more than two 2-wire branch circuits are supplied by a 3-wire feeder; (3) two or more 3-wire branch circuits are supplied by a 3-wire feeder or; (4) two or more 4-wire branch circuits are supplied by a 3-phase, 4-wire feeder.

(c) One Family Dwelling. For, a one-family dwelling the feeder disconnecting means shall have a rating of not less than 100 amperes single-phase 3-wire or 60-amperes 3-phase 4-wire.

(d) All Others. For all other installations, the feeder or branch circuit disconnecting means shall have a rating of not less than 60 amperes.

Other Dwelling Units. For an individual dwelling unit of a two-family or multifamily dwelling the disconnecting means shall have an ampere rating of not less than 60 (70) - amperes 3-wire single-phase or 30 (40) - amperes 4-wire three-phase (ampere figures in parentheses are alternates)

**SUBSTANTIATION:** The disconnecting means covered in this section apparently refer to the building or structure disconnects of Sections 225-31 through 225-39. Since supply conductors are feeders and/or branch circuits, references to feeder or branch circuit disconnecting means can be confusing and misleading as it applies to the disconnects at the feeder or branch circuit source of supply. A snap switch which disconnects the building wiring branch circuit supply conductors is not a branch circuit disconnecting means any more than a snap switch controlling a lighting fixture. A disconnect which may disconnect the building wiring from a feeder is not a feeder disconnect unless it supplies a feeder.

"Maximum computed" may be technically more correct since "load" can be considered with or without demand factors.

The present (a) refers to one circuit. Section 225-30 indicates more than one branch circuit may constitute supply conductors. "Limited" load is not defined and is somewhat meaningless in this application. All branch circuits supply a limited load, which can vary such as a 15-ampere 120-volt circuit and a 15-ampere 480/277 volt circuit. The intent is not clear whether a limit other than the circuit capacity is intended.

Since "disconnecting means" may consist of six snap switches it may be construed that the aggregate value of their ratings comply, i.e., three 5-ampere rated switches meet the 15-ampere minimum. "Each disconnect" clarifies that sum ratings such as permitted in Section 230-80 do not apply for snap switches.

The present (b) could apply to two separate 2-wire branch circuit supplies (where permitted by Section 225-30) even if their ampacities are less than 30-amperes, and it doesn't apply where there are more than two separate branch circuit supplies. It appears (d) would then apply. This subsection literally applies to a disconnect at the feeder or branch circuit source since the conductors on the line side of the building disconnects are feeders or branch circuits. A 3-wire feeder supplying the two 2-wire 15-ampere branch circuits could be size No. 14 or 12 yet this section requires a 30-ampere disconnecting means.

In (c) provision should be made for 3-phase 4-wire feeders (208y/120 v) which are not prohibited and can accommodate slightly less volt-amperes than a 120/240 volt 3-wire system but more than a 208y/120 volt 3-wire system. Section 220-30 refers to 208 y/120 volts 4-wire feeders.

Present (d) becomes unnecessary with the proposal for (c) which covers minimum disconnecting means ratings for feeders, which tracks the ampacity requirements of Section 215-2. If more than two branch circuit supplies are provided in accordance with Section 225-50, present (d) requires a 60-ampere rated disconnect even if the branch circuits are rated 15-amperes. If a 3-wire feeder supplies two or more 3-wire branch circuits Section 215-2(a) permits a minimum feeder ampacity of 30; this section requires a minimum 60-ampere rated disconnecting means.

The proposal for (d) fills a void not presently covered. Section 230-79(d) requires a minimum 60-ampere rating for service disconnecting means for such dwelling units and seems appropriate for feeders for 3-wire systems. It provides for disconnecting means rating where the system is 3-phase 4-wire.

(See my proposal for Section 230-79).

**PANEL ACTION:** Reject.

**PANEL STATEMENT:** The proposed language is adding requirements that have not been adequately substantiated. The existing text is clear in stating the requirements for the rating of the disconnecting means.

**NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE:** 11

**VOTE ON PANEL ACTION:**

**AFFIRMATIVE:** 11

(Log #3855)

4-38 - (225-41 (New) ): Reject

**NOTE:** It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 10 for information.

**SUBMITTER:** J. Philip Simmons, Olympia, WA

**RECOMMENDATION:** Move the text of existing Section 240-13 to become a new Section 225-41 as follows:

225-41. Ground-Fault Protection of Equipment. Ground-fault protection of equipment shall be provided in accordance with the provisions of Section 230-95 for solidly grounded wye electrical systems of more than 150 volts to ground, but not exceeding 600 volts phase-to-phase for each individual device used as a building or structure main disconnecting means rated 1000 amperes or more.

**Exception No. 1:** The provisions of this section shall not apply to a disconnecting means for a continuous industrial process where a nonorderly shutdown will introduce additional or increased hazards.

**Exception No. 2:** The provisions of this section shall not apply to fire pumps.

**Exception No. 3:** The provisions of this section shall not apply if the disconnecting means is protected on the supply side by service or feeder ground-fault protection.

**SUBSTANTIATION:** Part B of Article 225 deals with disconnecting means for buildings and structures on the premises that are supplied from a service in another building or structure. The requirements for ground fault protection of equipment in Section 240-13 for building disconnecting means should be located here in Article 225 where the other requirements for building or structure disconnecting means are located. This should improve the structure of the code and make the code more "user friendly."

**PANEL ACTION:** Reject.

**PANEL STATEMENT:** CMP 4 believes that this requirement is appropriately located in Section 240-13. This action is referred to CMP 10 for review.

**NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE:** 11

**VOTE ON PANEL ACTION:**

**AFFIRMATIVE:** 11

(Log #1469)

4-39 - (225-48): Accept in Principle

**NOTE:** It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 1 for information.

**SUBMITTER:** William M. Lewis, Eli Lilly and Co.

**RECOMMENDATION:** Add new section to read:

225-48 Supervised Installations.

For the purposes of Part C, the term supervised installation is defined as the portions of a facility where all of the following conditions are met:

1. Conditions of design, and installation are provided under engineering supervision.
2. Qualified persons provide maintenance, monitoring and servicing of the system.
3. The premises has at least one service that is more than 600 volts nominal.

**SUBSTANTIATION:** Existing load calculations as covered in Section 220 are impractical for outdoor feeders over 600 volts.

This proposal must be considered in concert with companion proposals to add Sections 225-49, 225-3, and Exception No. 2 to 220-1. It has long been the practice at utilities and at supervised installations to size feeder conductors based on connected transformer capacity and load characteristics. This proposal addresses these accepted practices.

This proposal was developed by the Task Group based on the Task Group's review and discussion of the current requirements of Articles 225, 230, 100, 110, 240, and 250. This proposal is one of 14 which makes up the Task Group's response to a recommendation by a TCC task group on usability in 1995. In considering the needed proposals, emphasis was placed on including in the NEC, practices which are recognized in the electrical industry as necessary for safe installation of over 600 volts systems. This is to provide guidance and direction for installation of these facilities which have not historically been included in the NEC.

The Task Group participants consisted of William M. Lewis (CMP 4); committee chair; Carl J. Fredericks (CMP 10); Tom Adams (CMP 4); John Beck (Chairman CMP 4); Mark Sumrall (CMP 4); Barry Hornberger, (CMP 13); William T. Beutler, P.E.; William Long, NEMA.

Interested persons (nonparticipants): Robert J. Pollock (CMP 4 and TCC); Merton Bunker (NFPA); Mark Earley (NFPA).

**PANEL ACTION:** Accept in Principle.

Modify the proposed section to read:

"225-48 Supervised Installations.

For the purposes of Part C, the term supervised installation is defined as the portions of a facility where all of the following conditions are met:

1. Conditions of design, and installation are provided under engineering supervision.
2. Qualified persons with documented training and experience in over 600 volt systems, provide maintenance, monitoring and servicing of the system.
3. The premises has at least one service that is more than 600 volts nominal."

**PANEL STATEMENT:** Working on systems over 600 volt requires special qualifications and training. The modification to (2) is made to emphasize that point. Paragraph (3) is deleted as superfluous because it is located in Part C of Article 225. The panel refers their action on modifying the definition of qualified person to CMP 1 as the definition (as accepted in Proposal 1-178) needs to be expanded to better cover over 600 volt installations.

**NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE:** 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 10  
NEGATIVE: 1

EXPLANATION OF NEGATIVE:

ZINANTE: I oppose the proposal as written. The NEC as stated in Article 90 is not intended as a design specification. I always thought that the locator state codes and ordinances as well as the Authority Having Jurisdiction determined who was qualified to perform electrical maintenance, monitoring and servicing. No where in the code do we define what a journeyman electrician or an apprentice electrician is and what documentation is required to distinguish them. Why should the NEC now start inserting these requirements. The assumption by the Code is that the person installing, servicing and monitoring, by definition is qualified.

COMMENT ON AFFIRMATIVE:

CARRICK: This definition should be placed in the over 600 volt section of Article 100.

SUMRALL: I applaud the Panel's decision to include a definition of the term "qualified" in this section, for installations over 600 vac. 90-1 specifically spells out the primary purpose of the NEC, and that is "THE PRACTICAL SAFEGUARDING OF PERSONS AND PROPERTY." By adapting this proposal, the Panel reaffirms 90-1 is still upheld as the high standard of the electrical industry. Over the past 12 months, thousands of dollars have been spent on medical, rehabilitation and funeral expenses. Though the NEC cannot regulate human error, it can continue to be a well-intentioned document to provide guidance in a fast and ever-changing industry.

(Log #1470)

4- 40 - (225-49): Accept in Principle

SUBMITTER: William M. Lewis, Eli Lilly and Co.

RECOMMENDATION: Add a new Section 225-49 to read as shown: 225-49. Sizing of conductors for outdoor feeders.

Sizing of conductors for outdoor feeders shall be sized in accordance with A or B below:

A. The sizing of conductors for outdoor feeders supplying only other feeders shall be based on the following:

1. Each segment of feeders beyond the service equipment shall be based on the total of the nameplate ratings of the transformers supplied by that segment of feeders.

2. The sizing of conductors for outdoor feeders supplying a combination of feeders, utilization equipment or other loads shall be based on the total of the nameplate ratings of the transformers supplied by that segment of feeders plus the maximum rating of the other equipment.

B. For supervised installations as defined in Section 225-48, conductor sizing shall be permitted to be determined by qualified persons using the requirements of this Code or under engineering supervision.

SUBSTANTIATION: This proposal must be considered in concert with companion proposals to add Sections 225-48, 225-3, and Exception No. 2 to 220-1. It has long been the practice at utilities and at supervised installations to size feeder conductors based on connected transformer capacity and load characteristics. This proposal addresses these accepted practices.

This proposal was developed by the Task Group based on the Task Group's review and discussion of the current requirements of Articles 225, 230, 100, 110, 240, and 250. This proposal is one of 14 which makes up the Task Group's response to a recommendation by a TCC task group on usability in 1995. In considering the needed proposals, emphasis was placed on including in the NEC, practices which are recognized in the electrical industry as necessary for safe installation of over 600 volt systems. This is to provide guidance and direction for installation of these facilities which have not historically been included in the NEC.

The Task Group participants consisted of William M. Lewis (CMP 4); committee chair; Carl J. Fredericks (CMP 10); Tom Adams (CMP 4); John Beck (Chairman CMP 4); Mark Sumrall (CMP 4); Barry Hornberger (CMP 13); William T. Beutler, P.E.; William Long, NEMA

Interested persons (nonparticipants): Robert J. Pollock (CMP 4 and TCC); Merton Bunker (NFPA); Mark Earley (NFPA)

PANEL ACTION: Accept in Principle.

PANEL STATEMENT: The submitter's concerns have been addressed by the panel's action on Proposal 4-40b.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #CP406)

4- 40a - (225-50): Accept

SUBMITTER: CMP 4

RECOMMENDATION: Delete section 225-50.

SUBSTANTIATION: These requirements are adequately expressed in Section 110-34(c).

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #CP409)

4- 40b - (225-50, 51, and 52): Accept

NOTE: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 2 for inclusion of the material in Articles 210 and 215 to cover over 600 volt branch circuits, feeders, and supervised installations, in general. This action will be considered by the Panel as a Public Comment.

SUBMITTER: CMP 4

RECOMMENDATION: Add the following text at the beginning of Part C and renumber accordingly in the present order.

"PART C. Over 600 Volts

225-50. Proposal 4-39 as modified.

225-51 Sizing of Outdoor Circuits.

Outdoor circuit conductors shall be sized in accordance with (A), (B) or (C):

(A) Sizing of Conductors for Outdoor Branch Circuits. The ampacity of branch circuit conductors shall not be less than 125 percent of the designed potential load of utilization equipment that will be operated simultaneously.

(B) Sizing of Conductors for Outdoor Feeders.

The ampacity of outdoor feeder conductors shall be in accordance with the following:

(1) The ampacity of feeders supplying only transformers shall not be less than the sum of the nameplate ratings of the transformers supplied by the feeder.

(2) The ampacity of feeders supplying a combination of transformers and utilization equipment shall be not less than the sum of the nameplate ratings of the transformers and 125 percent of the designed potential load of the utilization equipment that will be operated simultaneously.

(C) Sizing of Conductors in Supervised Installations. For supervised installations as defined in 225-50, branch circuit and feeder conductor sizing shall be permitted to be determined by qualified persons under engineering supervision.

225-52. Ampacities. The ampacity of conductors shall be in accordance with Section 310-15 and Section 310-60 as applicable." SUBSTANTIATION: This action provides necessary direction for sizing conductors for installations over 600 volts. The concepts of Proposals 4-7 and 4-40 have been incorporated into the panel proposal.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 10

NEGATIVE: 1

EXPLANATION OF NEGATIVE:

CARRICK: Conductors used for over 600 volt branch circuits and feeders can be used at 100 percent of their ratings. There is concern that the authority having jurisdiction will try to enforce 225-51 A and B as a minimum even in supervised installations when engineers have determined that conductors smaller than those specified in 225-51 A and B would be suitable. This was not the Panel's intent.

(Log #717)

4- 41 - (225-50): Reject

SUBMITTER: Dan Leaf, Palmdale, CA

RECOMMENDATION: Revise to read as follows:

Warning Signs. Signs with the words "Danger Warning High Voltage-Keep Out" shall be posted in plain view ~~where unauthorized persons might come in contact with live parts for electrical installations covered in Section 110-31.~~

Or alternatively: WARNING SIGNS. Signs with the words "DANGER HIGH-VOLTAGE KEEP OUT" shall be posted in plain view at entrances to rooms and other guarded locations that contain ~~exposed live parts where forbidding unqualified persons to enter. might come in contact with live parts.~~

SUBSTANTIATION: Editorial. The present wording infers unauthorized persons may have access to rooms, screened or fenced area, etc., where there are live parts. Section 110-31 indicates area

or enclosures for other than metal-enclosed installations (possible live parts) shall deter access by unqualified persons and Section 110-34(c) indicates deterrence to areas with live parts. Where building disconnect means as covered by Sections 225-51 and 225-52 may be inside a building, Sections 110-31(a)(1) and (c) require installations accessible to unauthorized persons to be metal-enclosed, locked, or in a location where access is controlled by a lock.

The word "danger" is proposed in lieu of "warning" to correlate with Sections 110-34(c); 230-203; 490-53; and 490-55.

**PANEL ACTION:** Reject.

**PANEL STATEMENT:** The panel's action on Proposal 4-40a has removed this wording from Article 225 as Section 110-34(c) adequately covers the requirement for signage.

**NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE:** 11

**VOTE ON PANEL ACTION:**

**AFFIRMATIVE:** 11

(Log #1831)

4- 42 - (225-50): Reject

**SUBMITTER:** Buster R. Falls, City of Orlando, FL

**RECOMMENDATION:** Replace "warning" with "danger."

**SUBSTANTIATION:** Corrects use of term that will be the same throughout the code.

**PANEL ACTION:** Reject.

**PANEL STATEMENT:** The panel's action on Proposal 4-40a has removed this wording from Article 225 as Section 110-34(c) adequately covers the requirement for signage.

**NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE:** 11

**VOTE ON PANEL ACTION:**

**AFFIRMATIVE:** 11

(Log #3261)

4- 43 - (225-50): Reject

**SUBMITTER:** Alan Manche, Square D Co.

**RECOMMENDATION:** Revise the 225-50 with the additions (underlined) as shown. The entire text is shown for clarity, but only those changes shown underlined are part of this proposal.

225.50. Warning Signs. Signs with the following words or equivalent, "WARNING - HIGH VOLTAGE - KEEP OUT" shall be posted in plain view where unauthorized persons might come in contact with live parts."

**SUBSTANTIATION:** The explicit nature of the present wording is causing field problems in the acceptance of appropriate warning signs or markings. The ANSI Z535 series of standards provides the proper procedure in establishing a hazard sign or marking. ANSI Z535.4 provides the information about what should be contained in a hazard sign or label. This includes a message panel that identifies the hazard, indicates how to avoid the hazard and advises the probable consequence of not avoiding the hazard.

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

**PANEL ACTION:** Reject.

**PANEL STATEMENT:** The panel's action on Proposal 40a has removed this wording from Article 225 as Section 110-34(c) adequately covers the requirement for signage.

**NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE:** 11

**VOTE ON PANEL ACTION:**

**AFFIRMATIVE:** 11

(Log #1471)

4- 44 - (225-60): Accept in Principle

**SUBMITTER:** William M. Lewis, Eli Lilly and Co.

**RECOMMENDATION:** Add new Section 225-60 as shown: 225-60. Clearances Over Roadways, Walkways, Rail, Water, Open Land.

(a) 22kV Nominal to Ground or Less.

(Table shown below)

(b) Over 22kV Nominal to Ground. Clearances for the above categories shall be increased by 0.4 in. (10 mm) per kV above 22000 volts.

(c) For special cases such as where crossings will be made over lakes, rivers, or areas utilizing large vehicles such as mining operations, specific designs shall be engineered considering the special circumstances and shall be approved by the authority having jurisdiction.

**SUBSTANTIATION:** The existing NEC does not give clearance requirements for feeders over 600 volts. The proposal addresses this oversight and is in harmony with the NESC.

This proposal was developed by the Task Group based on the Task Group's review and discussion of the current requirements of Articles 225, 230, 100, 110, 240, and 250. This proposal is one of 14 which makes up the Task Group's response to a recommendation by a TCC task group on usability in 1995. In considering the needed proposals, emphasis was placed on including in the NEC, practices which are recognized in the electrical industry as necessary for safe installation of over 600 volt systems. This is to provide guidance and direction for installation of these facilities which have not historically been included in the NEC.

The Task Group participants consisted of William M. Lewis (CMP 4); committee chair; Carl J. Fredericks (CMP 10); Tom Adams (CMP 4); John Beck (Chairman CMP 4); Mark Sumrall (CMP 4); Barry Hornberger, (CMP 13); William T. Beutler, P.E.; William Long, NEMA

Interested persons (nonparticipants): Robert J. Pollock (CMP 4 and TCC); Merton Bunker (NFPA); Mark Earley (NFPA)

**PANEL ACTION:** Accept in Principle.

Amend the proposed text and table as follows:

"(a) 22kVNominal to Ground or Less. The clearances over roadways, walkways, rail, water and open land for conductors and live parts up to 22kV nominal to ground or less shall be not less than the values shown in Table 225-60."

After (c) add the following Fine Print Note:

"Fine Print Note: For additional information see National Electrical Safety Code, ANSI C2-1997."

Add these metric values to the proposed table:

- 13.5 ft-4.1m
- 14.5 ft-4.4m
- 17 ft-5.2m
- 18.5 ft-5.6m
- 26.5 ft-8.1m

**PANEL STATEMENT:** The panel's action complies with the NFPA NEC Style Manual and the FPN has been added to provide additional guidance.

**NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE:** 11

**VOTE ON PANEL ACTION:**

**AFFIRMATIVE:** 11

| Open Land Subject to Vehicles, Cultivation, or Grazing | Roadways, Driveways, Parking Lots and Alleys | Walkways | Rail    | Spaces and Ways for Pedestrians and Restricted Traffic | Water Areas Not Suitable for Sail Boating |
|--|--|----------|---------|--|---|
| 18.5   | 18.5 ft                                      | 13.5 ft  | 26.5 ft | 14.5 ft  | 17 ft                                     |

(Log #1472)

4- 45 - (225-61): Accept in Principle  
**SUBMITTER:** William M. Lewis, Eli Lilly and Co.  
**RECOMMENDATION:** Add new Section 225-61 to read as shown:  
 225-61. Clearances Over Buildings and Other Structures.  
 (a) 22kV nominal to ground or less.

| Clearance of Conductors or Live Parts From:                         | Horizontal | Vertical |
|---|------------|----------|
| Building Walls, Projections, and Windows                            | 7.5 ft     |          |
| Balconies, Catwalks, and Similar Areas Accessible to People         | 7.5 ft     | 13.5 ft  |
| Over or Under Roofs or Projections Not Readily Accessible to People |            | 12.5 ft  |
| Over Roofs Accessible to Vehicles But Not Trucks                    |            | 13.5 ft  |
| Over Roofs Accessible to Trucks                                     |            | 18.5 ft  |
| Other Structures  | 7.5 ft     |          |

(b) Over 22kV Nominal to Ground. Clearances for the above categories shall be increased by 0.4 inches per kV above 22000 volts.  
**SUBSTANTIATION:** The existing NEC does not give clearance requirements for feeders over 600 volts. The proposal addresses this oversight and is in harmony with the NESC.

This proposal was developed by the Task Group based on the Task Group's review and discussion of the current requirements of Articles 225, 230, 100, 110, 240, and 250. This proposal is one of 14 which makes up the Task Group's response to a recommendation by a TCC task group on usability in 1995. In considering the needed proposals, emphasis was placed on including in the NEC, practices which are recognized in the electrical industry as necessary for safe installation of over 600 volt systems. This is to provide guidance and direction for installation of these facilities which have not historically been included in the NEC.

The Task Group participants consisted of William M. Lewis (CMP 4); committee chair; Carl J. Fredericks (CMP 10); Tom Adams (CMP 4); John Beck (Chairman CMP 4); Mark Sumrall (CMP 4); Barry Hornberger, (CMP 13); William T. Beutler, P.E.; William Long, NEMA.

Interested persons (nonparticipants): Robert J. Pollock (CMP 4 and TCC); Merton Bunker (NFPA); Mark Earley (NFPA)

**PANEL ACTION:** Accept in Principle.

Add the following to the proposed text:

(a) 22kV Nominal to Ground or Less. The clearances over buildings and other structures for conductors and live parts up to 22 kV nominal to ground or less shall be not less than the values shown in Table 225-61.

After (b) add the following Fine Print Note:

Fine Print Note: For additional information see National Electrical Safety Code, ANSI C2-1997

Add these metric values to the proposed table:

- 7.5 ft.-2.3m
- 12.5ft.-3.8m
- 13.5 ft.-4.1m
- 18.5ft.-5.6m

**PANEL STATEMENT:** The panel's action complies with the NFPA NEC Style Manual and the FPN has been added to provide additional guidance.

**NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE:** 11

**VOTE ON PANEL ACTION:**

**AFFIRMATIVE:** 11

**ARTICLE 230 — SERVICES**

(Log #516)

4- 46 - (230): Accept

**SUBMITTER:** Technical Correlating Committee National Electrical Code

**RECOMMENDATION:** 1. In Sections 230-6(1) and (2), replace "2 in. (50.8 mm)" with "50 mm (2 in.)" throughout.

2. In Section 230-9 first paragraph and the Exception, replace "3 ft (914 mm)" with "900 mm (3 ft)" throughout.

3. In Section 230-24, replace "60°F (15°C)" with "15°C (60°F)".

4. In Section 230-24(a), replace "8 ft (2.44 m)" with "2.5 m (8 ft)" and replace "3 ft (914 mm)" with "900 mm (3 ft)".

5. In Section 230-24(a) Exception No. 2, replace "4 in. (102 mm)" with "100 mm (4 in.)"; "12 in. (305 mm)" with "300 mm (12 in.)"; and "3 ft (914 mm)" with "900 mm (3 ft)".

6. In Section 230-24(a) Exception No. 3, replace "18 in. (457 mm)" with "450 mm (18 in.)"; "6 ft (1.83 m)" with "1.8 m (6 ft)"; and "4 ft (1.22 m)" with "1.2 m (4 ft)".

7. In Section 230-24(a) Exception No. 4, replace "3 ft (914 mm)" with "900 mm (3 ft)".

8. In Section 230-24(b), replace "10 ft (3.05 m)" with "3.0 m (10 ft)"; "12 ft (3.66 m)" with "3.7 m (12 ft)"; "15 ft (4.57 m)" with "4.5 m (15 ft)"; "12-ft (3.66-m)" with "3.7 m (12 ft)"; and "18 ft (5.49 m)" with "5.5 m (18 ft)".

9. In Section 230-26, replace "10 ft (3.05 m)" with "3.0 m (10 ft)".

10. In Section 230-43(15), replace "6 ft (1.83 m)" with "1.8 m (6 ft)" throughout.

11. In Section 230-50(b) and its Exception, replace "10 ft (3.05 m)" with "3.0 m (10 ft)" throughout.

12. In Section 230-51(a), replace "12 in. (305 mm)" with "300 mm (12 in.)" and replace "30 in. (762 mm)" with "750 mm (30 in.)".

13. In Section 230-51(b), replace "15 ft (4.57 m)" with "4.5 m (15 ft)" and replace "2 in. (50.8 mm)" with "50 mm (2 in.)".

14. In Section 230-54(c) Exception, replace "24 in. (610 mm)" with "600 mm (24 in.)".

**SUBSTANTIATION:** The proposed revision is intended to comply with the NFPA No. 1M Manual of Style Section 4.1 with respect to the placement of units and values of measurement, i.e., show SI units as the preferred and inch-pound units immediately following.

**PANEL ACTION:** Accept.

**NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE:** 11

**VOTE ON PANEL ACTION:**

**AFFIRMATIVE:** 11

(Log #CP412)

4- 46a - (230-2(a)(4)): Accept

**NOTE:** The Technical Correlating Committee directs that the Panel clarify the Panel Action on this Proposal. There is presently no definition for "Standby Systems." This action will be considered by the Panel as a Public Comment.

**SUBMITTER:** CMP 4

**RECOMMENDATION:** Amend the text in 230-2(a)(4) to read: "(4) Standby systems."

**SUBSTANTIATION:** The panel's action clarifies that a standby system is permissible. This action eliminates the confusion with Article 702 requirements.

**PANEL ACTION:** Accept.

**NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE:** 11

**VOTE ON PANEL ACTION:**

**AFFIRMATIVE:** 11

(Log #718)

4- 47 - (230-2(a)(4)): Reject

**SUBMITTER:** Dan Leaf, Palmdale, CA

**RECOMMENDATION:** Delete: (4) ~~Optional standby systems.~~

**SUBSTANTIATION:** The permission for an additional service to supply optional standby systems seems counter to Section 702-2, which per Section 90-3 modifies the general rules of Chapters 1 through 4. The word "intended" in Section 702-2 and in other Code sections conveys a quasi-mandatory intent.

