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M E M O R A N D U M

TO: Code-Making Panel 9

FROM: Sarah Caldwell, *Committee Administrator*

DATE: April 15, 2021

SUBJECT: NEC® First Draft Technical Committee FINAL Ballot Results (A22)

According to the final ballot results, all ballot items received the necessary affirmative votes to pass ballot.

12 Members Eligible to Vote
0 Members Not Returned

The attached report shows the number of affirmative, negative, and abstaining votes as well as the explanation of the vote for each revision.

To pass ballot, each revision requires: (1) a simple majority of those eligible to vote and (2) an affirmative vote of $\frac{2}{3}$ of ballots returned. See Sections 3.3.4.3.(c) and 4.3.10.1 of the *Regulations Governing the Development of NFPA Standards*.

**First Revision No. 7940-NFPA 70-2020 [Global Input]****Use Word file****New_Article_245_Overcurrent_and_Overvoltage_Protection_for_Systems_Rated_Over_1000_VAC_RJR.docx****Supplemental Information**

<u>File Name</u>	<u>Description</u>	<u>Approved</u>
New_Article_245_Overcurrent_and_Overvoltage_Protection_for_Systems_Rated_Over_1000_VAC_RJR.docx	For staff use	
NEC_Global_FR-7940_Article_245_NEW_for_ballot.pdf	For ballot	

Submitter Information Verification**Committee:** NEC-P09**Submittal Date:** Fri Dec 11 06:38:43 EST 2020**Committee Statement**

Committee Statement: CMP-9 provides text for a new Article 245 based on the actions and substantiation of the Medium Voltage Task Group.

Below is a summary of the changes that result in a new Article 245:

- Overcurrent Protection requirements in Part IX of Article 240 (Overcurrent Protection over 1000 Volts, Nominal), and Overvoltage Protection requirements in Part III of Article 242 (Surge Arresters, Over 1000 Volts) are relocated to a new Article 245, "Overcurrent and Overvoltage Protection for Systems Rated Over 1000 VAC, 1500 VDC. In addition, requirements from Article 490 that are specific to overcurrent protection are relocated to the new Article 245. A summary of the relocated Sections is noted below:
- Reconditioning requirements in Section 240.88 and 240.102 that are specific to overcurrent devices rated over 1000 volts are relocated to Section 245.15
- Section 490.21 is relocated to Section 245.21.
- Sections 240.100 and 240.101 are relocated to Sections 245.26 and 245.27, respectively.
- Sections 242.40 – 242-56 are relocated to Sections 245.42 – 245.56.
- Over 1000 Volt Equipment Articles (490 and 399) are relocated from Table 242.3 to new Table 245.40

Response Message: FR-7940-NFPA 70-2020

Ballot Results

✔ **This item has passed ballot**

12 Eligible Voters
0 Not Returned
8 Affirmative All
1 Affirmative with Comments
3 Negative with Comments
0 Abstention

Affirmative All

Belisle, Rodney D.
Colvin, Carmon A.
Hollander, Richard
Miller, Kevin R.
Osborne, Robert D.
Ridgeway, Ronnie H.
Sullivan, Paul B.
Sumbera, Darrell M.

Affirmative with Comment

Sasso, Nick
Affirmative.

Negative with Comment

Hartwell, Frederic P.

NOTE: Because this voting system does not allow the reproduction of carriage returns to divide paragraphs, making any extended argument an unintelligible block of text for the third cycle in a row, I am placing the following text to indicate paragraph divisions: "{Insert carriage return here.}" This FR should never have been voted. Combining sections from what would now be a dismembered Article 240 and Article 242 to create a new article on over somethings connected only by operating voltage is a plain violation of Section 2.1.3 of the Style Manual because such a grouping does not constitute a "specific topic." Articles 240 and 242 are covered by CMP 10, and CMP 10 has voted to resolve PI 3819 on its agenda that covers this medium voltage realignment, with the following statement: "The proposed revision does not increase clarity, it compromises the structure of Chapter 2 creating conflict with the scope of multiple articles. The idea put forth by the submitter is better met with annex material." There is one topic, however, that directly concerns CMP 9, and that is the relocation of 490.21. {Insert carriage return here.} This is a perfect little jewel of how the CMP 9 action on this topic so completely fails the test of historical analysis. When Article 710 was being parceled out in the 1999 cycle old 710.21 was indeed initially slated for Chapter 2. CMP 13 rejected that placement unanimously. They declared, in their unanimous statement on Proposal 13-35, that "Section 710.21 Circuit Interrupting Devices are equipment related, the panel recommends that it be moved to Section 490.21." Ironically, CMP 9 just dealt with this question in the 2017 cycle when retrofit trip units were added to the section. After the PI meeting, the Correlating Committee assigned jurisdiction to CMP 10 for an article 240 placement. Aware of this history and the overall context in Art. 240, I strenuously objected during the meeting on comments, and CMP 9 directed a request to the Correlating Committee to reverse that placement, which it did. This material needs to stay exactly where it is in Chapter 4. {Insert carriage return here.} This and comparable first revisions represent change for the sake of change, and a solution in search of a problem. The proponents freely admit that it will take three code cycles to fully implement this reorganization, without making any technical improvements in the NEC. Every code reorganization is extremely challenging for the users, who have spent years learning where things are. It should be a last resort. This is why former CC Chair (and now Member Emeritus) Harold Ware so struggled with this problem when the current organization was put in place, and he strongly opposes this effort now. This is also why I view these votes as the most important that I will ever cast in over thirty years, and why I predict that they will be the most important cast by any members of this panel throughout their time on this panel, which will often extend long after I have left. Please refer to my comments on FR 7941 for a complete discussion of this topic, which I will not repeat here.