**PANEL ACTION:** Reject.

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**PANEL STATEMENT:** The panel's action on Proposal 4-46a clarifies their position on the submitter's concern.  
**NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE:** 11  
**VOTE ON PANEL ACTION:**  
AFFIRMATIVE: 11

(Log #1022)

4- 48 - (230-2(a)(6) (New) ): Reject

**NOTE:** It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 16 for information.

**SUBMITTER:** Stanley Kaufman, Lucent Technologies  
**RECOMMENDATION:** Add a new section 230-2(a)(6) as follows:  
(6) High-power, network-powered broadband communications systems.

**SUBSTANTIATION:** This is a companion proposal to the proposal for Article 831, High-Power, Network-Powered Broadband Communications Systems, and is necessary to allow high-power, network-powered broadband communications systems as an additional service.

**PANEL ACTION:** Reject.

**PANEL STATEMENT:** The referenced Article 831 has not been accepted by CMP 16. CMP 4 refers this to CMP 16 for information.

**NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE:** 11  
**VOTE ON PANEL ACTION:**  
AFFIRMATIVE: 11

(Log #2431)

4- 49 - (230-2(b)(2)): Reject

**SUBMITTER:** Dennis Kaunzner, City of Sierra-Vista, AZ

**RECOMMENDATION:** Revise text to read as follows:

"A single building or other structure sufficiently large to make two or more services necessary at two locations of the building without being grouped providing the services can be tripped by a remote means outside the building."

**SUBSTANTIATION:** In cases of a mall it should be permissible to have two services because of distances but it should not be allowed to have two locations with 6 disconnects each in a locked room several hundred feet apart for the fire department to shut down in emergencies. Many fires start in the equipment rooms to begin with. Many power companies require a disconnecting means on the outside of the building.

**PANEL ACTION:** Reject.

**PANEL STATEMENT:** The submitter has not provided technical substantiation to require the remote tripping as proposed.

**NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE:** 11  
**VOTE ON PANEL ACTION:**  
AFFIRMATIVE: 11

(Log #2489)

4- 50 - (230-2(b)(2)): Reject

**SUBMITTER:** Lynn Adams, Escambia County, FL

**RECOMMENDATION:** Revise as follows:

230-2(b)(2) A single building or other structure sufficiently large to make two or more services necessary. Each service shall be limited to the adjacent area of the building.

**SUBSTANTIATION:** If multiple services are installed, a danger exists when circuit extensions are made into other areas of the building. Section 230-2(e) requires that the areas served be identified. This proposal would prevent the intermingling of circuits in the middle area between the two services.

**PANEL ACTION:** Reject.

**PANEL STATEMENT:** There are instances where it is necessary to have circuits supplied from multiple services in the same area of a building such as circuits supplied from an emergency service or different voltage characteristics. Acceptance of this proposal could lead to conflicts with other parts of Section 230-2.

**NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE:** 11  
**VOTE ON PANEL ACTION:**  
AFFIRMATIVE: 11

(Log #2430)

4- 51 - (230-2(c)(1), (2), (3)): Reject

**SUBMITTER:** Dennis Kaunzner, City of Sierra-Vista, AZ

**RECOMMENDATION:** At the end of each requirement add:  
"When the services are grouped in one location."

**SUBSTANTIATION:** Right now there is a conflict between 230-2(b)(2) and the above section. We just had a mall built and there were two services of 3500 amps a piece, the engineer argued that they could have two services in different locations because of the capacity of the service and did not need special permission to put them in different locations. My feelings are that if this were the case they should at least be in the same location.

**PANEL ACTION:** Reject.

**PANEL STATEMENT:** There is no conflict between Section 230-2(b)(2) and 230-2(c).

The submitter has not provided any documentation that the current wording has created problems in the field.

**NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE:** 11  
**VOTE ON PANEL ACTION:**  
AFFIRMATIVE: 11

(Log #2490)

4- 52 - (230-2(d)): Reject

**SUBMITTER:** Lynn Adams, Escambia County, FL

**RECOMMENDATION:** Revise as follows:

(d) Different Characteristics. Additional services shall be permitted for different voltages, frequencies, or phases, or for different uses, such as for different rate schedules. The services shall be in sight from one another.

**SUBSTANTIATION:** This would add to safety by making all sources of power apparent to any servicing or emergency personnel. Using the defined term "in sight from" allows for separate equipment locations, but ensures they can be opened promptly.

**PANEL ACTION:** Reject.

**PANEL STATEMENT:** Section 230-2(e) provides the necessary provisions for safety where multiple services are not within sight from each other. No substantiation has been provided to indicate that the current wording has created problems in the field.

**NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE:** 11  
**VOTE ON PANEL ACTION:**  
AFFIRMATIVE: 11

(Log #1749)

4- 53 - (230-5 (New) ): Reject

**SUBMITTER:** Jamie McNamara, Hastings, MN

**RECOMMENDATION:** Add new text to read as follows:

230-5. Diagrams of Service. If required by the authority having jurisdiction, a diagram showing service details shall be provided prior to the installation of the service. Such a diagram shall show the area in square feet of the building or other structure supplied by each service, the total connected load before applying demand factors, the demand factors used, the computed load after applying demand factors, and the size and type of conductors to be used. The diagram shall be done so the service is in compliance with article 220.

**SUBSTANTIATION:** The current requirement for a diagram of a feeder is in 215-5 and is limited to feeders only (see scope 215-1). This would expand the requirement to include services, when the authority having jurisdiction thought it was necessary. There are a lot of building that do not have a feeder in them (most smaller buildings). The current text will not allow the authority having jurisdiction to require a diagram of the service (load calculation per article 220). It may be appropriate to put this requirement in article 220-5 so it would not be needed in 215-5 and 230-5 please see other proposal on 220-5 and 215-5.

**PANEL ACTION:** Reject.

**PANEL STATEMENT:** Article 220 requires load calculations. It is the prerogative of the authority having jurisdiction to require the proposed diagram showing the load calculations. The proposal is unenforceable as changes to building systems invalidate the initial diagram. The submitter is referenced to Article 80-Administration and Enforcement.

**NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE:** 11  
**VOTE ON PANEL ACTION:**  
AFFIRMATIVE: 11

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(Log #431)

4-54 - (230-6): Accept in Principle

**NOTE:** It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 10 for consideration of Proposal 10-3a.

**SUBMITTER:** Steve Canaday, Dept. of Labor and Industries, WA  
**RECOMMENDATION:** Add text to 230-6 to read as follows:

Where installed in conduit not less than 18 in. in the earth.

**SUBSTANTIATION:** A conduit buried 18 in. deep in the earth should provide the same protection as a conduit encased in 2 in. of concrete. Also, it is difficult to determine if the conduit is actually encased in 2 in. of concrete all the way.

**PANEL ACTION:** Accept in Principle.

Modify the proposed text and make it Section 230-6(4) as follows:

"(4) Where installed in conduit and under not less than 450mm (18 in) of earth beneath a building or other structure."

**PANEL STATEMENT:** The panel's action clarifies that the accepted language is an alternative method of providing protection for service conductors.

**NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE:** 11

**VOTE ON PANEL ACTION:**

**AFFIRMATIVE:** 11

(Log #4068)

4-55 - (230-6(3)): Accept in Principle

**NOTE:** It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 10 for consideration of Proposal 10-3a.

**SUBMITTER:** David P. Brown, Baltimore Gas and Electric Co./Rep. Edison Electric Inst.

**RECOMMENDATION:** Revise as follows:

(3) Conductors and equipment ~~Where~~ installed in a transformer fire resistant vault conforming to the requirements of Article 450, Part C.

**SUBSTANTIATION:** There is a need to clarify that the intent of a vault is for fire resistance whether a transformer is present or not. A vault meeting the fire resistance requirements of 450 Part C shall be considered outside the building.

**PANEL ACTION:** Accept in Principle.

Revise the proposed language to read

3) Where installed in any vault that meets the construction requirements of 450 Part C.

**PANEL STATEMENT:** This action clarifies that any vault constructed in accordance with Part C of Article 450 is considered acceptable.

**NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE:** 11

**VOTE ON PANEL ACTION:**

**AFFIRMATIVE:** 11

(Log #4101)

4-56 - (230-6(3)): Accept in Principle

**SUBMITTER:** Robert E. Molde, Northern States Power Co./Rep. Wisconsin Utilities Assn.

**RECOMMENDATION:** Revise as follows:

(3) Conductors and equipment ~~Where~~ installed in a transformer fire resistant vault conforming to the requirements of Article 450, Part C.

**SUBSTANTIATION:** There is a need to clarify the intent of a vault is for fire resistance whether a transformer is present or not. A vault meeting the fire resistance requirements of 450 Part C shall be considered outside the building.

**PANEL ACTION:** Accept in Principle.

**PANEL STATEMENT:** The submitter's concerns are addressed by the panel's action on Proposal 4-55.

**NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE:** 11

**VOTE ON PANEL ACTION:**

**AFFIRMATIVE:** 11

(Log #719)

4-57 - (230-7): Reject

**SUBMITTER:** Dan Leaf, Palmdale, CA

**RECOMMENDATION:** Revise to read as follows:

Other Conductors in Raceway or Cable. ~~Conductors other than service~~ Service conductors shall not be contained installed in the same service a raceway, cable, auxiliary gutter, or cablebus assembly that contains other than service conductors, or service conductors of a different class.

Exceptions No. 1 and 2 No change.

**SUBSTANTIATION:** Editorial. For consistency other enclosures permitted for service conductors should be included. Code users may install conductors in a raceway but do not install them in a cable. Service cable may be interpreted as covering Type SE but not other cables permitted as service conductors. Literal wording does not prohibit 120/240 volt single phase and 480-volt three-phase sets of service conductors in the same raceway; both sets are service conductors.

**PANEL ACTION:** Reject.

**PANEL STATEMENT:** The proposal is more than editorial in nature. Auxiliary gutters are used to supplement the wiring space of service equipment and the intermixing of conductors is inevitable in that space. The submitter has provided no technical substantiation to apply this requirement to cablebus.

**NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE:** 11

**VOTE ON PANEL ACTION:**

**AFFIRMATIVE:** 11

(Log #2808)

4-58 - (230-7 Exception No. 3 (New) ): Reject

**SUBMITTER:** Bud Swathwood, Bud Swathwood Consulting

**RECOMMENDATION:** Add an Exception No. 3 to read:

Exception No. 3: In auxiliary gutters, when used as supplemental wiring spaces for service equipment and the conditions of Sections 374-1 and 374-2 are met. The service conductors when used in this wiring method shall be identified.

**SUBSTANTIATION:** There are those who feel that the auxiliary gutters are raceways and therefore cannot contain "other" conductors (with SE conductors). Auxiliary gutters was added to Section 300-3 as a wiring method because the panel (admitted) that auxiliary gutters, by definition, are NOT raceways. Manufacturers have available A.G.s as a supplement to their equipment for added ring space. Wireway manufactures market A.G.s. for additional wiring space. There is, in my opinion, no hazard by using this method of wiring. No more than having SE conductors installed in the "gutter" space in load centers, switchboards, etc. with branch circuits and feeders.

**PANEL ACTION:** Reject.

**PANEL STATEMENT:** In accordance with the definition of raceways in Article 100, auxiliary gutters are not raceways and the exception is not necessary.

**NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE:** 11

**VOTE ON PANEL ACTION:**

**AFFIRMATIVE:** 11

(Log #CP413)

4-58a - (230-8): Accept

**SUBMITTER:** CMP 4

**RECOMMENDATION:** In Section 230-8 amend the reference to Section 300-5 by adding (g). The correct reference is 300-5(g).

**SUBSTANTIATION:** This change is made to comply with the NFPA NEC Style Manual.

**PANEL ACTION:** Accept.

**NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE:** 11

**VOTE ON PANEL ACTION:**

**AFFIRMATIVE:** 11

(Log #1188)

4-59 - (230-8): Reject

**SUBMITTER:** Earl Dean, Town of Manchester, CT

**RECOMMENDATION:** Deleted text:

230-8. Raceway Seal. Where a service raceway enters a building or structure from an underground distribution system, it shall be sealed. (delete: in accordance with Section 300-5.) Spare or unused raceways shall also be sealed. Sealants shall be identified for use with the cable insulation, shield, or other components.

**SUBSTANTIATION:** The way it is currently written requires the reader to search out Section 300-5. It is a long section of which only a single sentence applies: "(g) Raceway Seals. Conduits or raceways through which moisture may contact energized live parts shall be sealed or plugged at either or both ends."

If the intent is to require the sealing of all UG service raceways, then it would be easier and plainer to simply state so in Article 230.

If the intent is to require the sealing of only those UG service raceways that may cause a moisture problem, then add the verbiage in Article 230.

As it stands now, I, as a building official, cannot require the sealing of service raceways until there is evidence of a moisture problem; akin to closing the barn door after the cows have run off.  
**PANEL ACTION:** Reject.  
**PANEL STATEMENT:** The panel disagrees that it is necessary to seal all service raceways. The reference to 300-5 provides the necessary guidance where it is required to seal service raceways. See panel action on Proposal 4-58a  
**NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE:** 11  
**VOTE ON PANEL ACTION:**  
**AFFIRMATIVE:** 11

(Log #4102)

4- 61 - (230-9): Reject  
**SUBMITTER:** Robert E. Molde, Northern States Power Co./Rep. Wisconsin Utilities Assn.  
**RECOMMENDATION:** Revise as follows:  
230-9. Clearance from Building Openings. The service head or similar fitting shall be located such that the service conductors installed as open conductors...

Move this newly worded requirement to Article 230-54(h).  
**SUBSTANTIATION:** The location of the attachment point at the building is a crucial factor in determining whether the service conductors have the required clearance. Emphasis is needed to alert the installer of the service head or similar fixture of the importance of their action in achieving the required clearance.  
**PANEL ACTION:** Reject.

**PANEL STATEMENT:** The existing text adequately covers the submitter's concerns. The panel's primary concern is that this proposal would limit the applicability of this section to service conductors that are not installed by the utility. The current language in Sections 230-9 and 230-54 does provide the appropriate clearance requirements for service conductors.  
**NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE:** 11  
**VOTE ON PANEL ACTION:**  
**AFFIRMATIVE:** 11

(Log #CP415)

4- 59a - (230-9): Accept  
**NOTE:** The Technical Correlating Committee understands that the metric values are those accepted in Proposal 4-46.  
**SUBMITTER:** CMP 4

**RECOMMENDATION:** In Section 230-9 revise as follows:  
"230-9. Clearance from Building Openings. Service conductors and final spans shall comply with (A), (B) and (C).  
(A) Clearance From Windows. Service conductors installed as open conductors or multiconductor cable without an overall outer jacket shall have a clearance of not less than 3 ft (914 mm) from windows that are designed to be opened, doors, porches, balconies, ladders, stairs, fire escapes, or similar locations.  
Exception: Conductors run above the top level of a window shall be permitted to be less than the 3 ft (914 mm) requirement above.  
(B) Vertical Clearance. The vertical clearance of final spans above, or within 3 ft (914 mm) measured horizontally of, platforms, projections, or surfaces from which they might be reached shall be maintained in accordance with Section 230-24(b).  
(C) Building Openings. Overhead service conductors shall not be installed beneath openings through which materials may be moved, such as openings in farm and commercial buildings, and shall not be installed where they will obstruct entrance to these building openings."  
**SUBSTANTIATION:** The panel action complies with the NFPA NEC Style Manual.  
**PANEL ACTION:** Accept.  
**NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE:** 11  
**VOTE ON PANEL ACTION:**  
**AFFIRMATIVE:** 11

(A) Clearance From Windows. Service conductors installed as open conductors or multiconductor cable without an overall outer jacket shall have a clearance of not less than 3 ft (914 mm) from windows that are designed to be opened, doors, porches, balconies, ladders, stairs, fire escapes, or similar locations.  
Exception: Conductors run above the top level of a window shall be permitted to be less than the 3 ft (914 mm) requirement above.

(B) Vertical Clearance. The vertical clearance of final spans above, or within 3 ft (914 mm) measured horizontally of, platforms, projections, or surfaces from which they might be reached shall be maintained in accordance with Section 230-24(b).

(C) Building Openings. Overhead service conductors shall not be installed beneath openings through which materials may be moved, such as openings in farm and commercial buildings, and shall not be installed where they will obstruct entrance to these building openings."

**SUBSTANTIATION:** The panel action complies with the NFPA NEC Style Manual.

**PANEL ACTION:** Accept.

**NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE:** 11

**VOTE ON PANEL ACTION:**

**AFFIRMATIVE:** 11

(Log #2913)

4- 60 - (230-9): Reject  
**SUBMITTER:** Donald A. Ganiere, Ottawa, IL  
**RECOMMENDATION:** Delete text as follows:

Service conductors installed as open conductors or multiconductor cable without an overall outer jacket shall have a clearance of not less than 3 ft (914 mm) from windows ~~that are designed to be opened~~, doors, porches, balconies, ladders, stairs, fire escapes, or similar locations. Vertical clearance of final spans above, or within 3 ft (914 mm) measured horizontally of, platforms, projections, or surfaces from which they might be reached shall be maintained in accordance with Section 230-24(b).

**SUBSTANTIATION:** Windows are used for fire department access whether they are designed to open or not. Fire departments need clear access to windows for victim rescue, building ventilation, and application of fire streams. Conductors are permitted to be installed in locations that unduly interfere with fire department operations by the existing code wording. Keeping conductors at least 3 ft away from all windows will increase fire fighter safety and will make the placement of ladders for emergency rescue and fire fighting faster.  
**PANEL ACTION:** Reject.

**PANEL STATEMENT:** The panel reaffirms its position that this section does not apply to fixed glass assemblies. There has been no technical substantiation provided to conclusively support that the placement of the final spans within three feet of windows, which are designed not to be opened, is unsafe.  
**NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE:** 11  
**VOTE ON PANEL ACTION:**  
**AFFIRMATIVE:** 11

**NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE:** 11

**VOTE ON PANEL ACTION:**

**AFFIRMATIVE:** 11

(Log #CP414)

4- 62a - (230-21): Accept  
**SUBMITTER:** CMP 4  
**RECOMMENDATION:** Delete existing Section 230-21, Overhead Supply. Delete the FPN as well.

**SUBSTANTIATION:** This language is not necessary as it repeats the Article 100 definition of the term "Service Drop".

**PANEL ACTION:** Accept.

**NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE:** 11

**VOTE ON PANEL ACTION:**

**AFFIRMATIVE:** 11

(Log #3148)

4- 63 - (230-21): Reject  
**SUBMITTER:** Michael Krumnauer, Vasso, MI  
**RECOMMENDATION:** After the word conductors in the first sentence, add the words "on the load side of the service point" so the sentence reads as follows:  
"Overhead service conductors, on the load side of the service point, to a building or..."

**SUBSTANTIATION:** This section is confusing as to what conductors are being considered as service drop conductors. The

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service drop up to the service point (usually the meter) are the jurisdiction of the utility and the NESC.

**PANEL ACTION:** Reject.

**PANEL STATEMENT:** The panel has deleted this section from Article 230. The term service drop is defined in Article 100. See panel action on Proposal 4-62a. The panel does not concur that the service drop up to the meter is always under the NESC.

**NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE:** 11

**VOTE ON PANEL ACTION:**

**AFFIRMATIVE:** 11

(Log #CP417)

4- 63a - (230-22): Accept

**SUBMITTER:** CMP 4

**RECOMMENDATION:** Revise Section 230-22 to read. Individual conductors shall be insulated or covered.

Existing exception is to remain.

**SUBSTANTIATION:** This action clarifies that it is permissible to use covered conductors. The use of covered conductors is appropriate, particularly in installations over 600 volts.

**PANEL ACTION:** Accept.

**NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE:** 11

**VOTE ON PANEL ACTION:**

**AFFIRMATIVE:** 11

(Log #720)

4- 64 - (230-22): Reject

**SUBMITTER:** Dan Leaf, Palmdale, CA

**RECOMMENDATION:** Revise to read as follows:

~~Insulation or Covering.~~ Individual conductors shall be insulated or covered with an extruded thermoplastic or thermosetting insulating material.

Exception: No change.

**SUBSTANTIATION:** Article 100 definition of covered conductor indicates the covering is not insulation. This section indicates an insulating material is required for "covered" conductors. The sentence basically states "conductors shall be insulated or covered with insulation" which is inane.

I recollect a commonly used individual covered conductor widely used by utilities for service-drops, commonly called "weatherproof" wire, but seldom if ever used today. Individual "covered" conductors are noticeable by their absence from code tables and do not appear to be a listed type conductor.

(see my proposal for Article 100 Conductor - Covered)

**PANEL ACTION:** Reject.

**PANEL STATEMENT:** There are installations, particularly over 600 volts, where the use of covered conductors is appropriate.

**NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE:** 11

**VOTE ON PANEL ACTION:**

**AFFIRMATIVE:** 11 **COMMENT ON AFFIRMATIVE:**

**SUMRALL:** Not more than 3 months ago, we installed a covered conductor. We used the existing NEC to justify and propose the use of this conductor, and guess what, there was nothing inane about the installation.

(Log #1185)

4- 65 - (230-23(a)): Reject

**SUBMITTER:** Dan Leaf, Palmdale, CA

**RECOMMENDATION:** Add new text:

"Where continuous load(s) or motor load(s) is supplied, the minimum conductor ampacity shall be in accordance with the provisions of Section 230-42."

**SUBSTANTIATION:** The provisions of Section 230-42 should be applicable to service-drop conductors which carry the same load as service-entrance conductors. The reference in Section 230-42 to adjustment factor can be applicable where service-drop conductors consist of multiconductor cable with or without an outer covering and there are more than three current-carrying conductors. (See my proposal for Section 230-42).

**PANEL ACTION:** Reject.

**PANEL STATEMENT:** The provisions of Articles 220 and 430 adequately cover the computation of motor loads.

**NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE:** 11

**VOTE ON PANEL ACTION:**

**AFFIRMATIVE:** 11

(Log #1052)

4- 66 - (230-23(b)): Accept

**SUBMITTER:** James M. Daly, BICC General

**RECOMMENDATION:** Revise Article 230 as follows:

230-23(b) - change "No. 8 copper or No. 6 aluminum" to "8 AWG copper or 6 AWG aluminum"

230-23(b), Exception - change "No. 12" to "12 AWG"

230-31(b) - change "No. 8 copper or No. 6 aluminum" to "8 AWG copper or 6 AWG aluminum"

230-31(b), Exception - change "No. 12 copper or No. 10 aluminum" to "12 AWG copper or 10 AWG aluminum"

230-202(a) - change "No. 6" to "6 AWG" and "No. 8" to "8 AWG".

**SUBSTANTIATION:** To provide consistency throughout the Code. The term "No." is not used in any of the Tables in Chapter 3. AWG and kcmil are trade size designators specifically authorized for use with the SI system of units in North America. Also, industry practice is to use AWG or kcmil only.

This is one of a series of proposals to make this change throughout the Code.

**PANEL ACTION:** Accept.

**NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE:** 11

**VOTE ON PANEL ACTION:**

**AFFIRMATIVE:** 11

(Log #2178)

4- 67 - (230-23(c) and FPN (New) ): Reject

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

**RECOMMENDATION:** Revise as follows:

(c) Grounded Conductors. The grounded conductors shall be not less than the minimum size as required by Section 250-24(b).

FPN: Reasonable efficiency of operation can be provided when voltage drop is taken into consideration in sizing overhead service-drop conductors.

**SUBSTANTIATION:** This fine print note should be added. A similar fine print note is found in Section 230-31 for underground service-lateral conductors. The fine print note applies equally to overhead service-drop conductors.

**PANEL ACTION:** Reject.

**PANEL STATEMENT:** The proposed fine print note does not enhance the usability of this section.

**NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE:** 11

**VOTE ON PANEL ACTION:**

**AFFIRMATIVE:** 11

(Log #3401)

4- 68 - (230-23(d) (New) ): Reject

**SUBMITTER:** Donald W. Zipse, West Chester, PA

**RECOMMENDATION:** It is suggested that a new paragraph be added after 230-23(c) or the panel should accept the concept and generate their own words.

230-23(d) Direct Utility Connection, Customer Option. The aerial service conductors can consist of one, two or three insulated phase conductors, and an insulated identified conductor (neutral), and a messenger that also serves as a grounding conductor to be used as an equipment grounding conductor, which originates at the service transformer.

Underground service conductors can consist of one, two or three insulated phase conductors, and an insulated identified conductor (neutral), and a grounding conductor to be used as an equipment grounding conductor, which originates at the service transformer.

**SUBSTANTIATION:** Please note that this is an option for the informed customer to make, not a requirement. Granted there is no probation against doing this, except the concept is foreign to the authority having jurisdiction and it is very doubtful if the authority having jurisdiction would approve such an installation. Therefore, this allowance must be placed in the NEC to permit protection against stray, uncontrolled primary neutral current flow over metallic piping such as water, gas, etc. and the earth.

There are laws such as Ohm's Law and Kirchoff's Laws. Now there is Zipse's Law - Zipse's Law:

"In order to have and maintain a safe electrical installation:

All continuously, flowing current shall be contained within an insulated conductor or if a bare conductor, the conductor shall be installed on insulators, insulated from earth, except at one place within the system and only one place can the neutral be connected to earth.

A system is defined as the conductors between transformers or after the last transformer.”

Approximately 25 years ago, what is now Code Making Panel 19 made mandatory the connection of trailers using 4 or 5 wire systems. The panel recognized the hazards associated with multiple connection of the neutral conductor, identified conductor to earth/ground. Two (2) or three (3) phase conductors, and insulated neutral conductor and a bare ground conductor were required.

One or two Code cycles later another Code Making Panel made mandatory the connection of Marinas using 4 or 5 wire systems thus eliminating the hazardous condition of stray, uncontrolled flow of current over metallic conducting paths and water.

It was not until the 1996 edition of the NEC that Code Making Panel No. 5, saw clear to make ranges and dryers wiring mandatory using 4 or 5 wire systems with an insulated and isolated neutral/identified conductor and a separate equipment ground/earth conductor.

It makes sense then that the high voltage electrical systems under the control of the NEC and Code Marking Panel No. 5 would follow the same logic, that the neutral/identified conductor would be insulated and connected to earth at only one place in order to eliminate hazardous flow of uncontrolled stray current. (Proposals have been submitted to CMP #5). It has been reported that persons in showers and swimming pools and dairy cows have received electric shocks from this stray uncontrolled flow of neutral return current flowing uncontrolled over the earth, metallic piping and other conductive surfaces.

Are the members of the Code Making Panel aware that the primary neutral return current from the primary side of the transformers used for services is directly connected to the secondary side neutral at the utility's transformer?

This allows primary neutral current to flow over the interior metallic water piping, uncontrolled, not within an insulated conductor. Does any member of this panel condone the flow of uncontrolled primary neutral current over interior metallic piping, over the earth flowing uncontrolled, shocking persons in swimming pools, showers, and dairy cows? After the panel members recognize this hazard I am sure they will agree and seek a solution.

If and when the public is informed of the dangers associated with multiple neutral to ground/earth connections that result in hazardous uncontrolled flow of stray current over the earth, interior water and gas piping systems and other conducting paths that result in electric shocks to the inhabitants, law suits will probably follow.

The object of this proposal is to prevent the uncontrolled flow of continuous current over the earth by allowing the service neutral to be insulated and to require a separate ground conductor to originate at the service transformer. This is the same requirement that now exists for marinas and mobile homes, ranges and dryers. Why should the building be exempt?

Yes, today the utilities do not supply an insulated, separate neutral, (yet). Someone has to be first and why not the NFPA's NEC? This is the case of the chicken and the egg, which came first?

The grounding conductor would be connected again to earth at the service entrance and any other places that would be desirable.

The basic substantiation is Ohm's Law and Kirchoff's Laws. Kirchoff states, "The algebraic sum of the currents toward any point in a network is zero." Thus with the identified conductor (neutral) connected to earth at more than one place, at the service to each and every house served from the transformer and at the transformer, uncontrolled current can and will flow over the earth. No matter what the resistance is to the earth and the resistance of the messenger serving also as the neutral and the ground, a proportion of the return current will flow uncontrolled over the earth. (Ohm's Law).

Two technical papers are available on the web. They explain in detail the problem with multiple connection to earth of the neutral conductor. One is subtitled, "The Shocking Showers" and the other is subtitled, "The Shocking Swimming Pool". They can be found at:

[www.mikeholt.com/Newsletters/8-16-99.doc](http://www.mikeholt.com/Newsletters/8-16-99.doc) and at [www.mikeholt.com/Newsletters/8-17-99.doc](http://www.mikeholt.com/Newsletters/8-17-99.doc).

All continuous current flow however, must be contained within insulated conductors. The rejection of this proposal could indicate this panel condones and approves of the uncontrolled flow of current over the earth, which I am sure you do not.

By approving this proposal, you are opening the way to improve the use of electrical energy safely by making the first step to preventing uncontrolled flow of continuous current over the earth. **PANEL ACTION:** Reject.

**PANEL STATEMENT:** The AHJ and the building owner have no control over the grounding of the service drop supplied by the utility or the methods and materials used. Regardless, if the neutral

is insulated the effect that the submitter desires is negated by the bonding jumper required at the service equipment.

**NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE:** 11

**VOTE ON PANEL ACTION:**

**AFFIRMATIVE:** 11

(Log #CP403)

4- 68a - (230-24): Accept

**SUBMITTER:** CMP 4

**RECOMMENDATION:** Delete the first sentence of Section 230-24.

**SUBSTANTIATION:** This requirement is not enforceable.

**PANEL ACTION:** Accept.

**NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE:** 11

**VOTE ON PANEL ACTION:**

**AFFIRMATIVE:** 11

(Log #CP418)

4- 68b - (230-24): Accept

**SUBMITTER:** CMP 4

**RECOMMENDATION:** In Section 230-24 number the clearance requirements (1) through (4).

**SUBSTANTIATION:** The panel action complies with the NFPA NEC Style Manual.

**PANEL ACTION:** Accept.

**NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE:** 11

**VOTE ON PANEL ACTION:**

**AFFIRMATIVE:** 11

(Log #1161)

4- 69 - (230-24(a) Exception No. 5 (New) ): Reject

**SUBMITTER:** Charles K. Eldridge, Indianapolis, IN

**RECOMMENDATION:** Add a new Exception No. 5 to read:

230-24. Clearances. The vertical clearances of all service-drop conductors shall be based on conductor temperature of 60°F (15°C), no wind, with final unloaded sag in the wire, conductor, or cable.

Service-drop conductors shall not be readily accessible and shall comply with (a) through (d) for services not over 600 volts, nominal. (a) Above Roofs. Conductors shall have a vertical clearance of not less than 8 ft (2.44 m) above the roof surface. The vertical clearance above the roof level shall be maintained for a distance of not less than 3 ft (914 mm) in all directions from the edge of the roof.

Exception No. 5: Where the voltage between conductors does not exceed 600, the roof has a slope of 4 in. (102 mm) in 12 in. (305 mm), or greater, and the service drop is Messenger Supported Wiring as defined in Article 321, a reduction in clearance above only the overhanging portion of the roof to not less than 36 in. (915 mm) shall be permitted if (1) not more than 6 ft (1.83 m) of service-drop conductors, 4 ft (1.22 m) horizontally, pass above the roof overhang, and (2) they are terminated at a through-the-roof raceway or approved support.

**SUBSTANTIATION:** This change would permit the now wide spread practice (the National Electrical Safety Code®, Rule 234C3d(1) Exception No. 1, permits this installation now) of allowing a 480 volt service drop to hit a through the roof raceway with proper clearance. In addition to the general restrictions given in Exception No. 3, I have increased safety by adding the general restrictions in Exception No. 2.

**PANEL ACTION:** Reject.

**PANEL STATEMENT:** The submitter has not adequately defined whether the proposed text is applicable to open conductors or cables. Reducing the clearance for this level of voltage is considered to be a reduction in the present level of safety. The panel does not concur that this is permitted by the NESC.

**NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE:** 11

**VOTE ON PANEL ACTION:**

**AFFIRMATIVE:** 11

(Log #122)

3-3 - (230-25, 305): Accept in Principle

**NOTE:** It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 4 for information.

**NOTE:** The following proposal consists of Comment 4-49 on Proposal 4-77 in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. The recommendation in Proposal 4-77 was:

Add the following new section under Article 230:  
230-25. Vegetation. Vegetation such as trees shall not be used for support of overhead service drop conductors.

Exception: For temporary wiring in accordance with Article 305.

**SUBMITTER:** Melvin K. Sanders, TECo., Inc.

**RECOMMENDATION:** CMP 3 Task Group accepts the Panel Action to Accept in Part Proposal 4-77 such that the rule will be: "Section 230-25. Vegetation. Vegetation such as trees shall not be used for support of overhead service drop conductors." and to exclude the proposed Exception.

**SUBSTANTIATION:** It is the position of CMP 03 Task Group Raymond W. Weber, Richard P. Owen and Melvin K. Sanders, Secretary, on ROP 4-77 that it is within the purview of CMP 04 to determine the support requirements for wiring methods in Article 230.

**PANEL ACTION:** Accept in Principle.

**PANEL STATEMENT:** Section 305-4 requires compliance with the provisions of Article 230 for services used for a temporary installation. Panel 4 has jurisdiction over the support requirements for service conductors and should make the determination on whether or not to relax support requirements for a temporary service. CMP 3's position is that vegetation shall not be used as a support means.

**NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE:** 11

**VOTE ON PANEL ACTION:**

**AFFIRMATIVE:** 11

(Log #1446)

4-70 - (230-25 and Exception (New)): Accept in Principle in Part

**NOTE:** It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 3 for information.

**SUBMITTER:** Barry F. Tower, Patten, ME

**RECOMMENDATION:** Add the following new section:

230-25. Vegetation. Vegetation such as trees shall not be used for support of overhead service drop conductors.

Exception: For temporary wiring in accordance with Article 305.

**SUBSTANTIATION:** This same requirement has been in the "Code" for feeders (225-26) for some time now. The same requirements should apply to overhead service conductors.

**PANEL ACTION:** Accept in Principle in Part.

The panel accepts the proposed text and has modified it by changing the title to read:

"Vegetation as Support", deleting the word "drop" and renumbering this to be 230-10. The panel rejects the proposed exception.

**PANEL STATEMENT:** The panel agrees with the submitter's proposal to prohibit vegetation as a support method and has expanded it to cover all service conductors by placing the requirement in Part A. The panel has not accepted the proposed exception as there is a significant difference between Article 225 and Article 230 relative to overcurrent protection requirements for conductors.

**NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE:** 11

**VOTE ON PANEL ACTION:**

**AFFIRMATIVE:** 11

(Log #721)

4-71 - (230-28): Reject

**SUBMITTER:** Dan Leaf, Palmdale, CA

**RECOMMENDATION:** Add:

Service masts shall be installed in a manner that will permit the

minimum clearances specified in Section 230-24 for service-drop conductors.

**SUBSTANTIATION:** The proposed requirement is inferred where service-drops are covered by the code. Many exempt utility-owned and installed service do not conform to Section 230-24. There is no requirement to provide mast installation which allows conformance with Section 230-24 in such cases. Since the majority of service drops are exempted from Section 230-24 by Section 90-2, the proposal would enhance the likelihood of conformance with Section 230-24.

**PANEL ACTION:** Reject.

**PANEL STATEMENT:** In order to meet the clearance requirements of this section, installers must coordinate the installation of the mast with the serving utility. Additional language is not necessary to assure compliance.

**NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE:** 11

**VOTE ON PANEL ACTION:**

**AFFIRMATIVE:** 11

(Log #4067)

4-72 - (230-28): Reject

**SUBMITTER:** David P. Brown, Baltimore Gas and Electric Co./Rep. Edison Electric Inst./Electric Light & Power Group

**RECOMMENDATION:** Add a sentence at the end of 230-28:

230-28. Service Masts as Supports. Where a service mast is used for the support of service-drop conductors, it shall be of adequate strength or be supported by braces or guys to withstand safely the strain imposed by the service drop. Where raceway-type service masts are used, all raceway fittings shall be identified for use with service masts. Only power service-drop conductors shall be permitted to be attached to a service mast. Only one service drop shall be attached to a raceway-type service mast.

**SUBSTANTIATION:** This change ensures that proper loading is applied to raceway-type masts.

**PANEL ACTION:** Reject.

**PANEL STATEMENT:** The submitter has not provided technical substantiation to limit the number of service drops permitted to be attached to a single mast.

**NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE:** 11

**VOTE ON PANEL ACTION:**

**AFFIRMATIVE:** 11

(Log #1670)

4-73 - (230-28, Exception): Reject

**NOTE:** It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 16 for information.

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

**RECOMMENDATION:** Add the following exception at the end of Section 230-28:

Exception: Communications and community antenna television (CATV) service drops shall be permitted to be attached to a service mast that is listed for the purpose of accepting multiple attachments.

**SUBSTANTIATION:** The present general prohibition regarding the attachment of communications and CATV service drops to the power service mast is excessive. Where the service mast is designed and listed for the attachment of multiple service drops, a single mast for all attachments should be permitted. Listing will ensure that the mast itself, as well as the installation hardware and methods, are adequate to withstand the total combined load. Also, listing will provide a verification method to the authority having jurisdiction. It is unnecessarily costly to the building owner and aesthetically unslightly when two service masts must be provided, one for power and another for communications and CATV services.

This proposal attempts to find a reasonable and safe alternative to the main rule by permitting communications and CATV attachments to power service masts that are listed for such application. Listing will help ensure the safety of attached power and communications conductors on a single mast, as well as address the personnel safety concerns raised by CMP 4 in previous Code cycles. It should be noted that the communications and CATV craft personnel are trained to work in close proximity to power conductors. Section 800-10(a)(4) permits a minimum separation of 12 inches between power-service drops and communications drops at their point of attachment to the building, provided that the nongrounded power conductors are insulated and that a clearance of 40 inches between the two services is maintained at the pole.

Section 820-10(f)(1) permits separations of as little as 4 inches where cables of the two systems are attached to buildings.

This proposal seeks relief from the present prohibition on communications and CATV attachments to a power service mast in a way that is both safe and cost effective.

Note that companion proposals for a new Section 800-10(c) and a revised Section 820-10(c) have been submitted. These companion proposals would permit communications and CATV service drop attachments to a power service mast in accordance with the proposed Section 230-28, Exception.

PANEL ACTION: Reject.

PANEL STATEMENT: The panel does not believe that the listing of the product will adequately address the personnel safety issues that are created by the co-mingling of the different systems on a common mast. Issues such as loading can be addressed by the proposed listing, however personnel safety can not be assured regardless of the listing criteria.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 10

NEGATIVE: 1

EXPLANATION OF NEGATIVE:

YOUNG: Personnel safety is important, but the code does not impose any limitations or restrictions on the installation of different systems today. A listed mast could well be safer by identifying where and how the systems are attached.

COMMENT ON AFFIRMATIVE:

HUGHES: I strongly support the panel action to reject this proposal. While the suggested listing requirement might address loading requirements, attachment methods, etc., it would still ignore the safety concerns of many installers and service electricians. Documented proof is available that multiple attachments have caused injury to service electricians. This possibility will not be eliminated with listing. Also contrary to the submitter's belief, not all CATV personnel have adequate training to work around live conductors.

The submitter also raises the question of unnecessary cost to the building owner. While cost should not be a controlling factor but rather safety, the installing electrician would have to bear increased cost as well as any increased liability.

SUMRALL: The continuing battle, of telecommunication companies, to attach another service drop to the electrical mast, is only driven by the profits that will be realized by these entities. As stated in the Panel Statement, listing will do absolutely nothing for the safety concerns that are raised each and every time this proposal or one like it is brought before the CMP, the Technical Correlating Committee, or the NFPA floor. These companies seek only greater profit margins and claim aesthetics as one of the substantiation concerns. During the last cycle, an appeals board met to discuss the merits of a similar proposal and agreed with the CMP, 90-1 is the driving force for the NEC. The NEC should not be concerned with minimal costs, but rather the practical safeguarding of persons and property.

(Log #3152)

4-74 - (230-30): Reject

SUBMITTER: Andrew J. Mayville, Escanaba, MI

RECOMMENDATION: Add the following new section and renumber the present sections of Part C. Make title of section Underground Supply. Article reads as follows:

Underground service conductors from a building or other structure (such as a pole) on which a meter is installed shall be considered service lateral conductors and installed accordingly.

SUBSTANTIATION: It is common to run conductors underground from a metering point, such as on a farm, underground to out buildings. In this case the underground conductors should be considered to be service lateral conductors just like overhead conductors under similar circumstances are to be considered service drop conductors.

PANEL ACTION: Reject.

PANEL STATEMENT: The submitter has not provided technical substantiation to treat these conductors as service lateral conductors. The panel intends that the requirements of Part D apply to the conductors on the load side of terminal box, meter or other enclosure.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #1184)

4-75 - (230-31(a)): Reject

SUBMITTER: Dan Leaf, Palmdale, CA

RECOMMENDATION: Add text to read:

"The ampacity of service-lateral conductors before the application of any adjustment or correction factors shall not be less than the sum of the noncontinuous load(s), plus 125 percent of the continuous load(s) or the ampacity specified for motor supply conductors in Part B of Article 430 and Part D of Article 440, whichever is greater.

Exception: The correction factors for temperatures below 26°C (78°F) shall be permitted in determining the initial conductor ampacity."

SUBSTANTIATION: Loads as computed in Article 220 do not specify any load increase, per se, for continuous load or motor load. Requirements for those type loads specify an increase in conductor ampacity, which is not the same as load. Those requirements are in Articles 210, 215, 230, and 430 which cover branch circuits, feeders, and service-entrance conductors, and "conductors" (not specific) for motors, which could apply but is easily overlooked as applying to service-laterals. Required ampacity increases should apply to service-laterals as it does to service-entrance conductors in Section 230-42(a)(1)(2).

Application of this section does not correlate with Section 215-2 for continuous load nor Section 430-24, and can lead to disparity of ampacity ratings for conductors supplying the same load.

The proposed exception allows for increased ampacity where underground temperatures are deemed to be less than 26°C.

See my proposals for Sections 210-19(a) and 215-2(a).

PANEL ACTION: Reject.

PANEL STATEMENT: The submitter has not demonstrated that the existing requirement for sizing service lateral conductors has proven to be inadequate. These conductors generally do not terminate in enclosures that require conductors to be sized at 125 percent.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #CP419)

4-75a - (230-31(c)): Accept

SUBMITTER: CMP 4

RECOMMENDATION: Remove the fine print note from Section 230-31(c).

SUBSTANTIATION: The fine print note does not enhance the usability of this section.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #3794)

4-76 - (230-33 (New)): Accept in Principle

SUBMITTER: John I. Williamson, Minnesota Board of Electricity

RECOMMENDATION: Create a new section in Part C

(Underground Service Lateral Conductors) similar to Section 230-46 for Service-Entrance Conductors as follows:

230.33. Spliced Conductors. Service-lateral conductors shall be permitted to be spliced or tapped by clamped or bolted connections. Splices shall be made in enclosures or, if directly buried, with a listed underground splice kit. Splices of conductors shall be made in accordance with Sections 110.14, 300.5(e), 300.13, and 300.15.

SUBSTANTIATION: There is no prohibition in the code from splicing service-lateral conductors, consequently it is assumed that it is permissible to do so. The usability of the code would be improved if the code included a section that specifically permitted service-lateral conductors to be spliced.

PANEL ACTION: Accept in Principle.

Revise as follows:

"230.33. Spliced Conductors. Service-lateral conductors shall be permitted to be spliced or tapped by ~~clamped or bolted connections. Splices shall be made in enclosures or, if directly buried, with a listed underground splice kit. Splices of conductors shall be made in accordance with Sections 110.14, 300.5(e), 300.13, and 300.15."~~

**PANEL STATEMENT:** The panel's action adequately addresses the submitter's concern. See panel action on Proposal 4-96.  
**NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE:** 11  
**VOTE ON PANEL ACTION:**  
**AFFIRMATIVE:** 11

(Log #1506)

4-77 - (230-40): Accept in Principle

**SUBMITTER:** Junior L. Owings, Rep. Oregon Chapter Int'l Assn. of Electrical Inspectors

**RECOMMENDATION:** Revise text as follows:

230-40. Number of Service-Entrance Conductor Sets. Each service drop or lateral shall supply only one set of service-entrance conductors.

Exception No. 1: Buildings with one or more than one occupancy shall be permitted to have one set of service-entrance conductors for each class different characteristic of service run to each occupancy or group of occupancies.

Exception No. 2: Where two to six service disconnecting means in separate enclosures are grouped at one location and supply separate loads from one service drop or lateral, one set of service-entrance conductors shall be permitted to supply each or several such service equipment enclosures.

Exception No. 3: A single-family dwelling unit and a separate structure shall be permitted to have one set of service-entrance conductors run to each from a single service drop or lateral.

Exception No. 4: A two-family dwelling or a multifamily dwelling shall be permitted to have one set of service-entrance conductors installed to supply the circuits covered in Section 210-25.

Exception No. 5: One set of service-entrance conductors connected to the supply side of the normal service disconnecting means shall be permitted to supply each or several systems covered by Section 230-82(4).

**SUBSTANTIATION:** The present Code language does not specify what "class" means, however, 230-2(d) does specify "different characteristics."

**PANEL ACTION:** Accept in Principle.

Revise Exception No. 1 to read:

"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 class service of different characteristics, as defined in Section 230-2(d), run to each occupancy or group of occupancies."

**PANEL STATEMENT:** The change to the proposed language enhances the clarity of the exception. This change also incorporates the language of Proposal 4-80.

**NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE:** 11

**VOTE ON PANEL ACTION:**

**AFFIRMATIVE:** 11

(Log #2250)

4-78 - (230 Part D): Reject

**SUBMITTER:** Michael G. Zeuger, LDA Co.

**RECOMMENDATION:** I feel a section should be added to service entrance conductors. All services entrance conductors shall be derated 80 percent with no exceptions.

**SUBSTANTIATION:** Due to a growing amount of nonlinear loads in commercial and institutional buildings.

**PANEL ACTION:** Reject.

**PANEL STATEMENT:** There is no technical substantiation to apply this requirement to all service entrance conductors.

**NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE:** 11

**VOTE ON PANEL ACTION:**

**AFFIRMATIVE:** 11

(Log #1042)

4-79 - (230-40 Exception No. 1): Reject

**SUBMITTER:** William Barnett, City of Gresham, OR

**RECOMMENDATION:** Delete Exception No. 1.

**SUBSTANTIATION:** Exception No. 1 is in direct conflict with Part F of Article 230. While 230-40 specifically addresses service-entrance conductors, Exception No. 1 in fact allows an unlimited number of service disconnects and unfused conductors throughout a building with more than one occupancy. A 40-unit apartment building or a 3-story building with a different retail tenant on each floor is a single

occupancy building by Uniform Building Code definition.

"Buildings with one or more than one occupancy" is a vague and undefined term that covers all existing and future buildings, with or without area or occupancy separations. Section 230-40 Exception No. 1 is subject to broad interpretation and nullifies Sections 230-2, 230-70(a), 230-71(a), and 230-72(a). The National Electrical Code does not define "occupancy", "mixed-occupancy", or "multi-occupancy". The NEC repeatedly refers to NFPA 101-1997 and this standard uses the UBC definition of "occupancy". Code Making Panel No. 1 has refused to accept the UBC definition of "occupancy". While it is necessary to have alternate methods to achieve compliance with the intent of the codes, Exception No. 1 lessens uniformity, compliance and is potentially hazardous for firefighters and building occupants.

**PANEL ACTION:** Reject.

**PANEL STATEMENT:** The substantiation is incorrect. Section 230-40 Exception 1 does not conflict with Part F. Exception No. 1 permits multiple sets of service entrance conductors to be supplied by a single service and Section 230-71(a) specifically addresses the location of the disconnecting means. The multiple sets of service entrance conductors are required to comply with the requirements of Section 230-70(a) and it is not permitted to run conductors without overcurrent protection through the interior of the building. The use of this exception has practical application for buildings with more than one occupancy and the submitter has not provided documentation to indicate that this language has resulted in decreased safety of the installation.

**NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE:** 11

**VOTE ON PANEL ACTION:**

**AFFIRMATIVE:** 11

(Log #1409)

4-80 - (230-40 Exception No. 1): Accept

**SUBMITTER:** Dan Leaf, Palmdale, CA

**RECOMMENDATION:** Revise as follows:

Exception No. 1: Buildings A building with one or more than one...

(Remainder Unchanged).

**SUBSTANTIATION:** Buildings (plural) literally indicates more than one structure. The proposal would include one structure with one or more occupancy, or a separate structure(s) with one or more occupancy which may be on the same property. Proposal is editorial.

**PANEL ACTION:** Accept.

**NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE:** 11

**VOTE ON PANEL ACTION:**

**AFFIRMATIVE:** 11

(Log #4171)

4-81 - (230-40 Exception No. 1): Reject

**SUBMITTER:** Frederic P. Hartwell, Hartwell Electrical Services, Inc./Rep. Massachusetts Electrical Code Advisory Committee

**RECOMMENDATION:** Revise as follows:

"By special permission, where there is no available space for service equipment accessible to all the occupants, buildings with more than one occupancy shall be permitted to have one set of service entrance conductors for each class of service run to each occupancy or group of occupancies."

**SUBSTANTIATION:** The continuing rejection of any limits on the existing exception is unbelievable. On the literal text of the present NEC, it is permitted to group six of seven service disconnects for a seven family dwelling at one point. Then, one can run a set of service conductors around the outside of the building to a remote location and spot the seventh disconnect. In fact, the service conductors need not run outside the building; they could be run in a wall as long as there was two inches of concrete encasement.

Section 230-2 does not apply, since there is only one service. Therefore, it is not even necessary to provide a directory at either disconnect location to inform the fire service of the remote, still energized disconnect. If this does not justify an outright prohibition, surely it justifies a requirement for special permission. This rule has been in the Massachusetts Code for over ten years now, and it is working well. In truly extenuating circumstances, special permission is granted, usually upon the condition of reciprocal labeling.

The 1999 change, expanding this allowance to each class of service, makes this proposal even more critical. Under the 1996 NEC a ten-family apartment house might have 60 service disconnects. If there are two classes of service, now there could be 120 disconnects.

Prior panel statements about (effectively) Section 90-4 are, frankly, irresponsible. Good inspectors loathe code rules that effectively force them in to inventing the Code through that process. Only the bad inspectors welcome this chance to show how powerful they are. In all the electrical seminars I have been part of across the nation, I have never found any support for they way this rule can be applied, and with the new change it's worse than ever. The inspector needs a forthright statement that clearly shows that special discretion is expected in these cases.

**PANEL ACTION:** Reject.

**PANEL STATEMENT:** The use of this exception has practical application for buildings with more than one occupancy and the submitter has not provided documentation to indicate that this language has resulted in decreased safety of the installation.

**NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE:** 11

**VOTE ON PANEL ACTION:**

**AFFIRMATIVE:** 11

**COMMENT ON AFFIRMATIVE:**

**SUMRALL:** Since the State of Massachusetts elected to utilize 90-4 for the adoption of this exception into their Electrical Code, it would appear not all inspectors need a "forthright statement" to grant special permission for this type of installation. This most learned seminar instructor, I hope, is not rejecting the idea of the Authority Having Jurisdiction does not already have the tools to use discretion in these cases, because they do have that ability. This is the only proposal for this section, so therefore the problem might not be as widespread as the submitter thinks.

(Log #722)

4- 82 - (230-40 Exception No. 5): Accept

**SUBMITTER:** Dan Leaf, Palmdale, CA

**RECOMMENDATION:** Revise to read as follows:

Exception No. 5: One set of service-entrance conductors connected to the supply side of the normal service disconnecting means shall be permitted to supply each or several systems covered by Section 230-82 (4) or (5).

**SUBSTANTIATION:** Editorial. Section 230-82(5) covers systems permitted to be connected to the supply side of the normal service disconnecting means by conductors which may be considered service conductors.

**PANEL ACTION:** Accept.

**NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE:** 11

**VOTE ON PANEL ACTION:**

**AFFIRMATIVE:** 11

(Log #723)

4- 83 - (230-41, Exception (New) ): Accept in Principle in Part

**SUBMITTER:** Dan Leaf, Palmdale, CA

**RECOMMENDATION:** Add a new paragraph (e) to the exception to read as follows:

(e) Bare copper used in an auxiliary gutter or in a cablebus assembly.

**SUBSTANTIATION:** Editorial. These are permitted wiring methods in Section 230-40, but since they are not considered raceways bare grounded conductors are not permitted, for no other apparent good reason.

**PANEL ACTION:** Accept in Principle in Part.

Amend the proposed text to read:

"(e) Bare conductors used in an auxiliary gutter".

Do not accept the proposed language to permit bare grounded conductors in cablebus.

**PANEL STATEMENT:** The panel disagrees that this proposal constitutes an editorial change only. The panel is capable of judging whether a proposed change is editorial. Section 365-3(a) requires that all current carrying conductors in cablebus be insulated. Section 374-7 permits the use of bare conductors in an auxiliary gutter and does not restrict this permission to copper conductors only. Conductors in auxiliary gutters may be wire or busbar.

**NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE:** 11

**VOTE ON PANEL ACTION:**

**AFFIRMATIVE:** 11

(Log #17)

4- 84 - (230-42(a)): Reject

**NOTE:** It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panels 2 and 11 for information.

**NOTE:** The following proposal consists of Comment 4-64 on Proposal 4-96 in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. The recommendation in Proposal 4-96 was:

Revise as follows:

230-42. Size and Rating.