Parker, Ryan

Medium Voltage category is not defined

Schultheis, Timothy James

The Correlating Committee has a responsibility to enforce the requirements of the 2020 NEC Style Manual (Section 2.1.3) which clearly indicates that articles must be on a "specific topic." A voltage range has not historically warranted a "specific topic" for an article, it is just a voltage range for a specific topic, consistent with the current NEC structure. The style manual also prohibits reference to an entire article. CMP-10 also revised multiple fuse definitions that pertain to this new proposed article that will need to be evaluated to make sure they are used consistently. In reality, this first revision should be evaluated by CMP-10 as the majority of this content is under their purview.

Article 245 Overcurrent and Overvoltage Protection for Systems Rated Over 1000 Volts AC, 1500 Volts DC

Part I. General and Scope

245.1 Scope.

This article covers requirements for the installation of overcurrent protection of circuits and related electrical equipment and overvoltage protection (surge arresters) permanently installed on premises wiring systems over 1000 volts ac, 1500 volts dc, nominal.

245.15 Reconditioned Equipment.

Reconditioned equipment shall be listed as *reconditioned* and the original listing mark removed.

- (A) Medium- and high-voltage circuit breakers shall be permitted to be reconditioned.
- (B) Electromechanical protective relays and current transformers shall be permitted to be reconditioned.
- (C) Medium-voltage fuseholders and medium-voltage nonrenewable fuses shall not be permitted to be reconditioned.

Part II. Overcurrent Protection

245.21 Circuit-Interrupting Devices.

(A) Circuit Breakers.

(1) Location.

- (a) Circuit breakers installed indoors shall be mounted either in metal-enclosed units or fire-resistant cell-mounted units, or they shall be permitted to be open-mounted in locations accessible to qualified persons only.
- (b) Circuit breakers used to control oil-filled transformers in a vault shall either be located outside the transformer vault or be capable of operation from outside the vault.
- (c) Oil circuit breakers shall be arranged or located so that adjacent readily combustible structures or materials are safeguarded in an approved manner.

(2) Operating Characteristics.

Circuit breakers shall have the following equipment or operating characteristics:

- (1) An accessible mechanical or other identified means for manual tripping, independent of control power
- (2) Be release free (trip free)

- (3) If capable of being opened or closed manually while energized, main contacts that operate independently of the speed of the manual operation
- (4) A mechanical position indicator at the circuit breaker to show the open or closed position of the main contacts
- (5) A means of indicating the open and closed position of the breaker at the point(s) from which they may be operated

(3) Nameplate.

A circuit breaker shall have a permanent and legible nameplate showing the manufacturer's name or trademark, manufacturer's type or identification number, continuous current rating, interrupting rating in megavolt-amperes (MVA) or amperes, and maximum voltage rating. Modification of a circuit breaker affecting its rating(s) shall be accompanied by an appropriate change of nameplate information.

(4) Rating.

Circuit breakers shall have the following ratings:

- (1) The continuous current rating of a circuit breaker shall not be less than the maximum continuous current through the circuit breaker.
- (2) The interrupting rating of a circuit breaker shall not be less than the available fault current the circuit breaker will be required to interrupt, including contributions from all connected sources of energy.
- (3) The closing rating of a circuit breaker shall not be less than the maximum asymmetrical fault current into which the circuit breaker can be closed.
- (4) The momentary rating of a circuit breaker shall not be less than the maximum asymmetrical fault current at the point of installation.
- (5) The rated maximum voltage of a circuit breaker shall not be less than the maximum circuit voltage.

(5) Retrofit Trip Units.

Retrofit trip units shall be listed for use with the specific circuit breaker with which it is installed.

(B) Power Fuses and Fuseholders.

(1) Use.

Where fuses are used to protect conductors and equipment, a fuse shall be placed in each ungrounded conductor. Two power fuses shall be permitted to be used in parallel to protect the same load if both fuses have identical ratings and both fuses are installed in an identified common mounting with electrical connections that divide the current equally. Power fuses of the vented type shall not be used indoors, underground, or in metal enclosures unless identified for the use.

(2) Interrupting Rating.

The interrupting rating of power fuses shall not be less than the available fault current the fuse is required to interrupt, including contributions from all connected sources of energy.

(3) Voltage Rating.

The maximum voltage rating of power fuses shall not be less than the maximum circuit voltage. Fuses having a minimum recommended operating voltage shall not be applied below this voltage.

(4) Identification of Fuse Mountings and Fuse Units.

Fuse mountings and fuse units shall have permanent and legible nameplates showing the manufacturer's type or designation, continuous current rating, interrupting current rating, and maximum voltage rating.