(a) General. Service-entrance conductors shall be of sufficient size to carry the loads as computed in Article 220.

(1) Ampacity. Ampacity shall be determined from Section 310-15.

Exception: The maximum allowable current of approved busways shall be that value for which the busway has been listed or labeled.

(2) Continuous and Noncontinuous Loads. Where service entrance conductors supply continuous loads or any combination of continuous and noncontinuous loads, the minimum service entrance conductor size, without the application of any adjustment or correction factors, shall have an allowable ampacity equal to or greater than the noncontinuous load plus 125 percent of the continuous load.

Exception: Where the assembly, including any overcurrent devices, is listed for operation at 100 percent of their rating, neither the ampere rating of the overcurrent device nor the ampacity of the branch circuit conductors shall be less than the sum of the continuous load plus the noncontinuous load.

**SUBMITTER:** Dan Leaf, Palmdale, CA

**RECOMMENDATION:** Accept in principle, revise Panel Action as follows:

(a) General. ~~The ampacity of the service-entrance conductors, before the application of any adjustment or correction factors shall not be less than items 1 or 2 below. Loads are to be determined in accordance with Article 220. Ampacity shall be determined from Section 310-15. 1) The sum of the noncontinuous load, if the service entrance conductors terminate in an overcurrent device that is listed for operation at 100 percent of its rating. Service-entrance conductors shall have an ampacity not less than the maximum load to be served. Where service-entrance conductors supply continuous load or any combination of continuous, noncontinuous load, and motor load, the minimum service-entrance conductor size, before the application of any adjustment or correction factors, shall have an allowable ampacity equal to or greater than the noncontinuous load plus 125 percent of the continuous load, plus the ampacity specified in Section 430-24 for motor loads.~~

Exception No. 1: Where the assembly, including the overcurrent protective device(s) for the service-entrance conductors are listed for 100 percent of their rating, the ampere rating of the overcurrent protective device(s) shall not be less than the sum of the continuous load plus the noncontinuous load, plus the motor load, and the ampacity of the service-entrance conductors shall not be less than the continuous load plus the noncontinuous load, plus the ampacity specified in Section 430-24 for motor loads.

**SUBSTANTIATION:** Although a fully loaded motor operating for 3 hours or more meets the definition of continuous load, this does not appear to be the intent of the Code. The revision would be more comprehensive for Code users (user friendly) and correlate with a similar requirement of Section 430-24. Although a fully loaded motor operating for 3 hours or more meets the definition of continuous load, this does not appear to be the intent of the Code and is not addressed in this section. The proposed revision would be more comprehensive for Code users and "user friendly". Panel revision item (a) (2) is incorrect as pointed out by Mr. Young and has left out inclusion of "assembly" which is generally necessary for a 100 percent continuous load rating. Busway current rating is covered in Article 364.

**PANEL ACTION:** Reject.

**PANEL STATEMENT:** The requirements of Articles 220, 430 and 440 adequately cover the requirements for calculating the loads described in the proposal. Panel 4 does not have jurisdiction over the rules for computing loads. See panel action on Proposal 4-87.

**NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE:** 11

**VOTE ON PANEL ACTION:**

**AFFIRMATIVE:** 11

(Log #4116)

4- 85 - (230-42(a)): Reject

**SUBMITTER:** Truman C. Surbrook, Michigan State University  
**RECOMMENDATION:** Revise the first sentence of the section as follows with the deletions and additions as indicated:

~~“The ampacity of the service-entrance conductors before the application of any adjustment or correction factors shall have an allowable ampacity not be less than as determined in either (1) or (2).”~~

**SUBSTANTIATION:** The phrase “before the application of any adjustment or correction factors” is particularly confusing to electricians making conductor ampacity selection when adjustment factors are being used. Some apply the adjustment factors to the allowable ampacity found in the appropriate table and then compare it with 100 percent of both continuous load and noncontinuous load, others compare the adjusted allowable ampacity to the sum of 100 percent of the noncontinuous load and 125 percent of the continuous load. By removing the confusing statement, it makes the section clear that the adjusted allowable ampacity of the conductor is not permitted to be less than the sum of 100 percent of the noncontinuous load plus 125 percent of the continuous load.

**PANEL ACTION:** Reject.

**PANEL STATEMENT:** The current language contained in 230-42(a) provides the correct sizing requirements. The ampacity of the conductors is determined by calculating the continuous and noncontinuous loads before the application of any adjustment or correction factors.

**NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE:** 11

**VOTE ON PANEL ACTION:**

**AFFIRMATIVE:** 11

operating time). If motors operating for 3 hours or more are deemed continuous load, this section (1) requires each motor supply conductor to be computed at 125 percent ampacity. If the motor(s) operate for less than 3 hours no factor is required by this section, which conflicts with Article 430 which requires the general 25 percent ampacity increase regardless of operating time. The 25 percent factor for motor supply conductors as I understand it, is not for a phantom load but provides for temporary motor overload and the general maximum rating for motor overload devices. The proposed revision for (1) would allow the continuous load factor to apply to the motor conductor ampacity factor or vice-versa, whichever is larger.

The proposal for (2) is revised to permit deletion of the 125 percent factor for continuous loads where conductors are terminated at an assembly without integral overcurrent devices, such as a nonfusible switch listed for continuous operation at 100 percent of rating. Present wording disallows a 100 percent ampacity rating of supply side conductors for such a switch or a meter socket. (Literally conductors don't terminate in an overcurrent device.)

Again, the required ampacity for motor supply conductors in Article 430 is a given, and should be provided for the largest supplied motor, whether operated for less than 3 hours or more than 3 hours. [See my proposal for Section 215-2(a)].

**PANEL ACTION:** Reject.

**PANEL STATEMENT:** The requirements of Articles 220, 430 and 440 adequately cover the requirements for calculating the loads described in the proposal. Panel 4 does not have jurisdiction over the rules for computing loads.

**NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE:** 11

**VOTE ON PANEL ACTION:**

**AFFIRMATIVE:** 11

(Log #4118)

4- 86 - (230-42(a)): Reject

**SUBMITTER:** Truman C. Surbrook, Michigan State University  
**RECOMMENDATION:** In the first line add the word allowable before ampacity. The section will then read “The allowable ampacity of the service-entrance conductors...”

**SUBSTANTIATION:** The addition of the word allowable should make it clear that the ampacity of the service entrance conductors is the value determined in the appropriate allowable ampacity table with any appropriate adjustment factors applied.

**PANEL ACTION:** Reject.

**PANEL STATEMENT:** Addition of this language does not add clarity to this section. In fact it may cause confusion that only the tables of Article 310-15(b) are permitted to be used.

**NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE:** 11

**VOTE ON PANEL ACTION:**

**AFFIRMATIVE:** 11

(Log #3142)

4- 88 - (230-42(a)(2)): Reject

**SUBMITTER:** Nathan Kay, Frankenmuth, MI  
**RECOMMENDATION:** Delete the entire Paragraph (2).

**SUBSTANTIATION:** Conductors are now required to be sized at 125 percent of the continuous load. Why does it matter if the overcurrent device is rated to operate at only 100 percent of the continuous load? In addition, this section deals with wire sizing, not overcurrent device ratings.

**PANEL ACTION:** Reject.

**PANEL STATEMENT:** The sizing of the conductors and the limitations on the overcurrent device are indeed interrelated. The existing language is necessary to properly match the conductor size to the service equipment terminations (loads and termination temperature ratings shall be considered).

**NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE:** 11

**VOTE ON PANEL ACTION:**

**AFFIRMATIVE:** 11

(Log #1186)

4- 87 - (230-42(a)(1), (2)): Reject

**NOTE:** It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panels 2 and 11 for information.

**SUBMITTER:** Dan Leaf, Palmdale, CA

**RECOMMENDATION:** Revise text to read:

(1) The sum of the noncontinuous load(s), plus 125 percent of the continuous load(s) or the ampacity specified for motor supply conductors in Part B of Article 430 or Part D of Article 440, whichever is greater.

(2) The sum of the noncontinuous load(s) plus and the continuous load(s), plus the ampacity specified for motor supply conductors in Part B of Article 430 and Part D of Article 440, if the service-entrance conductors terminate in an overcurrent device at an assembly with or without an integral overcurrent device(s) where both the overcurrent device and its the assembly are is listed for continuous operation at 100 percent of their its rating.

Exception: Boxes or other enclosures which contain only spliced or tapped conductors in accordance with Section 230-46 shall not be required to be listed for continuous operation.

**SUBSTANTIATION:** The panel statement for Comment 1-174 in the 1998 ROC indicated motor loads continuing for 3 hours or more are not excluded from the definition of continuous load. This may be literally correct but not in harmony with Article 430 and 440 and common practice which only applies the 25 percent ampacity increase (125 percent factor) to the largest motor (regardless of

(Log #4117)

4- 89 - (230-42(a)(2)): Reject

**SUBMITTER:** Truman C. Surbrook, Michigan State University  
**RECOMMENDATION:** Revise paragraph (2) as follows:

“The sum of the noncontinuous load plus the continuous load and not less than the rating of the overcurrent device if the service-entrance conductors terminate in an overcurrent device where both the overcurrent device and its assembly are listed for operation at 100 percent of their rating.”

**SUBSTANTIATION:** The rule for sizing conductors when the overcurrent device is listed for 100 percent operation and one that is not such listed can lead to widely different conductors sized for the same identical load. At least in the case where the overcurrent device is listed for 100 percent operation, the minimum allowable ampacity of the conductor should not be permitted to be less than the rating of the overcurrent device. The following example illustrates the point.

Example: If a set of service entrance conductors supplies a continuous load of 130 amperes and the overcurrent device and enclosure are listed for operation at 100 percent of its rating then the overcurrent device is permitted to be rated at 150 amperes. In this case the conductor is permitted to be sized based upon an allowable ampacity not less than 100 percent of the continuous load. If copper conductors are used with 75°C insulation and terminations, the maximum conductor size required would be AWG #1 which is listed in Table 310-16 as 130 amperes. If the overcurrent

device had not been listed for 100 percent operation, the minimum overcurrent device rating for this load would have been 175 amperes and the minimum conductor size would have been AWG #2/0. This seems to be a wide difference in minimum conductor size for the same identical load simply because one overcurrent device is rated for 100 percent operation and the other is not.

**PANEL ACTION:** Reject.

**PANEL STATEMENT:** The submitter has not provided any technical substantiation to justify requiring the conductor to have ampacity not less than the rating of the overcurrent device. This is permitted by Section 230-90(a) Exception No. 2.

**NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE:** 11

**VOTE ON PANEL ACTION:**

**AFFIRMATIVE:** 11

(Log #724)

4-90 - (230-42(b)): Reject

**SUBMITTER:** Dan Leaf, Palmdale, CA

**RECOMMENDATION:** Add:

Application of Note 3 to Article 310 Ampacity Tables of 0 to 2000 volts shall be permitted.

**SUBSTANTIATION:** Editorial. To provide correlation with Note 3 where conductor ampacity and service/feeder ratings may differ.

This is done in Section 230-90(a).

**PANEL ACTION:** Reject.

**PANEL STATEMENT:** This added reference is not necessary since the general requirements of Section 230-42(a) refer to Section 310-15.

**NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE:** 11

**VOTE ON PANEL ACTION:**

**AFFIRMATIVE:** 11

(Log #4172)

4-91 - (230-42(b)): Accept in Principle in Part

**SUBMITTER:** Frederic P. Hartwell, Hartwell Electrical Services, Inc.  
**RECOMMENDATION:** Revise by replacing the entire subsection as follows:

(b) Ungrounded Conductors. The ampacity of the ungrounded conductors shall be not less than the load to be carried, determined in accordance with Article 220. In no case shall the ampacity or the conductor sizes be lower than as specified in (1), (2), (3), or (4).

(1) One-Circuit Installation. For installations that supply only limited loads of a single branch circuit, the conductor(s) shall be not smaller than No. 12 copper or No. 10 aluminum or copper-clad aluminum. The service conductors shall not be smaller than the branch-circuit conductors.

(2) Limited-Circuit Installations. For installations consisting of not more than two 2-wire branch circuits, or by special permission for other installations limited by demand or by the source of supply, the conductors shall be not smaller than No. 8 copper or No. 6 aluminum or copper-clad aluminum.

(3) One-Family Dwelling. For a one-family dwelling, the conductors shall have an ampacity of not less than 100 amperes, 3-wire.

(4) All Others. For all other installations, the conductors shall have an ampacity of not less than 60 amperes.

**SUBSTANTIATION:** This proposal restores the conditions and allowances that were in the 1996 NEC, edited as positive text instead of using exceptions. The 1999 panel action changing this requirement to a cross reference to the disconnecting means thresholds in Section 230-79 introduced major changes without a shred of technical substantiation, and caused major confusion as well. For example, the minimum size on a single circuit was always No. 12. However, Sec. 230-79(a) sets the minimum disconnecting means for such circuits at 15A, which now allows a No. 14 for the first time. Similarly, the two-circuit installation used to be No. 8 minimum; now the rule goes over to the 30A disconnect size, which allows for a No. 10 instead. The former exception allowing a No. 8 for general use on limited demand situations by special permission was deleted outright.

The major area of confusion concerns the present phrase "the minimum rating of the disconnecting means." Suppose you have a

calculated load of 237A. You still install 237A minimum conductors, subject to allowances elsewhere in the Code for continuous loads, etc. The fact that the switch might be 400A with 250A fuses, because those are standard sizes, doesn't mean you have to cable to the 400A switch size. Nevertheless, I have found in doing seminars across the country that many people think they do have to cable to the switch size.

This proposal puts everything in the 1996 provisions, except as modified for the 100A house rule, back on the table. CMP 4 should retain this format. If it chooses to remove any element, then it should provide the technical justification for doing so.

**PANEL ACTION:** Accept in Principle in Part.

The panel has modified Section 230-42(b) to read:

"230-42(b) Specific Installations. In addition to the requirements of 230-42(a), the minimum ampacity for ungrounded conductors for specific installations shall not be less than the rating of the service disconnecting means specified in 230-79(a) through (d)." The remainder of the proposal is rejected.

**PANEL STATEMENT:** The panel has modified 230-42(b) to address the submitter's concern over clarity.

The panel reaffirms that the use of conductor ampacities based on 310-15 is not a reduction in the safety of the installation. The overcurrent protection required by Section 230-90 adequately protects the conductor. This action eliminated the confusion between Sections 230-42(b) and 230-79 in the 1996 NEC.

**NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE:** 11

**VOTE ON PANEL ACTION:**

**AFFIRMATIVE:** 11

(Log #2763)

4-92 - (230-43(15)): Reject

**SUBMITTER:** Joseph A. Tedesco, Nat'l Technology Transfer, Inc.

**RECOMMENDATION:** Add a new sentence to read as follows:

"Where flexible metal conduit is used it shall be installed to comply with Section 350-5(1) when installed in a wet location."

**SUBSTANTIATION:** The reference to the rule that covers the wiring method should be identified in this section.

**PANEL ACTION:** Reject.

**PANEL STATEMENT:** Section 230-43 already requires compliance with the respective wiring method articles in Chapter 3 which includes 350-5(1).

**NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE:** 11

**VOTE ON PANEL ACTION:**

**AFFIRMATIVE:** 11

(Log #372)

4-93 - (230-43(6), (15), (16)): Reject

**SUBMITTER:** Dan Leaf, Palmdale, CA

**RECOMMENDATION:** Delete:

~~(6) Electrical nonmetallic tubing.~~

Add to (15): and limited to a single length.

Add to (16): where limited to a single length not over 6 ft (1.83m) long.

**SUBSTANTIATION:** Section 331-3(1)(a) indicates ENT is permitted for exposed work in a building where not subject to physical damage. The FPN for this section indicates extreme (not defined) cold may cause susceptibility to damage. Section 331-4(7) indicates ENT is not permitted in exposed wet locations except indoors as specified in Section 331-3(7). This suggests that ENT may not be suitable as a service raceway on the outside of a building in a cold climate.

The substantiation for Proposal 4-99 in the 1986 TCR which reintroduced flexible conduit indicated it was to provide for short lengths necessary to facilitate difficult raceway routing around obstructions and reduce the need for conduit bodies. Present wording does not indicate this purpose and does not limit the number of separate 6 ft or less sections which may be interposed in the service raceway. Such latitude obviates the normal use of nonflexible raceway bends and conduit bodies even where there are no obstructions, which did not seem to be the intent of the proposal.

Present (16) provides no limit on the length of LTFNMC if supported in accordance with Section 351-23(a). If the prime reason for flexible raceway is as stated in the substantiation for Proposal 4-99, it should also apply to LTFNMC.

**PANEL ACTION:** Reject.

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**PANEL STATEMENT:** Although not appropriate for use in outdoor cold climates, there is no need to completely eliminate the use of ENT installed in accordance with Article 331, as a service wiring method. Additionally there is no technical substantiation to limit items (15) and (16) to a single six foot length.  
**NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE:** 11  
**VOTE ON PANEL ACTION:**  
AFFIRMATIVE: 11

(Log #CP420)

4- 93a - (230-44): Accept

**NOTE:** The Technical Correlating Committee understands that the last paragraph of the present Section 230-43 is deleted. The panel should also consider correcting the last phrase, "in accordance with Article 318", to comply with the NEC Style Manual. This action will be considered by the Panel as a Public Comment.  
**SUBMITTER:** CMP 4

**RECOMMENDATION:** Create new Section 230-44 to read:  
"230-44. Cable Trays. Cable tray systems shall be permitted to support cable used for service-entrance conductors in accordance with Article 318."

**SUBSTANTIATION:** CMP 8 has clarified that cable tray systems are support systems, not wiring methods, therefore it is necessary to separate it from Section 230-43.

**PANEL ACTION:** Accept.

**NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE:** 11

**VOTE ON PANEL ACTION:**

AFFIRMATIVE: 11

(Log #405)

4- 94 - (230-46): Accept in Principle

**SUBMITTER:** Amos D. Lowrance, Jr., City of Chattanooga, TN  
**RECOMMENDATION:** Revise 230-46 to read as follows:

Spliced Conductors. Service-entrance conductors shall be permitted to be spliced or tapped by crimped, exothermic clamped or bolted connections. Splices shall be made in enclosures or, if directly buried, with a listed underground splice kit. Splices or conductors shall be made in accordance with Sections 110-14, 300-5(e), 300-13 and 300-15.

**SUBSTANTIATION:** Presently, the code only permits clamped or bolted connections disregarding the traditional means of exothermic and crimped connections which practice has taught to be a superior method of tapping or splicing.

**PANEL ACTION:** Accept in Principle.

**PANEL STATEMENT:** The submitter's concerns are addressed by the panel's action on Proposal 4-96.

**NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE:** 11

**VOTE ON PANEL ACTION:**

AFFIRMATIVE: 11

(Log #1482)

4- 95 - (230-46): Accept in Principle

**SUBMITTER:** Larry T. Smith, Nat'l Electrical Seminars

**RECOMMENDATION:** Revise to read as follows:

Service-entrance conductors shall be permitted to be spliced with irreversible compression connectors or tapped by clamped or bolted connections. Splices shall be made in enclosures or, if directly buried, with a listed underground splice kit. Splices of conductors shall be made in accordance with Sections 110-14, 300-5(e), 300-13, and 300-15.

**SUBSTANTIATION:** History ignored will repeat itself, and split-bolt connections have a history of failure.

We need to listen to the people who are actually doing the work. Ask an assembly of one hundred electricians this question: "How many of you have seen a split-bolt splice go bad?" Usually ninety hands will go up. I have asked this question in seminar after seminar and gotten the same result; ninety to ninety-five percent of those in attendance will attest to having had to repair a bad split-bolt splice.

Clamped or bolted connectors, if properly installed, are a good product. It's with the proper installation that we have difficulty. Service conductor splices must have the reliability of irreversible compression connectors.

**PANEL ACTION:** Accept in Principle.

**PANEL STATEMENT:** The submitter's concerns are addressed by the panel's action on Proposal 4-96.

**NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE:** 11

**VOTE ON PANEL ACTION:**

AFFIRMATIVE: 11

**COMMENT ON AFFIRMATIVE:**

**SUMRALL:** The submitter in his substantiation asked an assembly of electricians if they have "seen a split-bolt splice go bad," however he did not address if a follow-up question, such as "How many have been properly trained to install a split bolt splice?" In recent history, I have seen two failures of split bolt connections, The Root Cause Failure Analyses in both cases were the result of untrained or poorly trained personnel doing the installation.

(Log #2814)

4- 96 - (230-46): Accept in Principle

**NOTE:** It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panels 1 and 3 for information.

**SUBMITTER:** John E. Staires, Tulsa Code Seminars/Rep.

Oklahoma Chapter IAEI

**RECOMMENDATION:** Remove the wording:

~~"splices shall be made in enclosures or, if directly buried, with a listed underground splice kit."~~

Insert the wording:

"splices shall be made in enclosures or, if directly buried, shall be permitted to be spliced with a listed underground splice kit."

**SUBSTANTIATION:** The above referenced sentence contains literal wording which would require directly buried service entrance conductors to be spliced with a listed underground splice kit. The requirement for the splicing of directly buried service entrance conductors are in the next sentence of Section 230-46 by reference to Sections 110-14, 300-5(e), 300-13 and 300-15. As presently written, Section 230-46 would literally preclude the splicing of directly buried conductors in an enclosure such as a junction box.

**PANEL ACTION:** Accept in Principle.

Modify Section 230-46 to read:

"Service-entrance conductors shall be permitted to be spliced or tapped by clamped or bolted connections. Splices shall be made in enclosures or, if directly buried, with a listed underground splice kit. Splices of conductors shall be made in accordance with Sections 110-14, 300-5(e), 300-13, and 300-15."

**PANEL STATEMENT:** The panel's action addresses the submitter's concern and adds clarity to this section.

**NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE:** 11

**VOTE ON PANEL ACTION:**

AFFIRMATIVE: 11

(Log #4012)

4- 97 - (230-50(a)(3)): Accept

**SUBMITTER:** Christopher Pharo, Rep. IBEW

**RECOMMENDATION:** This proposal is to revise (3) to read as follows:

Section 230-50(a)(3) Schedule 80 rigid nonmetallic conduit.

**SUBSTANTIATION:** There is always confusion when it comes to the installation of nonmetallic conduit. Most people do not realize that every day, typical, nonmetallic conduit is not approved for areas subject to physical damage. The only way one can know this is to carry the UL white book around. By removing the phrase "suitable for the location" and placing "Schedule 80" before the text "rigid nonmetallic conduit", this code section would effectively eliminate any chance of a misapplication of the product.

This type of specific reference to the use of Schedule 80 is made in Section 300-5(d) and Section 336-6(b). These articles specifically refer to Schedule 80 rigid nonmetallic conduit as an alternate wiring method in areas subject to physical damage. This was also done so as to prevent the misuse of Schedule 40 rigid nonmetallic conduit.

**PANEL ACTION:** Accept.

**NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE:** 11

**VOTE ON PANEL ACTION:**

AFFIRMATIVE: 11

(Log #725)

4- 98 - (230-51): Reject

**SUBMITTER:** Dan Leaf, Palmdale, CA

**RECOMMENDATION:** Revise to read as follows:

Mounting Supports. Cables or individual open service-entrance

conductors shall be supported as specified in (a) or (b) ~~or (c)~~.

(a) Service Cables. Type SE Service-entrance cables and Type MC and Type MI cables used as service-entrance conductors shall be supported by straps or other approved means within 12 in. (305 mm) of every service head, gooseneck, or connection to a raceway or enclosure and at intervals not exceeding 30 in. (762 mm).

(b) Delete.

(c) Individual Open Conductors. Individual open service-entrance conductors shall be installed in accordance with ~~Table 230-51(c)~~ applicable provisions of Article 320. Where exposed to the weather, the conductors shall be mounted on insulators or on insulating supports attached to racks, brackets, or other approved means. Where not exposed to the weather, the conductors shall be supported on glass or porcelain knobs. ~~The minimum separation between conductors and the surface wired over shall not be less than 2 in. (50.8 mm).~~

Delete Table 230-51(c).

SUBSTANTIATION: Since this section is in Part D Service-Entrance Conductors and not all service cables are service-entrance cable, per Article 338, the proper designation should be applied to the specific conductors used.

Panel 7 in response to Comment 7-48 of the 1998 ROC stated that Section 250-51(a) does not apply to support requirements for Type MI cable. Panel 4 in their response to Proposal 4-94 in the 1995 ROP stated they intended this section to apply to all cables used as service-entrance conductors. With different panel opinions consistent interpretation is difficult, and clarification is warranted. Section 334-10(e) indicates this section applies to Type MC cable.

Other (than Type SE) cables indicated by Section 230-43 as suitable for service-entrance conductors are Type MC and MI. Articles 330 and 334 do not have specific restrictions against contact with buildings. What other cables does the present (b) apply to?

Section 300-2 specifies Chapter 3 wiring methods to be used. Article 320 covers open wiring on insulators, which is permitted by Section 230-43(1); the FPN for Section 320-13 refers to this article. Since Article 320 has more comprehensive requirements, limits installation to industrial and agricultural occupancies, and not over 600 volts, has more detailed and limited support requirements, and general protection requirements, the differences between Article 320 and this section indicates this section covers a wiring method that is difficult to identify. While this method of service-entrance conductor installation may be outmoded and seldom used, the reference to Article 320 would provide clarification.

PANEL ACTION: Reject.

PANEL STATEMENT: The submitter is incorrect that service cables means only Type SE cable. Section 230-43 permits other cable types. Section 320-2 refers to and defers to Article 225 and other Code sections. Therefore the requirements of Table 230-51(c) are applicable where open conductors are installed as service conductors.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #517)

4-99 - (Table 230-51(c)): Accept

SUBMITTER: Technical Correlating Committee National Electrical Code

RECOMMENDATION: Change Table 230-51(c) as follows.

(Table shown below.)

SUBSTANTIATION: The proposed revision is intended to comply with the NFPA No. 1M Manual of Style Section 4.1 with respect to the placement of units and values of measurement, i.e., show SI units as the preferred and inch-pound units immediately following.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

Table 230-51(c). Supports and Clearances for Individual Open Service Conductors

| Maximum Volts | Maximum Distance Between Supports |        | Minimum Clearances |        |              |       |
|---------------|-----------------------------------|--------|--------------------|--------|--------------|-------|
|               |                                   |        | Between Conductors |        | From Surface |       |
|               | (m)                               | (ft)   | (mm)               | (in.)  | (mm)         | (in.) |
| 600           | 2.7                               | 9      | 150                | 6      | 50           | 2     |
| 600           | 4.5                               | 15     | 300                | 12     | 50           | 2     |
| 300           | 1.4                               | 4 1/2  | 75                 | 3      | 50           | 2     |
| 600*          | 1.4*                              | 4 1/2* | 65*                | 2 1/2* | 25*          | 1*    |

Note: For SI units: 1 in. = 25.4 mm; 1 ft = 0.3048 m

\*Where not exposed to weather

(Log #2502)

4-100 - (230-52): Reject

SUBMITTER: Andre R. Cartal, Bldg Dept., Princeton Borough, NJ  
RECOMMENDATION: Delete Section 230-52.

SUBSTANTIATION: There is no longer any application for this rule. These provisions applied to services that came into attic-installed meters and cutout boxes with the old style knob and tube wiring system.

PANEL ACTION: Reject.

PANEL STATEMENT: Article 324 covers the requirements for knob and tube wiring. Since it is still in the Code, this section should remain.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #726)

4-101 - (230-54(g)): Reject

SUBMITTER: Dan Leaf, Palmdale, CA

RECOMMENDATION: Revise to read as follows:

(g) Arranged that Water will not Enter Service Raceway or Equipment. Service-drop conductors and service-entrance conductors shall be arranged so that to minimize the likelihood of water will not enter entry into service raceways, service cables, or equipment.

SUBSTANTIATION: Present wording is an absolute type of requirement. Cables permitted by Section 230-43 should be included. It is difficult to prevent water entry into flexible metal conduit and Type MC cable.

PANEL ACTION: Reject.

PANEL STATEMENT: The existing wording of this section adequately covers the submitter's concern and provides appropriate requirements for installation.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #727)

4-102 - (230-56): Reject

SUBMITTER: Dan Leaf, Palmdale, CA

RECOMMENDATION: Revise to read as follows:

Service Conductor with the Higher Voltage to Ground. On a 4-wire delta-connected service where the midpoint of one phase is grounded, the service conductor with the highest voltage to ground shall be distinguished from the other phase conductors by a continuous outer finish that is orange in color along its entire length, durably and permanently marked by an outer finish that is orange in color or by other effective means except that a conductor that is larger than No. 6 shall be permitted to be identified at the time of installation by a durable and permanent distinctive orange marking that shall encircle the conductor insulation. Such identification shall be provided at each termination ~~or~~ and junction point except a conduit body that does not contain splices or unused hubs.

(FPN): Junction point includes auxiliary gutters that supplement wiring spaces at service disconnecting means.

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**SUBSTANTIATION:** The proposal word “distinguished” would specifically prevent orange insulation on other phase conductors, which seems to be the intent. Present wording permits No. 6 or smaller conductor identification only at termination and junction points. Insulated grounded and grounding conductors No. 6 and smaller must have continuous color identification.

A basic requirement to provide marking that encircles the insulated (grounded) conductor was established by Proposal 5-20 in the 1998 ROP the substantiation for which is applicable to this section. Section 200-6 does not provide for “other effective means” (whatever that means to different persons). The requirement for this section should be no less specific.

Service conductors run through a conduit body without splices or hubs do not appear to warrant this identification since the need to know the higher voltage at this junction point seems minimal.

The fine print note would clarify that an auxiliary gutter containing service conductors looped between service disconnects is a junction point.

**PANEL ACTION:** Reject.

**PANEL STATEMENT:** The proposed wording does not provide additional safety. The existing wording provides the necessary requirements.

**NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE:** 11

**VOTE ON PANEL ACTION:**

**AFFIRMATIVE:** 11

(Log #1502)

4- 103 - (230-56): Reject

**SUBMITTER:** Larry D. Wendt, State of Idaho/Rep. I.A.E.I.

**RECOMMENDATION:** Revise text as follows:

230-56. Service Conductor with the Higher Voltage to Ground.

On a 4-wire, delta-connected service where the midpoint of one phase winding is grounded, the service conductor having the higher voltage to ground shall be durably and permanently marked by an outer finish that is orange in color or by tagging or other effective means, at each termination or junction point. See Section 110-15.

**SUBSTANTIATION:** Service conductor with the higher voltage to ground is a requirement that should be in Section 110-15 for requirements for electrical installations where it would apply to all types of installations instead of this location. It would also streamline and simplify the code for easier usage.

Please coordinate with proposals on Sections 110-15, 210-4(d), 215-8, 384-3(e), and 384-3(f).

**PANEL ACTION:** Reject.

**PANEL STATEMENT:** There is no information to correlate the proposed wording with the submitter's proposal for new 110-15.

**NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE:** 11

**VOTE ON PANEL ACTION:**

**AFFIRMATIVE:** 11

(Log #1983)

4- 104 - (230-62)(c) (New) ): Reject

**SUBMITTER:** John M. O'Connor, North American Technologies, Inc.

**RECOMMENDATION:** Add new Section 230-62(c) to read as follows:

(c) Meter Sockets. Meter sockets shall be effectively closed by a closure which is integral to the meter socket enclosure when a meter is not installed in the socket.

**SUBSTANTIATION:** The enclosure of a meter socket is UL listed only when a meter is installed in a socket. The service which is energized without a meter being installed does not meet Section 111-27 Guarding of Live Parts. In many instances meters are bypassed, often by noncode approved means, in order to provide temporary power on construction jobsites. The protection of these live parts may or may not exist, depending on the installer and when or if a meter is installed.

These hazardous situations are occurring at new homes, offices, construction sites and at temporary classrooms (which are usually located on school playgrounds) while they are waiting to have meters installed. Utility deregulation may also cause increased incidence of these situations.

The addition of an integral closure to a meter socket would protect workers, children and others from a potentially dangerous situation, one that is preventable. Listed metering assemblies with integral socket closures are already commercially available.

Note: This is a companion proposal to my proposal on Section 373-4(b).

**PANEL ACTION:** Reject.

**PANEL STATEMENT:** The submitter's concerns are adequately covered by the requirements of Section 110-27 and 230-62. The panel also disagrees that the meter socket is only listed where the meter is in place. Underwriters Laboratories Standard 414 lists the sockets without the meter installed.

**NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE:** 11

**VOTE ON PANEL ACTION:**

**AFFIRMATIVE:** 11

(Log #2101)

4- 105 - (230-62)(c) (New) ): Reject

**SUBMITTER:** John M. O'Connor, North American Technologies, Inc.

**RECOMMENDATION:** Add new text to read as follows:

(c) Meter Sockets. Meter sockets shall be effectively closed by a closure which is integral to the meter socket enclosure when a meter is not installed in the socket.

**SUBSTANTIATION:** The enclosure of a meter socket is UL listed only when a meter is installed in a socket. The service which is energized without a meter being installed does not meet Section 111-27 Guarding of Live Parts. In many instances meters are bypassed, often by non-code approved means, in order to provide temporary power on construction jobsites. The protection of these live parts may or may not exist, depending on the installer and when or if a meter is installed.

These hazardous situations are occurring at new homes, offices, construction sites and at temporary classrooms (which are usually located on school playgrounds) while they are waiting to have meters installed. Utility deregulation may also cause increased incidence of these situations.

The addition of an integral closure to a meter socket would protect workers, children and others from a potentially dangerous situation, one that is preventable. Listed metering assemblies with integral socket closures are already commercially available.

Note: This is a companion proposal to my proposal on Section 373-4(b).

**PANEL ACTION:** Reject.

**PANEL STATEMENT:** The submitter's concerns are adequately covered by the requirements of Section 110-27 and 230-62. The panel also disagrees that the meter socket is only listed where the meter is in place. Underwriters Laboratories Standard 414 lists the sockets without the meter installed.

**NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE:** 11

**VOTE ON PANEL ACTION:**

**AFFIRMATIVE:** 11

(Log #1883)

4- 106 - (230-64) (New) ): Reject

**NOTE:** It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 14 for comment.

**SUBMITTER:** David A. Kerr, Jr., Friendsville, PA

**RECOMMENDATION:** Add a new Section 230-64 to read as follows:

Separation from Gas Meters and Tanks. Electric meters and equipment, in general, are sources of ignition and shall be located three ft from gas meters, five ft from portable LP gas tanks and ten ft from hose-filled LP gas tanks. See Section 501-3 and NFPA 54, 2.7.2(c), sources of ignition, and NFPA 58, 3-2.2.2 Table d.

**SUBSTANTIATION:** These important separation requirements need to be spelled out in Article 230 because service equipment and meters are most likely to have a location conflict with gas equipment.

**PANEL ACTION:** Reject.

**PANEL STATEMENT:** The determination of whether a specific location is hazardous (classified) is outside the scope of CMP 4. This proposal has provided no technical substantiation that there is a safety issue. CMP 4 refers this action to CMP 14 for information.

**NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE:** 11

**VOTE ON PANEL ACTION:**

**AFFIRMATIVE:** 11

**COMMENT ON AFFIRMATIVE:**

**BECK:** The proponent makes some broad assumptions and draws conclusion the Panel did not agree with. Electric meters and metering equipment are not sources of ignition. It is not correct to arbitrarily consider all electrical equipment, devices, or apparatus to be automatically considered sources of ignition. In addition to the

equipment itself and its operation, the equipment, device or apparatus must be considered within the context of the environment and conditions in which it is installed or placed to be considered as a source of ignition. National Electrical Code (NEC) Section 501-3 provides "guidance" for the determination of when a Class I Division 1 or Division 2 location may exist and provides reference to and applicability of NEC Section 500-7. Applying NEC Section 501-3 may require the installation of explosion proof, purged and pressurized enclosures, which would be an extreme and technically unsubstantiated requirement for residential installations especially those located in outdoor locations. Under NEC Section 500-7(a) you must have a gas or vapor concentration that, under normal operating conditions, can be ignitable. Most outdoor locations even when gas and electric meters are in close proximity or adjacent to one another do not necessarily meet that criteria. For example natural gas has a specific gravity of about 0.65 and an UFL of 14 percent and LFL of 4 percent. The actual determination of Class and Division for any location must be made by a knowledgeable person or representative of the Authority Having Jurisdiction, and no attempt should be made for a blanket application of a particular classification for all locations. The real issue here is application of NEC working space requirements. The NEC, as currently written, provides the reasonable guidance and requirements for use by such knowledgeable persons for classifying locations and provided for the proper working clearances as required by the NEC. The determination for application of the requirements of any other NFPA document may or may not, in fact, be appropriate and should be made by the appropriate knowledgeable person based on the site specific installation situation and conditions.

(Log #2564)

4- 107 - (230-70 and Part F): Accept in Principle in Part

SUBMITTER: Richard E. Loyd, Perryville, AR

RECOMMENDATION: Revise as follows:

F. Service Equipment — Disconnecting Means.

230-70. General. A means shall be provided to disconnect all conductors in a building or other structure from the service-entrance conductors. The service overcurrent device and ground fault protection where required shall be an integral part of the service disconnecting means or shall be located immediately adjacent thereto.

(a) Location. The service disconnect(s)ing means. Overcurrent device, and ground-fault protection where required shall be installed at a readily accessible location either in sight outside of a building or structure, or inside nearest the point of entrance of the service conductors.

(1) Service disconnecting means shall not be installed in bathrooms.

(2) A switch or button located in accordance with (a) used to operate a shunt trip main disconnecting means located elsewhere shall not be permitted as the disconnecting means.

(b) Manually or Power Operable. The service disconnecting means for ungrounded service conductors shall consist of either

(1) a manually operable switch or circuit breaker equipped with a handle or other suitable operating means or

(2) a power-operated switch or circuit breaker provided the switch or circuit breaker can be opened by hand in the event of a power supply failure.

(c) Suitable for Use. Each service disconnecting means shall be suitable for the prevailing conditions. Service equipment installed in hazardous (classified) locations shall comply with the requirements of Articles 500 through 517.

(d) Simultaneous Opening of Poles. Each service disconnect shall simultaneously disconnect all ungrounded service conductors that it controls from the premises wiring system.

(e) Indicating. The service disconnecting means shall plainly indicate whether it is in the open or closed position.

(f) (f) Marking. Each service disconnect shall be permanently marked to identify it as a service disconnect.

230-71. Maximum Number of Disconnects.

(a) General. The service disconnecting means for each service permitted by Section 230-2, or for each set of service-entrance conductors permitted by Section 230-40, Exception Nos 1 or 3, shall consist of not more than six switches or six circuit breakers mounted in a single enclosure, in a group of separate enclosures, or in or on a switchboard. There shall be no more than six disconnects per service grouped in any one location. For the purpose of this section, disconnecting means used solely for power monitoring equipment or the control circuit of the ground-fault protection system, installed as part of the listed equipment, shall not be considered a service disconnecting means.

(b) Single-Pole Units. Two or three single-pole switches or breakers, capable of individual operation, shall be permitted on multiwire circuits, one pole for each ungrounded conductor, as one multipole disconnect, provided they are equipped with handle ties or a master handle to disconnect all conductors of the service with no more than six operations of the hand.

FPN: See Section 384-16(a) for service equipment in panelboards, and see Section 430-95 for service equipment in motor control centers.

230-72. Grouping of Disconnects.

(a) General. The two to six disconnects as permitted in Section 230-71 shall be grouped. Each disconnect shall be marked to indicate the load served.

Exception: One of the two to six service disconnecting means permitted in Section 230-71, where used only for a water pump also intended to provide fire protection, shall be permitted to be located remote from the other disconnecting means.

(b) Additional Service Disconnecting Means. The one or more additional service disconnecting means for fire pumps, for legally required standby, or for optional standby services permitted by Section 230-2 shall be installed sufficiently remote from the one to six service disconnecting means for normal service to minimize the possibility of simultaneous interruption of supply.

(c) Access to Occupants. In a multiple-occupancy building, each occupant shall have access to the occupant's service disconnecting means.

Exception: In a multiple-occupancy building where electric service and electrical maintenance are provided by the building management and where these are under the continuous building management supervision, the service disconnecting means supplying more than one occupancy shall be permitted to be accessible to authorized management personnel only.

~~230-74. Simultaneous Opening of Poles. Each service disconnect shall simultaneously disconnect all ungrounded service conductors that it controls from the premises wiring system.~~

230-75. Disconnection of Grounded Conductor. Where the service disconnecting means does not disconnect the grounded conductor from the premises wiring, other means shall be provided for this purpose in the service equipment. A terminal or bus to which all grounded conductors can be attached by means of pressure connectors shall be permitted for this purpose.

In a multisection switchboard, disconnects for the grounded conductor shall be permitted to be in any section of the switchboard, provided any such switchboard section is marked.

~~230-76. Manually or Power Operable. The service disconnecting means for ungrounded service conductors shall consist of either (1) a manually operable switch or circuit breaker equipped with a handle or other suitable operating means or (2) a power-operated switch or circuit breaker provided the switch or circuit breaker can be opened by hand in the event of a power supply failure.~~

~~230-77. Indicating. The service disconnecting means shall plainly indicate whether it is in the open or closed position.~~

230-79. Rating of Service Disconnecting Means. The service disconnecting means shall have a rating not less than the load to be carried, determined in accordance with Article 220. In no case shall the rating be lower than specified in (a), (b), (c), or (d).

(a) One-Circuit Installation. For installations to supply only limited loads of a single branch circuit, the service disconnecting means shall have a rating of not less than 15 amperes.

(b) Two-Circuit Installations. For installations consisting of not more than two 2-wire branch circuits, the service disconnecting means shall have a rating of not less than 30 amperes.

(c) One-Family Dwelling. For a one-family dwelling, the service disconnecting means shall have a rating of not less than 100 amperes, 3-wire.

(d) All Others. For all other installations, the service disconnecting means shall have a rating of not less than 60 amperes.

230-80. Combined Rating of Disconnects. Where the service disconnecting means consists of more than one switch or circuit breaker, as permitted by Section 230-71, the combined ratings of all the switches or circuit breakers used shall not be less than the rating required by Section 230-79.

230-81. Connection to Terminals. The service conductors shall be connected to the service disconnecting means by pressure connectors, clamps, or other approved means. Connections that depend on solder shall not be used.

230-82. Equipment Connected to the Supply Side of Service Disconnect. Only the following equipment shall be permitted to be connected to the supply side of the service disconnecting means:

1. Cable limiters or other current-limiting devices.
2. Meters nominally rated not in excess of 600 volts, provided all metal housings and service enclosures are grounded in accordance with Article 250.

3. Instrument transformers (current and voltage), high impedance shunts, surge-protective devices identified for use on the supply side of the service disconnect, load management devices, and surge arresters.

4. Taps used only to supply load management devices, circuits for stand-by power systems, fire pump equipment, and fire and sprinkler alarms, if provided with service equipment and installed in accordance with requirements for service-entrance conductors.

5. Solar photovoltaic systems or interconnected electric power production sources (See Articles 690 or 705 as applicable.)

6. Control circuits for power-operable service disconnecting means, if suitable overcurrent protection and disconnecting means are provided.

7. Ground-fault protection systems where installed as part of listed equipment, if suitable overcurrent protection and disconnecting means are provided.

**SUBSTANTIATION:** Some plans examiners inspectors and engineers are interpreting Section 230-76(2) as permitting a shunt trip button (switch) to be located in accordance with Section 230-70(a). This is permitting a very dangerous situation as it allows service entrance conductors inside the building without overcurrent protection. Recently I was involved with a case which resulted in a laborer being killed in Little Rock, Arkansas. The engineer had specified a shunt-trip switch to be located outside at the point of entrance. The service disconnect was located approximately 170 feet inside the building fed with overhead 3000 amp busduct. The laborer while repairing a sheetrock fireblock drilled into the busduct. His last words were "the electrician said there was nothing hot he could touch". The arcing continued until the substation approximately 1/4 mile away tripped out. The plans examiner and inspector had approved the installation based on Section 230-76(2).

I did a survey at several IAEL section meetings and found other inspectors are interpreting the NEC to permit this method of installation. I feel rearrangement of Article 230 Part F will stop this misinterpretation of Article 230.

**PANEL ACTION:** Accept in Principle in Part.

The panel accepts in principle the concept of outside disconnecting means being within sight of the building or structure served and the issue of not permitting remote control actuators as the service disconnecting means.

The panel rejects the remainder of the proposal.

**PANEL STATEMENT:** The panel accepts in principle the concept of outside disconnecting means being within sight of the building or structure served and the issue of not permitting remote control actuators as the service disconnecting means. The panel's action on Proposal 4-107a has addressed these issues.

The panel rejects the remainder of the proposal as there is insufficient substantiation to warrant the proposed changes.

**NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE:** 11

**VOTE ON PANEL ACTION:**

**AFFIRMATIVE:** 11

(Log #CP422)

4-107a - (230-70(a)): Accept

**SUBMITTER:** CMP 4

**RECOMMENDATION:** Revise existing Section 230-70(a) to read: "230-70. General. Means shall be provided to disconnect all conductors in a building or other structure from the service-entrance conductors.

(A) Location. The service disconnecting means shall be installed in accordance with (1), (2), and (3):

(1) Readily Accessible Location. The service disconnecting means shall be installed at a readily accessible location in accordance with (a) or (b).

(a) Outside. Service disconnecting means installed outside a building or structure shall comply with (1) or (2):

(1) The service disconnecting means shall be permitted on or within sight of the building or structure served.

(2) Where the service disconnecting means is not within sight of the building or structure served, a feeder disconnecting means for the building or structure supplied shall be installed in accordance with Part B 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 (1) above."

The current sections (b) and (c) remain.

**SUBSTANTIATION:** The panel has addressed specific issues that have been raised relative to the location of service and building disconnecting means. Additionally, the panel's action on remote control actuators clarifies that they are not recognized as the required service disconnecting means.

**PANEL ACTION:** Accept.

**NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE:** 11

**VOTE ON PANEL ACTION:**

**AFFIRMATIVE:** 10

**NEGATIVE:** 1

**EXPLANATION OF NEGATIVE:**

**CARRICK:** See my Explanation of Negative Vote on Proposal 4-22a.

(Log #1778)

4-108 - (230-70(a)): Accept in Principle

**SUBMITTER:** Terry L. Carlson, Nebraska State Electrical Board

**RECOMMENDATION:** Revise as follows:

(a) Location. The service disconnecting means shall be located at a readily accessible location either inside or outside of a building or structure nearest the point of entrance of the service conductors.

Service disconnecting means shall not be installed in bathrooms.

**SUBSTANTIATION:** The intent of Section 230-70(a) and Section 225-32 are identical in that both provide the required location of a building or structure disconnecting means. The intent is based on electrical safety, and that safety depends on the ability of the building occupant to have ready access to the building disconnect in the event of an emergency.

However, even though the intent of each Section is the same, safety for the occupant, the language in both conflict with each other.

Section 225-32 requires that the disconnect in a second building be located either inside or outside of the building nearest the point of entrance of the service conductors. Therefore, regardless of whether the disconnect is located inside or outside, according to Section 225-32 it still must be located nearest the point of entrance of the service conductors.

But, Section 230-70(a) allows the building disconnect for a single building or structure to be located either inside nearest the point of entrance of the service conductors or outside of, and off of, the building at any location the designer or installer chooses, as long as it is readily accessible. A disconnect located 500 feet from the building in an open field may be considered 'readily accessible' by some designers, however it is not in the best interest of electrical safety or the building occupant. This is not consistent with the safety requirements of Section 225-32.

Whether a disconnecting means is for multiple buildings as covered in Section 225-32 or for a single building fed with a service as covered in 230-70(a), the location requirement for each should be the same. This can be accomplished by this proposal. It will both streamline the NEC for consistent building disconnect requirements and also enhance electrical safety for building occupants.

**PANEL ACTION:** Accept in Principle.

**PANEL STATEMENT:** The submitter's concern relative to the location of the disconnecting means has been clarified by the panel's action on Proposal 4-107a.

**NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE:** 11

**VOTE ON PANEL ACTION:**

**AFFIRMATIVE:** 11

(Log #1925)

4-109 - (230-70(a)): Accept in Principle

**SUBMITTER:** W. Creighton Schwan, Hayward, CA

**RECOMMENDATION:** Revise the first paragraph to read:

Location. The service disconnecting means shall be installed at a readily accessible location either inside or outside of a building or structure nearest the point of entrance of the service conductors.

**SUBSTANTIATION:** There is no new wording. The words have been rearranged to specify the outside disconnect location. Present wording permits the service disconnect to be at any location, at any distance outside the building. This is too vague for reasonable understanding or enforcement.

**PANEL ACTION:** Accept in Principle.

**PANEL STATEMENT:** The submitter's concern relative to the location of the disconnecting means has been clarified by the panel's action on Proposal 4-107a.

**NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE:** 11

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## VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #2893)

### 4-110 - (230-70(a)): Reject

**SUBMITTER:** James Maldonado, City of Tempe, AZ/Rep.  
Central Arizona Chapter IAEI

**RECOMMENDATION:** Revise Section 230-70(a) to read as follows:

(a) 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.

The service disconnecting means shall be installed adjacent to and accessible from the same working area as the utility meter.

**SUBSTANTIATION:** This requirement was added at the request of our fire departments, in order to have a disconnect available for emergencies, either on the outside of a building or within a dedicated room with one hour separation, as required in Proposal #11. At the present time fire departments have to pull the meter under load or wait for the utility to arrive to disconnect, if the disconnect is within the area of the fire.

**PANEL ACTION:** Reject.

**PANEL STATEMENT:** The location of the service disconnecting means is not relevant to the location of the meter. There are metering arrangements that would make this location impractical.

**NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE:** 11

**VOTE ON PANEL ACTION:**

AFFIRMATIVE: 11

(Log #2894)

### 4-111 - (230-70(a)): Reject

**SUBMITTER:** James Maldonado, City of Tempe, AZ/Rep.  
Central Arizona Chapter IAEI

**RECOMMENDATION:** Revise 230-70(a) to read as follows:

(a) 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.

All service disconnecting means located inside a building shall be enclosed within a room or space separated from the rest of the building by not less than a one-hour fire resistive occupancy separation.

**SUBSTANTIATION:** This code proposal was adopted by the Maricopa Association of Governments for the last 3 code cycles. There have been many cases when service entrance sections have been installed within a building. Because of high AIC availability in many cases, faults within this equipment have created costly fires. Faults have been created while servicing or working on SES equipment. These faults have in some cases burned for over 30 minutes until the utility was able to disconnect. We require that a one hour fire separation be installed that separates the service entrance section from any other spaces within a building. This separation enclosure is to be constructed in accordance with the applicable building code in effect within the jurisdiction. This type of installation has limited many fires to small areas in fires documented by the City of Phoenix.

**PANEL ACTION:** Reject.

**PANEL STATEMENT:** There is no technical substantiation provided to require a one hour fire-rated room or enclosure in a residential structure.

**NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE:** 11

**VOTE ON PANEL ACTION:**

AFFIRMATIVE: 11

(Log #3240)

### 4-112 - (230-70(a)): Reject

**SUBMITTER:** Edward J. Fox, Jr., Orange County Bldg Div., FL  
**RECOMMENDATION:** 230-70(a): The service disconnecting means for residential services shall be installed on the outside of the building.

**SUBSTANTIATION:** If the electrical service is on the interior of a building, then firemen and emergency people would not be able to shut power off safely in the case of emergency.

The above article provides a higher degree of safety and flexibility for the consumers.

To safely remove power in case of emergency reason's, such as fire, tree down or storm damage items. This could be accomplishing quickly and easily because a person would not have to go into a

building to find the service disconnect switch. This would help save lives and property due to fire when the fireman has to shut power off.

Power could be locked off or disconnected quickly and easily if needed in case of emergency.

It would allow power to be shut off quickly and easily in time of an emergency, such as fire and would allow fireman access to fight fires and thusly save more structures.

In times of emergency, such as during lightning storms, which frequent Florida, fires spring up very easily, less damage will be done to structures if power can be shut off quickly when firemen arrive to fight fires.

**PANEL ACTION:** Reject.

**PANEL STATEMENT:** The historical precedence of locating the service disconnecting means inside a building or structure has not resulted in a reduction of safety. There are locations where locating the equipment inside is necessary.

**NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE:** 11

**VOTE ON PANEL ACTION:**

AFFIRMATIVE: 11

(Log #4090)

### 4-113 - (230-70(a)): Reject

**SUBMITTER:** Leonard F. Devine, Jr., W. Palm Beach County Bldg & Zoning, FL

**RECOMMENDATION:** Add new text to read as follows:

(a) 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. If the service disconnecting means is located at a point that is not accessible and available for servicing, and disconnecting in case of emergencies, there shall be a shunt trip switch installed on the exterior of the building or structure. The shunt trip switch, when installed should be between six (6) feet and six feet seven inches (6 ft 7 in.) above finish grade. A sign constructed of a permanent material with no less than 1-1/2 in. high letters designating "Shunt Trip — Main Disconnect" shall be located on the exterior of the building or structure, and approximately one foot (1) above and one foot (1) to one side of the shunt trip mechanism.

**SUBSTANTIATION:** This new text is needed to provide firefighters with a means to turn off the power to a building or structure much quicker and safer in some cases.

**PANEL ACTION:** Reject.

**PANEL STATEMENT:** There is no technical substantiation provided to require a remote actuator for the service disconnecting means.

**NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE:** 11

**VOTE ON PANEL ACTION:**

AFFIRMATIVE: 11

(Log #4173)

### 4-114 - (230-70(a)): Accept in Principle

**SUBMITTER:** Frederic P. Hartwell, Hartwell Electrical Services, Inc. /Rep. Massachusetts Electrical Code Advisory Committee

**RECOMMENDATION:** Revise the first paragraph as follows:

"The service disconnecting means shall be installed at a readily accessible location either outside and attached to or immediately adjacent to the building or structure served, or inside nearest the point of entrance of the service conductors."

**SUBSTANTIATION:** A service disconnect in a metering pedestal would not be located at a building or structure, and therefore the multiple buildings or structures provisions in Section 225-8 wouldn't apply. The service disconnect could indeed be remote from the building. The consistent position of CMP 4, however, has always been that the metering pedestal is a structure.

This doesn't agree with the BOCA definition of "structure", which is "a combination of materials assembled at a fixed location to give support or shelter, such as a building, framework, retaining wall, tent, reviewing stand, platform, bin, fences over six feet high, sign, flagpole, recreational tramway, mast for radio antenna, or the like."

A metering pedestal supported on a pole would, collectively constitute a structure, true enough. However, a self-contained, single-entity item like a metering pedestal alone, wouldn't be a "combination of materials assembled at a fixed location," and therefore wouldn't qualify, except under the most tortured interpretation of the definition.

**PANEL ACTION:** Accept in Principle.

The panel accepts in principle the concept of establishing a proximity for the service disconnecting means.

**PANEL STATEMENT:** Without a defined distance for the term "immediately adjacent" the panel has embraced the concept of "within sight" per the definition of that term in Article 100. See the panel's action on Proposal 4-107a.

**NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE:** 11

**VOTE ON PANEL ACTION:**

**AFFIRMATIVE:** 11

(Log #1777)

**4-115 - (230-70(d) (New) ): Reject**

**SUBMITTER:** Terry L. Carlson, Nebraska State Electrical Board

**RECOMMENDATION:** New subsection: (d) Mounting Height.

Each service disconnecting means shall be installed so the bottom of the enclosure containing the disconnecting means is not less than 610 mm (2 ft) above finished grade or working platform.

Exception: Service disconnecting means located within floor mounted switch gear enclosures.

**SUBSTANTIATION:** There is currently no reference to the minimum mounting height of normal service disconnecting means other than for mobile home service equipment. Inspectors in the field find service disconnects mounted so low to the floor or finished grade that it is impossible to inspect them or for electricians to service them without getting down on their knees or lower to open the equipment enclosure.

The exception is for large floor mounted switch gear where it is common to locate the main disconnect in the lower part of the enclosure. The need for a minimum height requirement has existed for many years and this proposal will accomplish it.

**PANEL ACTION:** Reject.

**PANEL STATEMENT:** There is no technical substantiation to mandate a minimum clearance. Additionally this proposal raises an equipment design consideration that is outside the scope of the NEC.

**NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE:** 11

**VOTE ON PANEL ACTION:**

**AFFIRMATIVE:** 11

(Log #3684)

**4-116 - (230-70(d) (New) ): Reject**

**SUBMITTER:** Leonard F. Devine, Jr., W. Palm Beach County Bldg & Zoning, FL

**RECOMMENDATION:** Add new paragraph (d) to read as follows:

(d) The service disconnecting means for residential services shall be installed on the outside of the building.

**SUBSTANTIATION:** This new text is needed to provide a quicker and safer means of turning off the power to a residence for firefighters if the need should arise to do so.

**PANEL ACTION:** Reject.

**PANEL STATEMENT:** The historical precedence of locating the service disconnecting means inside a building or structure has not resulted in a reduction of safety. There are locations where locating the equipment inside is necessary.

**NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE:** 11

**VOTE ON PANEL ACTION:**

**AFFIRMATIVE:** 11

(Log #728)

**4-117 - (230-71(a) ): Accept**

**NOTE:** It was the action of the Technical Correlating Committee that this Proposal be reconsidered and correlated with the action on Proposal 4-118. This action will be considered by the Panel as a Public Comment.

**SUBMITTER:** Dan Leaf, Palmdale, CA

**RECOMMENDATION:** Revise to read as follows:

(a) General. The service disconnecting means for each service permitted by Section 230-2, or for each set of service-entrance conductors permitted by Section 230-40, Exception Nos. 1, or 3, 4, or 5 shall consist of not more than six switches or sets of circuit breakers or a combination of not more than six switches and sets of circuit breakers, mounted in a single enclosure, in a group of enclosures, or in or on a switchboard. There shall be no more than six sets of disconnects per service grouped in any one location. For the purpose of this section disconnecting means used solely for power monitoring, or the control circuit of the ground-fault

protection system or power-operable service disconnecting means installed as part of the listed equipment, shall not be considered a service disconnecting means.

**SUBSTANTIATION:** Editorial. the conductors permitted by Exceptions No. 4 and 5 appear to have been overlooked. These conductors must terminate in service equipment and should be included. Since (b) permits single-pole circuit breakers with a handle tie, each individual breaker may be considered as one of six. The word "sets" would clarify they are considered one unit. The reference to a combination would clarify that all sets do not have to be either switches or circuit breakers.

Disconnects for control circuits of power-operable service disconnecting means are a reasonable inclusion with ground-fault and power monitoring equipment, otherwise they are not exempted from the rule.

**PANEL ACTION:** Accept.

**NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE:** 11

**VOTE ON PANEL ACTION:**

**AFFIRMATIVE:** 11

(Log #4354)

**4-118 - (230-71(a) ): Accept**

**NOTE:** It was the action of the Technical Correlating Committee that this Proposal be reconsidered and correlated with the action on Proposal 4-117. This action will be considered by the Panel as a Public Comment.

**SUBMITTER:** Brian E. Rock, Hubbell Inc.

**RECOMMENDATION:** Revise as follows:

230-71. Maximum Number of Disconnects.

(a) General. The service disconnecting means for each service permitted by Section 230-2, or for each set of service-entrance conductors permitted by Section 230-40, Exception Nos. 1 or 3, shall consist of not more than six switches or six circuit breakers mounted in a single enclosure, in a group of separate enclosures, or in or on a switchboard. There shall be no more than six disconnects per service grouped in any one location. For the purpose of this section, disconnecting means used solely for power monitoring equipment, transient voltage surge suppression, or the control circuit of the ground-fault protection system, installed as part of the listed equipment, shall not be considered a service disconnecting means.

**SUBSTANTIATION:** Section 230-71(a) mandates that maximum number of disconnects not exceed six for each service; each disconnect, typically a circuit breaker overcurrent device, constitutes 1/6 of the total number of overcurrent devices; 1/6 equals 16.67 percent, more than 10 percent. Section 384-14(a) defines a lighting and appliance branch-circuit panelboard as having more than 10 percent of its overcurrent devices protecting lighting and appliance branch circuits. Section 230-79(d) mandates that a service disconnect not be rated less than 60 amperes. By contrast, Section 384-14(a) defines a lighting and appliance branch circuit as having overcurrent protection limited to 30 amperes maximum.

When a transient voltage surge suppressor is provided at the service entrance, there have been misinterpretations treating the TVSS as a branch circuit carrying a continuous load. Transient voltage surge protection (TVSS) is wired across each of the ungrounded, grounded and grounding conductors, with no outputs for load. In other words, transient voltage surge suppressors provide this protection in parallel, not "downstream" in series, with their single set of connection wire leads.

The TVSS normally sit across the conductors, with no conduction whatsoever. When a transient voltage surge appears, the TVSS clamps and a surge current flows for nanoseconds-to-microseconds duration (billionths of a second to millionths of a second) between the ungrounded, grounded and grounding lines, thereby providing transient voltage surge protection to the entire service. This conducted surge current is of such short duration that the wire lead conductors of the TVSS experience no temperature rise whatsoever, never even remotely approaching the thermal limits associated with the steady-state ampacity rating of that conductor size. As such, TVSSs do not constitute loads and do not require individual overcurrent thermal protection. The TVSSs are protected against excessive surge current and internal failures by internal protection devices as required by UL Standard UL 1449 to which the TVSSs are Listed. Short circuit protection is provided by the main circuit breaker or fuse to the electrical service. The UL Listing Report explicitly states "they are intended to be installed on the load side of the main Overcurrent Protection."

When misclassified as a branch circuit, there have been conflicts regarding the proper ampere rating of overcurrent protection required for the TVSS on its own disconnect. As indicated by the

UL Report, the main overcurrent protections rating, whatever it may be, is adequate and therefore safe. The selection of conductor size for the integral wire leads of the TVSS has absolutely no bearing on the temperature capacity nor any bearing on the ampere rating of the circuit breaker or fuse; conductor size selection relates solely to the transient voltage clamping characteristics and to manufacturing coordination of components internal to the TVSS.

Discrete service equipment panels having only one main disconnecting means would require the TVSS to be tapped off the one set of feeder conductors (load side) in accordance with NEC Section 240-21(b)(1). Servicing a tapped-in TVSS would necessitate disconnecting the electrical service to the entire feeder, resulting in consequential downtime.

Since NEC Section 230-71 allows up to a total of six service disconnects, spare capacity in the same service equipment panelboard for additional disconnects allows one further option; adding a separate main circuit breaker dedicated as a disconnect solely for a TVSS. A dedicated disconnect would allow the TVSS to be served unenergized without disconnecting any of the feeders from the other four main circuit breakers, thereby avoiding any downtime to ongoing operations. However, NEC Section 230-79(d), the service disconnect (main circuit breaker) would have to have a minimum rating of 60 amperes. Until such time that NEC Section 230-71(a), last sentence, is modified to also include transient surge suppression protection, NEC Section 230-79(d)'s 60 ampere minimum has been and may continue to be incorrectly misinterpreted to preclude the use of a lower ampere main circuit breaker with a TVSS.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #1882)

4-119 - (230-71(a), FPN (New) ): Reject

SUBMITTER: David A. Kerr, Jr., Friendsville, PA

RECOMMENDATION: Add a fine print note to 230-71(a) to read as follows:

FPN: See Sections 384-14, 384-15, 384-16 for restrictions on branch circuit breakers.

SUBSTANTIATION: Very few people seem to realize that most 15-30 ampere branch circuits require main protection. This needs a cross reference.

PANEL ACTION: Reject.

PANEL STATEMENT: The addition of the fine print note does not add to the clarity of this section. Users of the Code are required to follow the applicable rules of Article 384.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #435)

4-120 - (230-71(a), Exception (New) ): Accept in Principle

SUBMITTER: Abel S. Lampa, T&M Assoc.

RECOMMENDATION: Add an exception to 230-71(a) to read as follows:

Exception: For the purpose of this section, disconnecting means used solely for the control circuit of ground fault protection system, installed as part of the listed equipment and (transient voltage suppression system equipment) (TVSS) shall not be considered a service disconnecting means.

SUBSTANTIATION: The ability for emergency personnel to disconnect electric loads quickly during an emergency situation appears to be the reason why a limit was placed on the number of disconnects allowed (6). However, a TVSS does not feed a load, it is a sensor. Therefore, the TVSS would not need to be shut down during an emergency.

Based on the above, it is suggested that the section be modified to allow a TVSS connection in addition to six (6) disconnects. This revision will result in significant cost savings to building owners in numerous situations, and should not compromise safety.

PANEL ACTION: Accept in Principle.

PANEL STATEMENT: The submitter's concerns are addressed by the panel's action on Proposal 4-118.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

4-121 - (230-72(b)): Reject

SUBMITTER: Dan Leaf, Palmdale, CA

RECOMMENDATION: Revise to read as follows:

(b) Additional Service Disconnecting Means for Additional Services. The one or more additional service ~~disconnecting means~~ disconnects for fire pumps, emergency, legally required standby, or ~~optional standby systems services~~ permitted by the exceptions for Section 230-2 to be served by an additional service(s), shall be installed sufficiently remote from the one to six service ~~disconnects~~ disconnecting means for the normal service to minimize the probability of simultaneous interruption of supply.

SUBSTANTIATION: Emergency systems were mistakenly removed from this section by panel action on Proposal 4-156 in the 1998 ROP apparently due to confusion that this section applies to additional disconnecting means for taps on the supply side of the normal service disconnect. In the heading the word "additional" may be construed as applying to "service" or "service disconnecting means", which are different and may be confusing. However, the text reference to Section 230-2 clearly indicates service is intended since that section does not relate to taps ahead of the service disconnecting means. Deletion of "emergency" removes the application of the requirement to disconnects for an additional emergency service. The "one or more additional" phrase is superfluous and may add to the confusion, and is covered by Section 230-71. Since disconnecting means is defined as a group of devices and may consist of six devices per group, the word "disconnects" may be more technically correct and clear.

Optional standby systems is deleted since Section 702-2 indicates on-site generated power is to be used.

PANEL ACTION: Reject.

PANEL STATEMENT: The action by CMP 15 in the 1996 NEC to remove taps ahead of the service disconnecting means as a method of providing emergency power is the substantiation offered by the proposer in his Proposal 4-157 in the 1998 ROP, therefore the panel maintains that the inclusion of the term "emergency" is not appropriate.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #4174)

4-122 - (230-72(c) Exception No. 2 (New) ): Accept in Principle

SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc./Rep. Massachusetts Electrical Code Advisory Committee

RECOMMENDATION: Add a second Exception as follows:

Exception No. 2: In a multiple occupancy building where each occupant has grouped, readily accessible means to disconnect all ungrounded conductors within that occupancy with no more than six motions of the hand, the service disconnecting means shall be permitted to be accessible to authorized management personnel only.

SUBSTANTIATION: Relief is needed. Consider an underground service to a package store on the first floor and basement, with an apartment upstairs. Does anyone seriously believe the package store owner is going to allow the apartment tenant access to his basement on a 24-hour basis? The other exception doesn't apply since there is no "continuous building management supervision." The present requirements are not realistic for many of these small occupancies. The result is anarchy, as jurisdiction by jurisdiction the rule is avoided or unenforced in many different ways. The submitted wording is working well in Massachusetts as a part of its electrical code. Everyone is playing on a level playing field, applying a workable, consistent rule.

The last time the panel rejected this substantiation, it said every occupant had a legitimate need for access for the purposes of continuity and control. They would have that in their own panels under the provision of this proposal, and they would have it far more quickly at hand. This proposal strikes a more realistic balance between the prerogatives of the building ownership and the rights of the various tenancies.

PANEL ACTION: Accept in Principle.

Change the word "motions" to "operations" in the proposed new text.

Add the following to the proposed text:

The rating of the individual branch circuit overcurrent devices shall comply with 230-92.

PANEL STATEMENT: The panel's action harmonizes the proposed language with that of 230-71(b) relative to the use of the word "operation", and correlates with Section 230-92.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11  
VOTE ON PANEL ACTION:  
AFFIRMATIVE: 10  
NEGATIVE: 1

EXPLANATION OF NEGATIVE:

SUMRALL: The submitter continues to submit the same proposal cycle after cycle. In his substantiation he cites a basement of a package store as the reasons building management will not allow access to a tenant of a various class. I am from a location where basements will fill up with water at 5 1/2 ft below the ground level. The alternative is to put the services in a different location, accessible to the various tenants. The State of Massachusetts, by adopting this exception, embraced 90-4, the very same section, the submitter says in Proposal 4-81 is "irresponsible."

Perception, without the facts, is truth. Fact, during the past two cycles this submitter is the only person that feels the playing field needs to be leveled. Fact, during the past two cycles this Panel has rejected the very same proposal it now accepts. Fact, this submitter called the result of this CMP's work an "anarchy."

Truth, there is nothing wrong with the present wording of this section. If this were not so, this Panel would have had more proposals to change the present code. Truth, the only playing field that is not level is that in Massachusetts, compared to the rest of the world. If this were not so, this Panel would have had more proposals to see the wording changed. Fact, the work of this CMP is indeed a privilege to work on, and with colleagues of all disciplines, to learn and share experiences, and to make a better Code. But in so doing, we at times must endure the repeated assault of certain individuals that have other alternatives to making a better code.

(Log #CP423)

4- 122a - (230-75): Accept

NOTE: 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.

SUBMITTER: CMP 4

RECOMMENDATION: Remove the existing second paragraph of Section 230-75.

SUBSTANTIATION: The issue addressed in the second paragraph is a product standard issue and does not need to be restated in the Code.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 10

NEGATIVE: 1

EXPLANATION OF NEGATIVE:

YOUNG: This paragraph is deleted with the substantiation that this is covered in product standards and does not need to be in the code. This is incorrect. This paragraph was added in the 1990 NEC and one of the problems being addressed was the interpretation of "service equipment" meaning the switchboard section containing the service disconnect. The product standard allowed the disconnect for the grounded conductor to be in other sections prior to that code change, but these interpretations would not allow it to be in other sections because of the wording in the first paragraph. This problem would be reintroduced if this paragraph is deleted.

The other problem is that if the second paragraph is deleted there would no longer be a requirement for marking the switchboard section where the disconnect is located and this could be removed from the product standards.

The intent of the code-making panel is that the grounded conductor disconnect can be located in any section of a multisection switchboard, and that this section should be identified by marking. Deleting this paragraph confuses the intent of the code-making panel and will result in reintroducing the problems that existed prior to the 1990 NEC.

(Log #730)

4- 123 - (230-75): Reject

SUBMITTER: Dan Leaf, Palmdale, CA

RECOMMENDATION: Revise last paragraph to read as follows:

In a multisection switchboard or motor control center, disconnects for the grounded conductor shall be permitted in any section of the switchboard or motor control center provided any such switchboard section other than the service disconnecting means enclosure is marked to indicate the location of the disconnect.

SUBSTANTIATION: Motor control centers may contain service equipment, and since they are covered in Article 430 may not be equated with switchboards even if similarly constructed. Purpose of the marking should be indicated, and such marking does not seem necessary where the grounded conductor disconnect is in the service disconnecting means section.

PANEL ACTION: Reject.

PANEL STATEMENT: The second paragraph of Section 230-75 has been removed. See panel action and comment on Proposal 4-122a.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #731)

4- 124 - (230-79(b), (c), (d)): Reject

SUBMITTER: Dan Leaf, Palmdale, CA

RECOMMENDATION: Revise to read as follows:

(b) Two-Circuit Installation Specified Circuits. For installations consisting of not more than two 2-wire branch circuits the service disconnecting means shall have a rating of not less than 30-amperes to supply: (1) two or more 2-wire circuits supplied by a 2-wire service; (2) more than two 2-wire circuits supplied by a 3-wire service; (3) two or more 3-wire circuits supplied by a 3-wire service or; (4) two or more 4-wire circuits supplied by a three-phase 4-wire service.

(c) One Family Dwelling Units. For a one family dwelling, the service disconnecting means shall have a rating of not less than 100-amperes 3-wire single phase or 60-amperes 4-wire three phase. For an individual dwelling unit of a two-family or multifamily dwelling the service disconnecting means shall have a rating of not less than 60-amperes 3-wire single-phase or 30 (40) amperes 4-wire three phase (Figure 40 is alternate)

(d) All Others. For all other installations the service disconnecting means shall have a rating of not less than 60-amperes.

SUBSTANTIATION: The proposal for (b) tracks Section 215-2 for feeders and is more specific and comprehensive than present wording. Present wording requires a minimum 30-ampere disconnecting means for a 3-wire service supplying two 2-wire branch circuits, but if a single 3-wire circuit is supplied per (a) the disconnecting means could be rated 15-amperes. A disconnecting means for a 3-wire service which supplies two 15-ampere 3-wire circuits, for example, is not covered and falls under the requirement of (d) which requires a minimum 60-ampere rating, likewise for a 4-wire three phase disconnecting means supplying two 15-ampere 4-wire circuits.

Present wording of (c) suggests a 4-wire three phase service is not permitted. A 60-ampere 208y/120-volt 4-wire service can supply 21600 volt-amperes compared to 20800 volt-amperes of a 208y/120 volt 3-wire single-phase service. Though (d) may be construed to permit a 60-ampere disconnecting means where a 100-ampere 3-wire rating per (c) is not provided, the text is not clear. The proposal for two-family and multifamily dwellings is similar in vein; present (d) requires a minimum 60-ampere rating which can supply 12480 volt-amperes at 208y/120-volt 3-wire single-phase, compared to a 30-ampere rating at 208y/120-volt three phase which can supply 10800 volt-amperes or at 480 volts three phase, 14400 volt-amperes.

The present 60-ampere minimum seems arbitrary and doesn't appear to take into account voltage and number of phases whereby the volt-ampere capacity can greatly vary.

Under the present wording of this section where a minimum 60-ampere disconnecting means is required, it can result in service-entrance conductors larger than necessary for the load. For example, a 60-ampere disconnect which supplies two branch circuits for 7-1/2 HP 460 volt three phase motors. No. 10 copper service-entrance conductors have ampacity suitable for the load. If nontime-delay fuses are used for OC devices the service OC device could be rated 40-amperes. This fuse rating requires a 60-ampere switch, which also satisfies (d). However, Section 230-42(b) requires the service-entrance conductor ampacity to be at least 60-amperes. For other installations requiring a 60-ampere rating per (d) but where a lower rated OC device is sufficient for the load, the same condition can exist. For circuit breakers used as the service disconnect it is difficult to provide the required 60-ampere rating with lower overcurrent trip rating, which may be suitable for the load. The requirement of (d) in effect, also mandates a service-entrance ampacity and OC device rating of 60-amperes.

PANEL ACTION: Reject.

**PANEL STATEMENT:** The current requirements of the Code provide the minimum specifications for safe service installations. The current Code does not prohibit a 3-phase, 4-wire service to a dwelling provided it has the same capacity as the 100 ampere, 3-wire rated disconnect.

**NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE:** 11  
**VOTE ON PANEL ACTION:**  
**AFFIRMATIVE:** 11

(Log #4440)

4-125 - (230-79(c)): Reject

**SUBMITTER:** George T. Anderson, Antioch, CA  
**RECOMMENDATION:** Revise as follows:

(c) One-Family Dwelling. For a one-family dwelling, the service disconnecting means shall have a rating of not less than 200 amperes, 3-wire.

**SUBSTANTIATION:** Today's technology and optional appliances have increased our needs for extra circuits:

1. Electronic equipment performs "cleaner" on its own circuit.
2. Audio equipment as above.
3. Spas at 2 pole 40 to 60 amperes.
4. Landscape and "garden" lighting.
5. Future automotive recharging.

**PANEL ACTION:** Reject.

**PANEL STATEMENT:** The submitter has not provided technical substantiation to increase the minimum rating of the disconnecting means.

**NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE:** 11  
**VOTE ON PANEL ACTION:**  
**AFFIRMATIVE:** 11

**COMMENT ON AFFIRMATIVE:**

**SUMRALL:** During the last cycle a subcommittee convened to submit the changes the 1999 code now has as the rule. The mentioning of electronic equipment was noted and discussed. However, the technical substantiation was not available and therefore the current installation practices were utilized. Articles 210, 220 and 680 all refer to Chapter 2 for calculating loads. The submitter might be better equipped to submit technical data for their consideration, than to this CMP.

(Log #3263)

4-126 - (230-82): Accept

**NOTE:** The Technical Correlating Committee directs the Panel to reword "in accordance with Article 250" to comply with the NEC Style Manual. This action will be considered by the Panel as a Public Comment.

**SUBMITTER:** Alan Manche, Square D Co.

**RECOMMENDATION:** Revise NEC 230-82 with the deletion (strike-through) as shown. The entire text of 230-82 is shown for clarity, but only those changes shown as strike-through are part of this proposal.

230-82. Equipment Connected to the Supply Side of Service Disconnect. Only the following equipment shall be permitted to be connected to the supply side of the service disconnecting means:

1. Cable limiters or other current-limiting devices
2. Meters nominally rated not in excess of 600 volts, provided all metal housings and service enclosures are grounded in accordance with Article 250
3. Instrument transformers (current and voltage), high-impedance shunts, ~~surge-protective devices identified for use on the supply side of the service disconnect~~, load management devices, and surge arresters.

**SUBSTANTIATION:** The NEC only addresses the installation of surge arresters presently. I am not aware of any surge protection device that is "identified for use on the supply side of the service disconnect" that is not presently covered as a Surge Arrester in Article 280. The problem with the present language is that it is leading installers to assume that devices other than surge arresters (i.e. TVSS devices) are OK on the line side of the service disconnect. Since there are no devices other than surge arresters that can be installed in this manner, the confusing wording should be removed.

**PANEL ACTION:** Accept.

**NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE:** 11  
**VOTE ON PANEL ACTION:**  
**AFFIRMATIVE:** 11

4-127 - (230-82): Accept in Principle

**NOTE:** It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 15 for information.

**SUBMITTER:** David P. Brown, Baltimore Gas and Electric Co./Rep. Edison Electric Inst./Electric Light & Power Group  
**RECOMMENDATION:** Revise as follows:

230-82. Equipment Connected to the Supply Side of Service Disconnect. Only the following equipment shall be permitted to be connected to the supply side of the service disconnecting means:

1. Cable limiters or other current-limiting devices.
2. Meters nominally rated not in excess of 600 volts, provided all metal housings and service enclosures are grounded in accordance with Article 250.
3. Instrument transformers (current and voltage), high-impedance shunts, surge-protective devices identified for use on the supply side of the service disconnect, load management devices, and surge arresters.
4. Taps used only to supply load management devices, circuits for standby power systems, fire pump equipment, and fire and sprinkler alarms, if provided with service equipment and installed in accordance with requirements for service-entrance conductors.
5. Solar photovoltaic systems or interconnected electric power production sources. (See Articles 690 or 705 as applicable.)
6. Control circuits for power-operable service disconnecting means, if suitable overcurrent protection and disconnecting means are provided.
7. Ground-fault protection systems where installed as part of listed equipment, if suitable overcurrent protection and disconnecting means are provided.
8. Standby power system transfer equipment that is listed and labeled as service disconnect and grouped with the service overcurrent device. (See Articles 100, 250, and 700 through 702 as applicable)

**SUBSTANTIATION:** This change is necessary to clarify the intent for the main service equipment function when transfer equipment is installed on the supply side for standby power. For example, some transfer switches are manufactured, listed and labeled "suitable for use as service equipment" and contain only a disconnecting device along with necessary grounding provisions for service equipment. Although, the listing agency qualifies the equipment in this manner, they do indicate the installation shall meet national and local requirements. The practice typically recognized as the local requirement is that service equipment needs to be comprised of a switch and fuse or circuit breaker to meet the necessary disconnecting and protective function at the load end of service conductors. The service equipment could contain these devices in one enclosure or within adjacent enclosures. In outdoor high voltage stations, the devices are grouped within the same switchyard.

This change will mitigate installation arrangements in conflict with the requirements of authorities having jurisdiction of the electric supply and National Electrical Code.

**PANEL ACTION:** Accept in Principle.

Revise the text of item 8 to read:

"8. Transfer equipment installed in accordance with Sections 700-6, 701-7 and 702-6."

**PANEL STATEMENT:** The proposed language has been added to permit transfer switches to be connected ahead of the service disconnecting means. The panel does not intend that transfer switches become the service disconnecting means unless identified and installed for that purpose. This change correlates with the changes made by CMP 15 to Sections 700-6, 701-7 and 702-6. It is recommended to the Technical Correlating Committee that this action be referred to CMP 15 for information.

**NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE:** 11  
**VOTE ON PANEL ACTION:**  
**AFFIRMATIVE:** 11

(Log #3757)

4-128 - (230-82(2)): Accept

**NOTE:** It was the action of the Technical Correlating Committee that further consideration be given to the comments expressed in the voting. The Technical Correlating Committee directs the Panel to reword "in accordance with Article 250" to comply with the NEC Style Manual. This action will be considered by the Panel as a Public Comment.

**SUBMITTER:** Timothy M. Croushore, Allegheny Power Service Corp./Rep. Edison Electric Inst./Electric Light and Power Group  
**RECOMMENDATION:** Revise the current (2) to read as follows:

Meters, meter sockets, or meter disconnect switches, normally rated not in excess of 600 volts, provided all metal housings and service enclosures are grounded in accordance with Article 250.

**SUBSTANTIATION:** This change will add meter sockets and meter disconnect switches to the list of equipment permitted ahead of the service disconnecting means. Meter sockets are commonly placed ahead of the service disconnecting means in almost every location to facilitate the installation of electric metering. Meter disconnects are commonly used ahead of meter sockets on 480Y/277 volt services with self-contained metering. Self-contained metering does not have external potential or current transformers. These meter disconnects are required by the serving electric utility to de-energize the meter socket during meter installation or replacement. Electric utilities will often refer to this type of metering as "cold sequence."

**PANEL ACTION:** Accept.  
**NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE:** 11  
**VOTE ON PANEL ACTION:**

**AFFIRMATIVE:** 11  
**COMMENT ON AFFIRMATIVE:**

**ZINNANTE:** I believe that Proposals 4-128 and 4-129 were supposed to be submitted identically. Proposal 4-128 had one word misspelled ("normally" instead of "nominally"). Therefore, the Panel accepted in principle 4-128 and accepted 4-129, not as both accepted as shown on the ballot. If the error was by staff, then there are no objections to accepting both. If the spelling error is by the submitter, then 4-128 should be "accepted in principle".

(Log #4070)

4-129 - (230-82(2)): Accept  
**SUBMITTER:** David P. Brown, Baltimore Gas and Electric Co./Rep. Edison Electric Inst./Electric Light & Power Group

**RECOMMENDATION:** Revise the current (2) to read as follows:

Meters, meter sockets, or meter disconnect switches, nominally rated not in excess of 600 volts, provided all metal housings and service enclosures are grounded in accordance with Article 250.

**SUBSTANTIATION:** This change will add meter sockets and meter disconnect switches to the list of equipment permitted ahead of the service disconnecting means. Meter sockets are commonly placed ahead of the service disconnecting means in almost every location to facilitate the installation of electric metering. Meter disconnects are commonly used ahead of meter sockets on 480Y/277 volt services with self-contained metering. Self-contained metering does not have external potential or current transformers. These meter disconnects are required by the serving electric utility to de-energize the meter socket during meter installation or replacement. Electric utilities will often refer to this type of metering as "cold sequence."

**PANEL ACTION:** Accept.  
**NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE:** 11  
**VOTE ON PANEL ACTION:**

**AFFIRMATIVE:** 11  
**COMMENT ON AFFIRMATIVE:**

**ZINNANTE:** See my Comment on Affirmative on Proposal 4-128.

(Log #732)

4-130 - (230-82(4)): Reject  
**SUBMITTER:** Dan Leaf, Palmdale, CA  
**RECOMMENDATION:** Revise to read as follows:

(4) Taps used only to supply load management devices, circuits for standby power systems, fire pump equipment, and fire and sprinkler alarms, if provided with service equipment and installed in accordance with requirements for services, service-entrance conductors.

**SUBSTANTIATION:** Editorial. If service equipment for such taps is grouped with "normal" service disconnects (max. of 6 total) grounding/bonding per service requirements will likely be done; if the service equipment for such taps is remote from the "normal" service disconnects, service type grounding/bonding may not occur. Since "services" covers all aspects including service-entrance conductors it may be more appropriate.

**PANEL ACTION:** Reject.  
**PANEL STATEMENT:** The current wording adequately covers the requirements for the tap conductors. The reference to providing service equipment for the tap conductors in the requirement addresses the submitter's concerns.

**NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE:** 11  
**VOTE ON PANEL ACTION:**  
**AFFIRMATIVE:** 11

(Log #3909)

4-131 - (230-82(4)(a) (New) ): Accept in Principle  
**SUBMITTER:** Ronald E. Gnotke, Rep. Minnesota Board of Electricity  
**RECOMMENDATION:** Add new Section 230-82(4)(a) to read as follows:

(a) A transfer switch or disconnecting means, listed as suitable for use as service equipment, with or without overcurrent protection, shall be permitted at the distribution point or service point supplying one or more buildings or structures under single management or ownership. Transfer switches without overcurrent protection, shall not be installed in or on buildings or structures, but are permitted to be installed adjacent to these structures providing the working space between the transfer switch and the building or structure complies with the minimum requirements of Section 110-34.

Where a parallel path is not created with the grounded conductor, the bonding requirements of 250-28 shall apply to both the transfer switch and the service disconnecting means in the building. Agricultural buildings and structures shall comply with the requirements of Section 547-8.

**SUBSTANTIATION:** When 1996 NEC Section 230-83 was deleted in the 1999 NEC, some authorities having jurisdiction would only allow unfused transfer switches to be installed on agricultural building sites as indicated in Section 547-8(a). There are many other residential sites with small acreages and commercial installations that would be better served by allowing or clarifying this code change. Where the transfer switch without overcurrent protection ahead of or an integral part of the switch, is away from the building or structure, it would appear that there is not greater safety hazard present with this switch than there is with a CT enclosure, connection cabinet, meter socket or other unprotected piece of equipment. If interrupting ratings or available fault current is an issue, consider limiting the size of the transfer switch without overcurrent protection to 800 or 1000 amps maximum.

By locating these switches according to Table 110-34(a), distances from the building would not be left to field interpretation.

**PANEL ACTION:** Accept in Principle.  
**PANEL STATEMENT:** The submitter's concerns are addressed by the panel's action on Proposal 4-127.

**NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE:** 11  
**VOTE ON PANEL ACTION:**  
**AFFIRMATIVE:** 11

(Log #3293a)

4-132 - (230-82(5)): Accept  
**NOTE:** It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 3 for information. The Technical Correlating Committee directs the Panel to reword "(See Articles 690, 691, or 705 as applicable.)" to comply with the NEC Style Manual. This action will be considered by the Panel as a Public Comment.

**SUBMITTER:** Kenneth Krastins, Plug Power, Inc.  
**RECOMMENDATION:** Revise Section 230-82(5) to read as follows: "Solar photovoltaic systems, fuel cell systems, or interconnected electric power production sources (See Articles 690, 691, or 705 as applicable.)"

**SUBSTANTIATION:** This proposal is submitted to provide correlation for a new Article 691.

An important goal of building codes is to permit to the fullest extent possible, the use of modern methods, devices and technological improvements while protecting the health, safety, and welfare of the end user and general public. While new technology may offer many worthwhile benefits, appropriate regulations are needed to allow safe adoption of the technology and prevent misapplication. The fuel cell represents just such an emerging technology. Fuel cells provide a means, via an electrochemical process, of converting a fuel gas (such as natural gas, propane, etc.) into electrical energy that may then be used to power a building or residential dwelling. Fuel cells are virtually pollution free, very quiet when compared to other means of electric power generation, and can operate at high efficiency levels using very abundant and cheap fuels such as natural gas and LP gas.

There is growing interest in small, clean and quiet independent power generating units. The installation of fuel cell electrical generating systems used at residential and light commercial establishments is imminent. Recent advances in fuel cell technologies and more economical means of production will foster widespread acceptance of small distributed electrical generating units (under 50 kW) for single family home use and medium size units (51 kW to 250 kW) for multifamily units and small commercial buildings.

The interest in other clean forms of distributed generation is demonstrated by the adoption of the NEC Article 690, Solar Photovoltaic Systems. The direct interpretation of this article and its application deals specifically with solar photovoltaic electrical generating systems. It has been suggested that this article can also adequately cover other forms of distributed generation including fuel cell systems. However, since much of the language in Article 690 is specific to photovoltaic systems and rather complex to accommodate the interconnection requirements of the many sub-systems in photovoltaic systems, application of this article to fuel cells will be cumbersome.

Much of the information in Article 690 could apply to small and medium size electrical generating systems in general. Likewise, Article 705, Interconnected Electrical Power Production Sources, and Article 490, Equipment Over 600 Volts, Nominal, apply mainly to the large utility grid parallel independent electrical generating units. For example, Article 705-12, (b), (1) stipulates, "The aggregate of non-utility sources of electricity has a capacity in excess of 100k W, or the service is above 1000 volts." Leaving the interpretation of Article 690 and other articles up to the local inspector to determine the requirements for fuel cell systems will be problematic and could hinder the use of this beneficial technology. While the combination of these existing articles and others may adequately address fuel cells, it is clearly advantageous to users of the National Electrical Code, to have an article which specifically articulates the electrical installation requirements of fuel cell systems.

This being stated, Article 690, Solar Photovoltaic Systems, does offer a good basis for the creation of a Fuel Cell Systems article. A description of and substantiation for the individual topics to be covered in the proposed article follows. Where appropriate, comparisons are made within the following detailed substantiation between this proposed fuel cell article and the extant Photovoltaic Article 690. Sections of the Photovoltaic article that do not appear at all in the proposed article are also discussed and distinguished in bold, italicized text.

Additional Changes – Revised wording is recommended for section 230-82 (5), the exception to section 705-3, and section 705-30 to include language to cover fuel cell systems, similar to what is currently included for solar photovoltaic systems.

Members of Plug Power, Inc. and DTE Energy Technologies drafted the original version of the proposed fuel cell article. The proposed article began to be referred to as 691 because of its similarity and relationship to Article 690. It is recognized that the number ultimately assigned to the article may be different from 691.

The article was then circulated, reviewed, and revised internally at Plug Power. Subsequently, an e-mail notification was forwarded on September 13, 1999 to the members of three different groups advising them of the existence of the proposed article and inviting them to request a copy for review and comment. The three different groups notified were

- The members of the IEEE Standards Coordinating Committee (SCC) 21 currently involved in the development of a national standard (P1547) to cover interconnection of distributed resources with electrical power systems
- The members of the technical working group involved in the development of Standard Interconnection Requirements (SIR) for New York State which have since been submitted to the NYS Public Service Commission
- The Codes & Standards Working Group of the US Fuel Cell Council

All totaled, these groups include over 200 individuals. Presentations concerning the proposed article were given by Plug Power at both the September 27, 1999 meeting of the IEEE-SCC21 committee in Arlington, Virginia and the October 8, 1999 Power Quality Workshop (Interconnect-3) sponsored by the US Fuel Cell Council in Phoenix, Arizona. Those individuals who requested a copy of the draft article as a result of the e-mail notification or the presentations were sent one for review. After comments were received, they were negotiated and incorporated in the proposed article currently being submitted. Substantial changes have been made to the proposed article since its original inception, but the input generously provided by the individuals of the groups listed above has served to help develop a much better article as a result.

**PANEL ACTION:** Accept.  
**PANEL STATEMENT:** This action is based on acceptance of the proposed Article 691.  
**NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE:** 11  
**VOTE ON PANEL ACTION:**

**AFFIRMATIVE:** 11

(Log #1982)

4-133 - (230-83 (New) ): Reject

**SUBMITTER:** John M. O'Connor, North American Technologies, Inc.  
**RECOMMENDATION:** Add new Section 230-83 to read as follows:

230-83. Meter Socket Bypass/Jumper Means. Meter sockets shall be bypassed or jumpered only by a full rated listed bypass or jumper. The bypass/jumper shall be enclosed by a listed method which prevents access to live parts.

**SUBSTANTIATION:** The enclosure of a meter socket is UL listed only when a meter is installed in a socket. The service which is energized without a meter being installed does not meet Section 111-27 Guarding of Live Parts. In many instances meters are bypassed, often by noncode approved means, in order to provide temporary power on construction jobsites. The protection of these live parts may or may not exist, depending on the installer and when or if a meter is installed.

These hazardous situations are occurring at new homes, offices, construction sites and at temporary classrooms (which are usually located on school playgrounds) while they are waiting to have meters installed. Utility deregulation may also cause increased incidence of these situations.

The addition of an integral closure to a meter socket would protect workers, children and others from a potentially dangerous situation, one that is preventable. Listed metering assemblies with integral socket closures are already commercially available.

**Note:** This is a companion proposal to my proposal on Section 373-4(b).

**PANEL ACTION:** Reject.

**PANEL STATEMENT:** The use of bypass mechanisms is not an installation issue. This is a maintenance and service issue and the proposed language is unenforceable.

**NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE:** 11

**VOTE ON PANEL ACTION:**

**AFFIRMATIVE:** 11

(Log #2100)

4-134 - (230-83 (New) ): Reject

**SUBMITTER:** John M. O'Connor, North American Technologies, Inc.  
**RECOMMENDATION:** Add a new section to read as follows:

"Meter sockets shall be bypassed or jumpered only by a full rated Listed bypass or jumper. The bypass/jumper shall be enclosed by a Listed method which prevents access to live parts."

**SUBSTANTIATION:** In many instances meters are bypassed, often by non-code approved means, in order to provide temporary power on construction jobsites and power to homes and businesses until a meter is installed. If a bypass switch is used this can be done safely. However, most times it is jumpered in an unsafe manner which can be dangerous to the individual doing the work and is a shock hazard to others if not properly protected. Removal of nonListed jumpers can also be hazardous to the meter installer when it is time for the meter to be installed. With the advent of utility deregulation, there will be increased occurrences of jumepring and hazardous situations. By requiring Listed bypass/jumpers and integral covers, the industry will be safer for workers and users.

Listed metering assemblies with safe bypass means and integral covers are already commercially available.

**PANEL ACTION:** Reject.

**PANEL STATEMENT:** The use of bypass mechanisms is not an installation issue. This is a maintenance and service issue and the proposed language is unenforceable.

**NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE:** 11

**VOTE ON PANEL ACTION:**

**AFFIRMATIVE:** 11

(Log #4175)

4-135 - (230-83): Accept in Principle

**SUBMITTER:** Frederic P. Hartwell, Hartwell Electrical Services, Inc.  
**RECOMMENDATION:** Restore 1996 NEC Section 230-83 to the 2002 NEC, in the following edited form:

230-83. Transfer Equipment.

Transfer equipment, including transfer switches and all permanent wiring arrangements that contemplate a transfer of power between on-site sources and service conductors, shall operate such that all ungrounded conductors of one source of supply are disconnected before any ungrounded conductors of the second source are connected.

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Exception No. 1: Where manual equipment identified for the purpose or suitable automatic equipment is utilized, two or more sources shall be permitted to be connected in parallel through transfer equipment.

Exception No. 2: ~~Where~~ Parallel operation is shall be permitted used and where suitable automatic or manual control equipment is provided.

**SUBSTANTIATION:** This section was removed by a panel proposal with essentially no substantiation. It took up about one inch of space in the ROP and most of use read over it, which is probably why there weren't any comments. I tried to convince some CMP 4 members to push for a panel comment to restore it during the ROC meetings, but no deal. Contrary to the panel statement, there are larger issues here than the product standard issue about contact overlap. It needs to be restored because until and unless the scope of Article 702 changes, this material is all that stands as enforceable language between a homeowner's power inlet for his cord-connected generator and a utility line crew repairing an outage.

I had used the phrase "including transfer equipment" as a key point in arguing that the scope of this section extended beyond just transfer equipment. Then I insisted the owner show how one system had to be off if the other were on. The final result, invariably, was an agreement to go get a manual transfer switch. Time after time this was in the context of the owner showing me how he was willing to turn everything off except this circuit and that circuit. "The main breaker; you mean I have to turn that off too?" went the response, "OK, I'll be sure and remember to do that." Sure.

This proposal updates the main rule to clearly address these arrangements. It also makes an editorial change in the last exception to make it more positive and use a complete sentence format.

**PANEL ACTION:** Accept in Principle.

**PANEL STATEMENT:** The submitter's concerns have been addressed by the panel's action on Proposal 4-127.

**NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE:** 11

**VOTE ON PANEL ACTION:**

**AFFIRMATIVE:** 11

(Log #CP424)

4-135a - (230-90): Accept

**NOTE:** The Technical Correlating Committee directs the Panel to reword Exception No. 3 "in accordance with Article 220" to comply with the NEC Style Manual. This action will be considered by the Panel as a Public Comment.

**SUBMITTER:** CMP 4

**RECOMMENDATION:** Revise 230-90 as follows:

"230-90. Where Required. Each ungrounded service conductor shall have overload protection.

(a) Ungrounded Conductor. Such protection shall be provided by an overcurrent device in series with each ungrounded service conductor that has a rating or setting not higher than the allowable ampacity of the conductor. A set of fuses shall be considered all the fuses required to protect all the ungrounded conductors of a circuit. Single-pole circuit breakers, grouped in accordance with Section 230-71(b), shall be considered as one protective device.

Exception No. 1: For motor-starting currents, ratings that conform with Sections 430-52, 430-62, and 430-63 shall be permitted.

Exception No. 2: Fuses and circuit breakers with a rating or setting that conform with Section 240-3(b) or (c) and Section 240-6 shall be permitted.

Exception No. 3: Two to six circuit breakers or sets of fuses shall be permitted as the overcurrent device to provide the overload protection. The sum of the ratings of the circuit breakers or fuses shall be permitted to exceed the ampacity of the service conductors, provided the calculated load in accordance with Article 220 does not exceed the ampacity of the service conductors.

Exception No. 4: Overload protection for fire pump supply conductors shall conform with Section 695-4(b)(1).

Exception No. 5: Overload protection for 120/240-volt, 3-wire, single-phase dwelling services shall be permitted in accordance with the requirements of Section 310-15(b)(6).

**FPN:** See Standard for the Installation of Centrifugal Fire Pumps, NFPA 20-1996.

(b) Not in Grounded Conductor. No overcurrent device shall be inserted in a grounded service conductor except a circuit breaker that simultaneously opens all conductors of the circuit."

**SUBSTANTIATION:** The changes that have been made are editorial and to comply with the NFPA NEC Style Manual. The fine print note is deleted as NFPA 20 is referenced in Article 695, therefore it is not necessary to repeat it in Article 230.

**PANEL ACTION:** Accept.

**NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE:** 11

**VOTE ON PANEL ACTION:**

**AFFIRMATIVE:** 11

(Log #2920)

4-136 - (230-90): Reject

**SUBMITTER:** Joseph A. Tedesco, Boston, MA

**RECOMMENDATION:** Change the word "overload" to "overcurrent" so that it reads "230-90 Where Required. Each ungrounded service conductor shall have overcurrent protection".

**SUBSTANTIATION:** The current requirement is often met by limiting the load at the service equipment. No short-circuit protection is provided for the service entrance conductors. This proposed wording would require short-circuit protection where the service entrance conductors receive their source of supply, but would still allow overload protection at the service entrance equipment by limiting the load. Limiters, as allowed by 230-82(1), are available to provide this short-circuit protection.

**PANEL ACTION:** Reject.

**PANEL STATEMENT:** The intent of this section is to reasonably and practically address the safety issues of conductors connected and energized by utility provided conductors. Adding cable limiters is not technically justified in all instances. There is no technical justification to require the installation of load limiters by changing "overload" to "overcurrent".

**NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE:** 11

**VOTE ON PANEL ACTION:**

**AFFIRMATIVE:** 11

(Log #2477)

4-137 - (230-90(a) Exception No. 3): Reject

**SUBMITTER:** William Eder, Chicago Switchboard Co.

**RECOMMENDATION:** Revise as follows:

... The sum of the ratings of the circuit breakers or fuses shall not be permitted to exceed 125 percent of the ampacity of the service conductors when these overcurrent devices are rated at 80 percent and not exceed 100 percent of service conductors when rated at 100 percent.

**SUBSTANTIATION:** Loading in buildings is constantly growing and what may work now for overcurrent protection will not in the future - this is safety insured and not overload service conductors after future growth.

**PANEL ACTION:** Reject.

**PANEL STATEMENT:** The submitter has not provided technical substantiation to justify the proposed change. Providing extra capacity is a design consideration.

**NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE:** 11

**VOTE ON PANEL ACTION:**

**AFFIRMATIVE:** 11

(Log #733)

4-138 - (230-90(a) Exception No. 6 (New) ): Reject

**SUBMITTER:** Dan Leaf, Palmdale, CA

**RECOMMENDATION:** Add an exception to read as follows:

Exception No. 6: Ratings for welders in conformance with Article 630 shall be permitted.

**SUBSTANTIATION:** Although Chapter 6 may modify this section, Exception No. 4 is provided, and the proposed exception would also be useful to code users.

**PANEL ACTION:** Reject.

**PANEL STATEMENT:** Section 90-3 states that the requirements of Chapter 6 articles modify the requirements of Chapters 1-4.

**NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE:** 11

**VOTE ON PANEL ACTION:**

**AFFIRMATIVE:** 11

(Log #2921)

4- 139 - (230-91(a) (New) ): Reject

SUBMITTER: Joseph A. Tedesco, Boston, MA

RECOMMENDATION: Add a new paragraph as follows:

(a) Residential Occupancies. Service entrance conductors for residential occupancies shall be protected against overcurrents before the conductors enter the structure.

SUBSTANTIATION: Fires cause by unprotected service entrance cables continue to take lives and cause property damage. Several utilities already require this proposed protection. Outdoor, weatherproof fused disconnects or circuit breakers could be locked as long as the branch circuit devices, per Section 230-92, were accessible and of a smaller size than the outdoor main. Therefore, this proposal should not cause any problems, and will definitely save lives and property.

PANEL ACTION: Reject.

PANEL STATEMENT: The submitter has not provided adequate technical substantiation to require overcurrent protection, other than overload protection, for residential service conductors.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #406)

4- 140 - (230-92): Reject

SUBMITTER: Amos D. Lowrance, Jr., City of Chattanooga, TN

RECOMMENDATION: Revise 230-92 to read as follows:

Locked Service Overcurrent Devices. In a multiple-occupancy building, where the device overcurrent devices are locked or sealed, or not readily accessible to the occupant, branch-circuit overcurrent devices shall be installed on the load side, shall be mounted in a readily accessible location and shall be of lower ampere rating than the service overcurrent device.

SUBSTANTIATION: The code as currently written requires a reduction in size of the overcurrent service any time the service disconnection means is locked, even on a single-family dwelling. This would require that any tab be removed that would permit locking the outside disconnect or that the inside overcurrent devices be smaller than the main.

PANEL ACTION: Reject.

PANEL STATEMENT: This requirement is only applicable where the overcurrent device(s) is actually locked or sealed, not where the potential of locking exists.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #734)

4- 141 - (230-92): Reject

SUBMITTER: Dan Leaf, Palmdale, CA

RECOMMENDATION: Revise to read as follows:

Locked Service Overcurrent Device. Where the service overcurrent device(s) is locked or sealed, or otherwise not readily accessible to the an occupant for whom access is not requisite, branch-circuit overcurrent devices shall be installed on the load side, shall be mounted in a readily accessible location and shall be of a lower ampere rating than the service overcurrent device(s) from which they are supplied.

FPN: See Section 240-24(b).

SUBSTANTIATION: "Locked or sealed" appears to be equated with "not readily accessible". This section uses not readily accessible (location) instead of accessible which relates to locks or other effective means. Overcurrent devices which are not readily accessible conflicts with Section 230-70(a) where the disconnecting means is a fused switch or circuit breaker. Section 240-24(a) generally does not permit not readily accessible overcurrent devices. Section 380-8(a) generally does not permit (fused) switches and circuit breakers to be not readily accessible.

This section does not correlate with other sections where fused switches and circuit breakers are permitted or required to be locked, but are considered readily accessible. For example Sections 110-26, 110-31, 110-34(c), 240-24(b).

Branch-circuit overcurrent devices which are also locked can be readily accessible but would not be accessible to those without a key.

Since service overcurrent devices may consist of six sets with different ampere ratings, the proposal would clarify the rating relationship.

The FPN would be helpful to Code users as Section 240-24(b) relates to this section and also covers feeder overcurrent devices.

PANEL ACTION: Reject.

PANEL STATEMENT: The submitter's proposal does not accurately reflect the current wording of this requirement. The panel is unclear of the submitter's intent.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #3378)

4- 142 - (230-92): Reject

SUBMITTER: Dale P. Missey, Mesa, AZ

RECOMMENDATION: Revise 230-92 to read:

230-92. Locked Service Overcurrent Devices. Where the service overcurrent devices are locked or sealed, or not readily accessible to the occupant, branch-circuit overcurrent devices shall be installed on the load side, shall be mounted in a readily accessible location, and shall be selectively coordinated with the service overcurrent device.

SUBSTANTIATION: The intent of the existing phrase "of lower ampere rating than" is to assure that an overcurrent on a branch circuit will open only the branch circuit overcurrent device and not the service overcurrent device, so that the occupant can reenergize the circuit after finding and fixing the problem. This is especially important for occupants that utilize in-home life support systems. Unfortunately, just because the service overcurrent device is larger than the branch device, it doesn't mean that the two will selectively coordinate. This proposal clarifies the intent by requiring that the two devices are selectively coordinated. Both fuses and circuit breakers are available to meet this proposed requirement.

PANEL ACTION: Reject.

PANEL STATEMENT: Selective coordination is a design consideration.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #1507)

4- 143 - (230-95): Reject

SUBMITTER: Junior L. Owings, Rep. Oregon Chapter Int'l Assn. of Electrical Inspectors

RECOMMENDATION: Revise text 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 equipment rated 1000 amperes or more.

~~The rating of the service disconnect shall be considered to be the rating of the largest fuse that can be installed or the highest continuous current trip setting for which the actual overcurrent device installed in a circuit breaker is rated or can be adjusted.~~

Definition. Solidly grounded means that the grounded conductor is grounded without inserting any resistor or impedance device.

Exception No. 1: The ground-fault protection provisions of this section shall not apply to a service disconnect for a continuous industrial process where a nonorderly shutdown will introduce additional or increased hazards.

Exception No. 2: The ground-fault protection provisions of this section shall not apply to fire pumps.

(a) Setting. The ground-fault protection system shall operate to cause the service disconnect to open all ungrounded conductors of the faulted circuit. The maximum setting of the ground-fault protection shall be 1200 amperes, and the maximum time delay shall be one second for ground-fault currents equal to or greater than 3000 amperes.

(b) Fuses. If a switch and fuse combination is used, the fuses employed shall be capable of interrupting any current higher than the interrupting capacity of the switch during a time when the ground-fault protective system will not cause the switch to open.

(c) Performance Testing. The ground-fault protection system shall be performance tested when first installed on site. The test shall be conducted in accordance with instructions that shall be provided with the equipment. A written record of this test shall be made and shall be available to the authority having jurisdiction.

FPN No. 1: Ground-fault protection that functions to open the service disconnect will afford no protection from faults on the line

side of the protective element. It serves only to limit damage to conductors and equipment on the load side in the event of an arcing ground fault on the load side of the protective element.

FPN No. 2: This added protective equipment at the service equipment may make it necessary to review the overall wiring system for proper selective overcurrent protection coordination. Additional installations of ground-fault protective equipment may be needed on feeders and branch circuits where maximum continuity of electrical service is necessary.

FPN No. 3: Where ground-fault protection is provided for the service disconnect and interconnection is made with another supply system by a transfer device, means or devices may be needed to ensure proper ground-fault sensing by the ground-fault protection equipment.

SUBSTANTIATION: The hazards of equipment damage from ground faults are based on total system capacity, not disconnect ratings, therefore the protection for the hazard should be based on system capacity, which is related to equipment rating. The number of service disconnecting means as allowed by 230-71, does not reduce the potential hazard. The section as written works fine for when there is a single main disconnect which is related to the overall equipment rating. The problem arises when multiple disconnects (up to six) are installed each with ratings below 1000 amps. A 4000 amp switchboard with six 800 amp main service disconnects has the same potential to burn down from an arcing ground fault as the same 4000 amp switchboard with a single 4000 amp main disconnect.

In addition, since the ground fault protection would now be based on the rating of the service equipment, defining the disconnect rating is no longer necessary. This also removes the potential conflict and confusion that has come from application of Section 240-6(c).

PANEL ACTION: Reject.

PANEL STATEMENT: The original study for including this requirement in the Code was based on the rating of the overcurrent device installed in the disconnecting means and not the total rating of the service. The statement in the submitter's substantiation relative to the similar effects of multiple disconnecting means is not accurate, was not supported by the original study, and in fact the subdivision of the disconnecting means is desirable to minimize the impact of ground faults.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #1159)

4-145 - (230-95 Exception No. 3 (New) ): Reject

SUBMITTER: James A. Erickson, Boltswitch, Inc.

RECOMMENDATION: Add a new Exception No. 3 to read:

Exception No. 3: The ground-fault protection provisions shall not be required on the service disconnect if all sub-main devices are contained within the same switchboard and all are equipped with ground-fault protection. This allowance shall not be intended to require ground-fault protection on loads identified in Exceptions No. 1 and No. 2.

SUBSTANTIATION: Service disconnect devices that are designed to interrupt ground fault circuits can and do usually require maintenance after the device trips under fault conditions. This is understood and allowed by design standards. When a service disconnect requires maintenance, a utility shutdown is generally required. Consequently, when a service disconnect interrupts under ground fault conditions, the building management is faced with the choice of either lengthy delays (and costs) for a utility shutdown to perform maintenance or re-energize the system without proper maintenance. Unfortunately, the second option is usually selected.

The addition of Exception No. 3 would allow for a service disconnect to be placed directly ahead of any device equipped with ground fault protection. This would allow for proper maintenance without the delays and costs of a utility shutdown.

Also, Exception No. 3 would allow for ground fault protection to be installed solely on sub-main switches, which would provide an additional benefit of isolating a ground fault induced outage to only a portion of the facility. The unexpected outage would be less catastrophic, and the fault would be easier to locate.

Also, Exception No. 3 would allow for ground fault protection to be installed on sub-main switches without relying on coordinated trip settings or the cost and complexity of zone interlocking.

PANEL ACTION: Reject.

PANEL STATEMENT: The proposed exception reduces the level of protection for the main bus of the service equipment. The submitter has not provided technical substantiation to justify using downstream GFP protection as a substitute for protection for the entire bus.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #2559)

4-144 - (230-95, FPN No. 3): Reject

SUBMITTER: Joseph C. Warren, Joseph C. Warren Electrical Consulting Services

RECOMMENDATION: Revise as follows:

FPN No. 3: Where ground-fault protection is provided for the service disconnect and interconnection is made with another supply system by a transfer device, a 4-pole transfer switch should be used on this 3-phase 4-wire system to isolate the neutral completely from the generator windings under normal power conditions to stop false tripping of ground-fault protection, and having current flowing back on neutral taking a path through ground-fault sensor and not sensed as fault current.

SUBSTANTIATION: In my experience in the installation of 480/277 volt 3-phase systems where a 3-pole transfer switch is used, if a phase leg develops a ground fault, this current travels back on the neutral and takes a path through the ground-fault sensor and is not sensed as fault current. In addition to this problem, under normal conditions when no ground-fault exists, neutral current due to normal load unbalance on phase legs divides at common neutral connection in automatic transfer switch with some current flowing toward the generator and returning to service main on a metal conduit indicating falsely that a ground-fault exists and takes out ground-fault protection. A four pole transfer switch always eliminates this condition and gives a definitive method of installation.

PANEL ACTION: Reject.

PANEL STATEMENT: The present wording of the fine print note adequately covers the topic of interconnected system concerns. The proposed text could be construed as a mandatory requirement in an advisory statement.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #2455)

4-146 - (230-96 (New) ): Reject

NOTE: The Technical Correlating Committee notes that Code-Making Panel 2 rejected Proposal 2-119 that relates to this proposal. It is also the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 2 for information.

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

RECOMMENDATION: Add new Section 230-96 as follows:

230-96. Replacement of Service Equipment in Dwelling Units. When service equipment in dwelling units is replaced, each existing 125-volt, single-phase, 15- and 20-ampere lighting and appliance branch circuit shall be individually protected by an arc-fault circuit interrupter.

FPN: See Section 210-12(c). (Editorial note: Section 210-12(c) is a proposed new paragraph, submitted separately to the CMP for Article 210, to complement this proposed new Section 230-XX. For information purposes, proposed new Section 210-12(c) reads as follows: Lighting and Appliance Branch Circuits. Each existing 125-volt, single-phase, 15- and 20-ampere lighting and appliance branch circuit shall be individually protected by an arc-fault circuit-interrupter when the service equipment is replaced.)

SUBSTANTIATION: According to a study conducted by the U.S. Consumer Product Safety Commission (CPSC), "Residential Electrical Distribution System Fires", Smith & McCoskrie, 1987, 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. Older dwellings are frequently upgraded with replacement service equipment to accommodate an increase in the service rating to supply additional appliance and equipment loads. However, often times, the existing lighting and appliance branch circuits in dwelling units are not replaced when the service is upgraded, due to the increased cost, and/or the inability to evaluate the remaining life expectancy of the branch circuit conductors. The branch circuit conductors are frequently located in concealed spaces surrounded with thermal insulation, and may be in a deteriorated condition at the time the service is

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upgraded. This proposal is intended to remedy this situation with the addition of arc-fault circuit interruption (AFCI) protection against fire hazard conditions for the existing branch circuit conductors.

**PANEL ACTION:** Reject.

**PANEL STATEMENT:** The proposal is outside the scope of CMP 4. CMP 4 directs the Technical Correlating Committee to refer this to CMP 2 and CMP 10 for review.

**NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE:** 11

**VOTE ON PANEL ACTION:**

**AFFIRMATIVE:** 11

(Log #2922)

4-147 - (230-96 (New)): Reject

**SUBMITTER:** Joseph A. Tedesco, Boston, MA

**RECOMMENDATION:** Add a new Section 230-96 in the 2002 NEC as shown below:

230-96. Large Services. Where the size of the service is large enough so that three or more cables per phase are utilized, and are connected together at both the point where they receive their supply and at the service entrance equipment, current-limiting cable limiters shall be installed on both ends of each cable to provide both short-circuit protection and isolation of a faulted cable.

**SUBSTANTIATION:** This proposal provides for service entrance conductor protection for those large services that require three or more cables per phase. Because of their large size, these services can produce tremendous amounts of available short-circuit current. Without this requirement, there is only minimal protection provided on the line side of the transformer. Many utilities already have similar requirements for these limiters on large services. Because of the very high available short-circuit currents, the available arc flash energy is also extremely high. Because of their current-limiting properties, current-limiting cable limiters can limit this arc flash energy. Workers will still need to wear appropriate PPE, but the hazard level will be greatly reduced.

**PANEL ACTION:** Reject.

**PANEL STATEMENT:** The submitter has not provided technical substantiation to require this type of protection. In a three conductor per phase installation, where cable limiters have been installed, the isolation of one cable would cause the remaining two cables in that phase to continue operation with inadequate overload protection. This method of installation is permitted by Article 240 and is a design consideration.

**NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE:** 11

**VOTE ON PANEL ACTION:**

**AFFIRMATIVE:** 11

(Log #CP421)

4-147a - (230-203): Accept

**SUBMITTER:** CMP 4

**RECOMMENDATION:** Delete Section 230-203.

**SUBSTANTIATION:** These requirements are adequately expressed in Section 110-34(c).

**PANEL ACTION:** Accept.

**NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE:** 11

**VOTE ON PANEL ACTION:**

**AFFIRMATIVE:** 11

(Log #3262)

4-148 - (230-203): Reject

**SUBMITTER:** Alan Manche, Square D Co.

**RECOMMENDATION:** Revise the 230-203 with the additions (underlined) as shown. The entire text is shown for clarity, but only those changes shown underlined are part of this proposal.

230-203. Warning Signs. Signs with the following words or equivalent, "DANGER - HIGH VOLTAGE - KEEP OUT" shall be posted in plain view where unauthorized persons might come in contact with energized parts.

**SUBSTANTIATION:** The explicit nature of the present wording is causing field problems in the acceptance of appropriate warning signs or markings. The ANSI Z535 series of standards provides the proper procedure in establishing a hazard sign or marking. ANSI Z535.4 provides the information about what should be contained in a hazard sign or label. This includes a message panel that identifies

the hazard, indicates how to avoid the hazard and advises the probable consequence of not avoiding the hazard.

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

**PANEL ACTION:** Reject.

**PANEL STATEMENT:** The submitter's concerns have been addressed by the panel's action on Proposal 4-147a.

**NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE:** 11

**VOTE ON PANEL ACTION:**

**AFFIRMATIVE:** 11

(Log #735)

4-149 - (230-208(b)): Accept

**SUBMITTER:** Dan Leaf, Palmdale, CA

**RECOMMENDATION:** Revise to read as follows:

(b) Enclosed Overcurrent Devices. The restriction to 80 percent of the rating for an enclosed overcurrent device for continuous loads shall not apply to overcurrent devices installed in services systems operating at over 600 volts.

**SUBSTANTIATION:** Editorial. This section appears almost unnecessary in view of ratings permitted in the first paragraph. Moreover, the specific 80 percent wording appears only in Section 384-16(d) for lighting and appliance panelboards. It is my understanding there are no panelboards listed for over 600 volts. Since this section specifies only services, is it intended that Section 210-20(a) apply to branch circuits served by a service or separately derived system?

Article 490 does not indicate such requirement.

**PANEL ACTION:** Accept.

**PANEL STATEMENT:**

**NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE:** 11

**VOTE ON PANEL ACTION:**

**AFFIRMATIVE:** 11

(Log #1473)

4-150 - (230-212): Accept in Principle

**SUBMITTER:** William M. Lewis, Eli Lilly and Co.

**RECOMMENDATION:** Change Section 230-212 to read:

230-212 Services Over 15,000 Volts. Where the voltage exceeds 15,000 volts, between conductors they shall enter either which enter a building, they shall terminate in a metal-enclosed switchgear compartment or a transformer vault conforming to the requirements of Sections 450-41 through 450-48.

**SUBSTANTIATION:** Many services over 15000 volts do not enter a building but terminate in an outdoor substation. The proposed wording remedies this oversight.

This proposal was developed by the Task Group based on the Task Group's review and discussion of the current requirements of Articles 225, 230, 100, 110, 240, and 250. This proposal is one of 14 which makes up the Task Group's response to a recommendation by a TCC task group on usability in 1995. In considering the needed proposals, emphasis was placed on including in the NEC, practices which are recognized in the electrical industry as necessary for safe installation of over 600 volt systems. This is to provide guidance and direction for installation of these facilities which have not historically been included in the NEC.

The Task Group participants consisted of William M. Lewis (CMP 4); committee chair; Carl J. Fredericks (CMP 10); Tom Adams (CMP 4); John Beck (Chairman CMP 4); Mark Sumrall (CMP 4); Barry Hornberger, (CMP 13); William T. Beutler, P.E.; William Long, NEMA.

Interested persons (nonparticipants): Robert J. Pollock (CMP 4 and TCC); Merton Bunker (NFPA); Mark Earley (NFPA)

**PANEL ACTION:** Accept in Principle.

Amend the proposed language to read:

"230-212 Services Over 15,000 Volts. Where the voltage exceeds 15,000 volts, between conductors they shall enter either which enter a building, they shall terminate in a metal-enclosed switchgear compartment or a transformer vault conforming to the requirements of Sections 450-41 through 450-48."

**PANEL STATEMENT:** The modification to the proposed text clarifies that the conductors are permitted to terminate in any vault that meets the requirements of Article 450, Part C.

**NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE:** 11  
**VOTE ON PANEL ACTION:**

**AFFIRMATIVE:** 11

**COMMENT ON AFFIRMATIVE:**

LEWIS: The Panel Action is appropriate and clarifies the intent of Section 230-212. I notice, however, that there is an inconsistency with 230-212, and 450-21, and 450-24, and 450-25. 450-21(b) requires only that specific transformers be installed in a fire resistant room. The term "Fire Resistant" for this section is defined as construction having a minimum fire rating of one hour. 450-21(c), 450-24, and 450-25 then specify that the three hour fire rated room (part C) will be required only if the voltage rating is greater than 35,000 Volts.

By requiring that services over 15,000 Volts which enter a building and terminate in other than metal enclosed switchgear, be in a three hour vault; the panel is requiring more restrictive rules on services, than on feeders between 15,000 Volts and 35,000 Volts. Since there is no difference in protection methods for feeders and services at this voltage level, I question the justification for the difference.

This comment is offered to highlight the inconsistency and to give the public an opportunity to suggest corrective measures if it has created a problem; or to provide justification for the difference.

(Log #4069)

4- 151 - (230-212): Accept in Principle

**SUBMITTER:** David P. Brown, Baltimore Gas and Electric Co./Rep. Edison Electric Inst.

**RECOMMENDATION:** Revise as follows:

230-212. Services Over 15,000 Volts ~~Within Buildings.~~

**SUBSTANTIATION:** Applied literally, this rule excludes the use of outdoor substations as allowed by Section 110-31(b).

**PANEL ACTION:** Accept in Principle.

**PANEL STATEMENT:** The submitter's concerns are addressed by the panel's action on Proposal 4-150.

**NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE:** 11

**VOTE ON PANEL ACTION:**

**AFFIRMATIVE:** 11

(Log #4103)

4- 152 - (230-212): Accept in Principle

**SUBMITTER:** Robert E. Molde, Northern States Power Co./Rep. Wisconsin Utilities Assn.

**RECOMMENDATION:** Revise as follows:

230-212. Services Over 15,000 Volts ~~Within Buildings.~~

**SUBSTANTIATION:** Applied literally, this rule excludes the use of outdoor substations as allowed by Article 110-31(b).

**PANEL ACTION:** Accept in Principle.

**PANEL STATEMENT:** The submitter's concerns are addressed by the panel's action on Proposal 4-150.

**NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE:** 11

**VOTE ON PANEL ACTION:**

**AFFIRMATIVE:** 11

## ARTICLE 240 — OVERCURRENT PROTECTION

(Log #1274)

10- 3 - (240): Accept in Principle

**SUBMITTER:** Technical Correlating Committee National Electrical Code

**RECOMMENDATION:** 1. In Section 240-4(b)(2) replace text with ~~strikeout with underlined text "20-ampere circuits — No. 18, up to 50 ft (15.2 m) 15m (50 ft) of run length"~~

2. In Section 240-4(b)(2) replace text with ~~strikeout with underlined text "20-ampere circuits — No. 16, up to 100 ft (30.5 m) 30m (100 ft) of run length"~~

3. In Section 240-21(b)(1) replace in subdivision title and text "10 ft (3.05 m)" with "3.0 m (10 ft)"

4. In Section 240-21(b)(2) replace in subdivision title and text "25 ft (7.62 m)" with "7.5 m (25 ft)"

5. In Section 240-21(b)(3) replace in subdivision title and text "25 ft (7.62 m)" with "7.5 m (25 ft)"

6. In Section 240-21(b)(4) replace in subdivision title and text "25 ft (7.62 m)" with "7.5 m (25 ft)"

7. In Section 240-21(b)(4) replace "35 ft (10.67 m)" with "11 m (35 ft)"

8. In Section 240-21(b)(4) replace "100 ft (30.5 m)" with "30 m (100 ft)"

9. In Section 240-21(b)(4) replace "30 ft (9.14 m)" with "9.0 m (30 ft)"

10. In Section 240-21(c)(2) replace in subdivision title and text "10 ft (3.05 m)" with "3.0 m (10 ft)"

11. In Section 240-21(c)(3) replace in subdivision title and text "25 ft (7.62 m)" with "7.5 m (25 ft)"

12. In Section 240-92(b)(1)(a) replace "50 ft (15.24 m)" with "15 m (50 ft)"

13. In Section 240-92(b)(1)(b) replace "75 ft (22.86 m)" with "23 m (75 ft)"

14. In Section 240-92(b)(1)(c) replace "75 ft (22.86 m)" with "23 m (75 ft)"

**SUBSTANTIATION:** The proposed revisions are intended to comply with the NFPA No. 1M Manual of Style Section 4.1 with respect to the placement of units.

**PANEL ACTION:** Accept in Principle.

In Item 1, change "No. 18" to "18 AWG".

In Item 2, change "No. 16" to "16 AWG".

In Item 3, change "3.0 m" to "3 m".

In Item 9, change "9.0 m" to "9 m".

In Item 10, change "3.0 m" to "3 m".

**PANEL STATEMENT:** The change from "No." to "AWG" is to provide consistency with the action taken on proposal 10-2. The deletion of the extra precision in the conversion shown in Items 3, 9, and 10 is made to avoid implying undue precision in the conversion to a smaller length in metric units.

**NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE:** 12

**VOTE ON PANEL ACTION:**

**AFFIRMATIVE:** 12

(Log #CP1004)

10- 3b - (240-2, Other Article Referenced): Accept

**SUBMITTER:** CMP 10

**RECOMMENDATION:** Move existing 240-2 to 240-3, delete existing title and add new title "Other Articles."

Delete second paragraph of section 240-3(e) and relocate to section 240-2 as a definition titled "Tap conductor".

Delete section 240-11 and relocate to section 240-2 as definition titled "Current limiting overcurrent protective device".

Delete section 240-91 and relocate to section 240-2 as definition titled "Supervised Industrial Installations".

Delete last paragraph of section 240-12 and relocate to section 240-2 as definition titled "Coordination".

Move existing 240-3 to 240-4.

Move existing 240-4 to 240-5.

Revise as follows:

240-1 No change

"240-2 Definitions

Coordination. The proper localization of a fault condition to restrict outages to the equipment affected, accomplished by the choice of selective fault-protective devices.

Current-Limiting Overcurrent Protective Device. A current-limiting overcurrent protective device is a device that, when interrupting currents in its current-limiting range, will reduce the current flowing in the faulted circuit to a magnitude substantially less than that obtainable in the same circuit if the device were replaced with a solid conductor having comparable impedance.

Supervised Industrial Installation. For the purposes of Part H, supervised industrial installation is defined as the industrial portions of a facility where all of the following conditions are met:

1. Conditions of maintenance and engineering supervision ensure that only qualified persons will monitor and service the system.
2. The premises wiring system has 2500 kVA or greater of load used in industrial process(es), manufacturing activities, or both, as calculated in accordance with Article 220.
3. The premises has at least one service that is more than 150 volts to ground and more than 300 volts phase-to-phase.

This definition shall not apply to those 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.

Tap Conductors. As used in this article, a tap conductor is defined as a conductor, other than a service conductor that has overcurrent protection ahead of its point of supply, that exceeds the value permitted for similar conductors that are protected as described elsewhere in this section."

240-3 Other Articles (Add existing text of section 240-2).

240-4 (relocate existing section 240-3).

240-5 (relocate existing section 240-4).

**SUBSTANTIATION:** The proposed changes are in conformance with the NEC style manual. This change provides for a more user friendly format of Article 240.  
**PANEL ACTION:** Accept.  
**NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE:** 12  
**VOTE ON PANEL ACTION:**  
AFFIRMATIVE: 12

(Log #1053)

10- 2 - (240-2): Accept  
**SUBMITTER:** James M. Daly, BICC General  
**RECOMMENDATION:** Revise Article 240 as follows:  
240-3(d) - change:  
"No. 14" to "14 AWG"  
"No. 12" to "12 AWG" in two places  
"No. 10" to "10 AWG" in two places  
240-4(b)(1) - change:  
"No. 18" to "18 AWG"  
"No. 16" to "16 AWG"  
240-4(b)(2) - change:  
"No. 18" to "18 AWG"  
"No. 16" to "16 AWG"  
"No. 14" to "14 AWG" in two places  
"No. 12" to "12 AWG" in two places  
240-4(b)(3) - change "No. 16" to "16 AWG"  
240-21(b)(4)(g) - change "No. 6 copper or No. 4 aluminum" to "6 AWG copper or 4 AWG aluminum".  
**SUBSTANTIATION:** To provide consistency throughout the Code. The term "No." is not used in any of the Tables in Chapter 3. AWG and kcmil are trade size designators specifically authorized for use with the SI system of units in North America. Also, industry practice is to use AWG or kcmil only.  
This is one of a series of proposals to make this change throughout the Code.  
**PANEL ACTION:** Accept.  
**PANEL STATEMENT:** No clarity is added for U.S. and some other locations, where the meaning of "No. 14" and "14 AWG" are universally known and interchangeable; further, the Code is generally consistent in listing "xx AWG" in the tables and "No. xx" in the text. However, this proposal adds considerable clarity for international locations that might accept the NEC, where common U.S. trade sizes are less well known.  
The panel suggests that the Technical Correlating Committee ensures that all final actions on similar proposals are consistent throughout the Code.  
**NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE:** 12  
**VOTE ON PANEL ACTION:**  
AFFIRMATIVE: 12

(Log #CP1005)

10- 3a - (240-2 (New)): Accept  
**NOTE:** It was the action of the Technical Correlating Committee that this Proposal be reconsidered and correlated with the action on Proposals 4-54 and 4-55. The Technical Correlating Committee directs the panel to clarify the location of the new definition. This action will be considered by the Panel as a Public Comment.  
The Technical Correlating Committee directs that this proposal be forwarded to Code-Making Panel 4 for information.  
**SUBMITTER:** CMP 10  
**RECOMMENDATION:** Add the following definition to 240-2: "Conductors Considered Outside the Building. In addition to outdoor conductors," (Add existing text from Section 230-6 of the existing code).  
**SUBSTANTIATION:** This definition clarifies the panel's intent in recognizing a long-standing practice.  
**PANEL ACTION:** Accept.  
**NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE:** 12  
**VOTE ON PANEL ACTION:**  
AFFIRMATIVE: 11  
NEGATIVE: 1

**EXPLANATION OF NEGATIVE:**

**BORTHICK:** I am opposed to the panel action.  
Existing 240-21(b)(5) permits feeder conductors to be tapped without restriction to the length of the tap conductors and without restriction to the minimum tap conductor size. These two parameters can have significant effect on circuit impedance. Without careful consideration of these factors a short-circuit near the extreme end of the tap might reduce the fault-current in the circuit to a level that the feeder overcurrent protective device might not operate quickly enough to prevent damage to the tap conductor or at the very least its insulation. Another possible scenario is that the tap conductor could melt in two before the overcurrent protective device could open thus "clearing the fault" and the overcurrent protective device would not open at all leaving the severed tap conductors energized.

A generic example to illustrate this might be a 200 amp 480 volt three-phase feeder run to a junction box where numerous taps are made. The available fault-current at the junction or "tap" box is 24000 amps. A three-phase tap is made here, using #12 AWG copper. The tap conductors immediately exit the building and are run on the building surface for 160 feet and terminate at a 20 amp overcurrent protective device that protects the tap conductors against overload. If a short-circuit occurs at 150 feet from the tap box the available fault current is roughly 1100 amps. How long will the feeder overcurrent protective device take to open at only 550 percent of its rating? At least a few seconds longer than it would take for the #12 copper to melt. Also, if the tap conductors are attached to a combustible surface the heat generated at the fault might also be of sufficient duration and intensity to ignite these combustibles.

The existing 240-21(b)(5) is sufficiently unrestrictive to cause concern for its general application.

The panel's acceptance of the proposal further broadens the permitted installations. It is conceivable that many traditional branch circuits that have been safely protected against overcurrent by installation of overcurrent protective devices at their supply, will now become taps protected from overload by virtue of being installed per the criteria of 230-6.

**COMMENT ON AFFIRMATIVE:**

**DOLLARD:** I am voting affirmative to the panel action to accept proposal 10-3a. My comments are as follows:

"The panel statement explains that defining "Conductors Considered Outside the Building" in Article 240 is necessary to recognize a long-standing practice. I agree with the Panel's intent to allow some flexibility to outside tap conductors at the point they enter a building or structure. However, applying this definition globally throughout Article 240, may result in confusion, installations and interpretations that are not the intent of the Panel on this proposal. The words "outside", "outdoors" and "outdoor" occur in Sections 240-21(b), 240-21(c) and 240-92(c). The need for this definition arises from the use of these words in the associated tap rules. With the acceptance of this new definition to Article 240 the words "outside", "outdoor" and "outdoors" as used in existing text will be interpreted in a very different manner. Acceptance of this proposal will permit "Service Equivalent Taps" as described in proposal 10-68 in the ROP for the 1999 code cycle. The Panel rejected this proposal and noted in the panel statement the confusion that could occur in the application and enforcement of such a change.

I believe that the Panel's intention can be met with the following changes:

240-21(b)(5) Outside Taps of Unlimited Length. Where the conductors are located outdoors or enter a building or structure from the outdoors in accordance with Condition No. 1 or Condition No. 2 of Section 230-6, except at the point of load termination, and comply with all of the following conditions.

240-21(c)(4) Outside Secondary Conductors. Where the conductors are located outdoors or enter a building or structure from the outdoors in accordance with Condition No. 1 or Condition No. 2 of Section 230-6, except at the point of load termination, and comply with all of the following conditions.

240-92(c)(3) The tap conductors are installed outdoors or enter a building or structure from the outdoors in accordance with Condition No. 1 or Condition No. 2 of Section 230-6, except at the point of load termination."