(5) Fuses.

Fuses that expel flame in opening the circuit shall be designed or arranged so that they function properly without hazard to persons or property.

(6) Fuseholders.

Fuseholders shall be designed or installed so that they are de-energized while a fuse is being replaced. A field-applied permanent and legible sign, in accordance with 110.21(B), shall be installed immediately adjacent to the fuseholders and shall be worded as follows:

DANGER — DISCONNECT CIRCUIT BEFORE REPLACING FUSES.

Exception: Fuses and fuseholders designed to permit fuse replacement by qualified persons using identified equipment without de-energizing the fuseholder shall be permitted.

(7) High-Voltage Fuses.

Switchgear and substations that use high-voltage fuses shall be provided with a gang-operated disconnecting switch. Isolation of the fuses from the circuit shall be provided by either connecting a switch between the source and the fuses or providing roll-out switch and fuse-type construction. The switch shall be of the load-interrupter type, unless mechanically or electrically interlocked with a load-interrupting device arranged to reduce the load to the interrupting capability of the switch.

Exception: More than one switch shall be permitted as the disconnecting means for one set of fuses where the switches are installed to provide connection to more than one set of supply conductors. The switches shall be mechanically or electrically interlocked to permit access to the fuses only when all switches are open. A conspicuous sign shall be placed at the fuses identifying the presence of more than one source.

(C) Distribution Cutouts and Fuse Links — Expulsion Type.

(1) Installation.

Cutouts shall be located so that they may be readily and safely operated and re-fused, and so that the exhaust of the fuses does not endanger persons. Distribution cutouts shall not be used indoors, underground, or in metal enclosures.

(2) Operation.

Where fused cutouts are not suitable to interrupt the circuit manually while carrying full load, an approved means shall be installed to interrupt the entire load. Unless the fused cutouts are interlocked with the switch to prevent opening of the cutouts under load, a conspicuous sign shall be placed at such cutouts identifying that they shall not be operated under load.

(3) Interrupting Rating.

The interrupting rating of distribution cutouts shall not be less than the available fault current the cutout is required to interrupt, including contributions from all connected sources of energy.

(4) Voltage Rating.

The maximum voltage rating of cutouts shall not be less than the maximum circuit voltage.

(5) Identification.

Distribution cutouts shall have on their body, door, or fuse tube a permanent and legible nameplate or identification showing the manufacturer's type or designation, continuous current rating, maximum voltage rating, and interrupting rating.

(6) Fuse Links.

Fuse links shall have a permanent and legible identification showing continuous current rating and type.

(7) Structure Mounted Outdoors.

The height of cutouts mounted outdoors on structures shall provide safe clearance between lowest energized parts (open or closed position) and standing surfaces, in accordance with 110.34(E).

(D) Oil-Filled Cutouts.

(1) Continuous Current Rating.

The continuous current rating of oil-filled cutouts shall not be less than the maximum continuous current through the cutout.

(2) Interrupting Rating.

The interrupting rating of oil-filled cutouts shall not be less than the available fault current the oil-filled cutout is required to interrupt, including contributions from all connected sources of energy.

(3) Voltage Rating.

The maximum voltage rating of oil-filled cutouts shall not be less than the maximum circuit voltage.

(4) Fault Closing Rating.

Oil-filled cutouts shall have a fault closing rating not less than the maximum asymmetrical fault current that can occur at the cutout location, unless suitable interlocks or operating procedures preclude the possibility of closing into a fault.

(5) Identification.

Oil-filled cutouts shall have a permanent and legible nameplate showing the rated continuous current, rated maximum voltage, and rated interrupting current.

(6) Fuse Links.

Fuse links shall have a permanent and legible identification showing the rated continuous current.

(7) Location.

Cutouts shall be located so that they are readily and safely accessible for re-fusing, with the top of the cutout not over 1.5 m (5 ft) above the floor or platform.

(8) Enclosure.

Suitable barriers or enclosures shall be provided to prevent contact with nonshielded cables or energized parts of oil-filled cutouts.

(E) Load Interrupters.

Load-interrupter switches shall be permitted if suitable fuses or circuit breakers are used in conjunction with these devices to interrupt available fault currents. Where these devices are used in combination, they shall be coordinated electrically so that they will safely withstand the effects of closing, carrying, or interrupting all possible currents up to the assigned maximum short-circuit rating.

Where more than one switch is installed with interconnected load terminals to provide for alternate connection to different supply conductors, each switch shall be provided with a warning sign identifying the presence of more than one source. Each warning sign or label shall comply with 110.21.

(1) Continuous Current Rating.

The continuous current rating of interrupter switches shall equal or exceed the maximum continuous current at the point of installation.

(2) Voltage Rating.

The maximum voltage rating of interrupter switches shall equal or exceed the maximum circuit voltage.

(3) Identification.

Interrupter switches shall have a permanent and legible nameplate, including the following information: manufacturer's type or designation, continuous current rating, interrupting current rating, fault closing rating, maximum voltage rating.

(4) Switching of Conductors.

The switching mechanism shall be arranged to be operated from a location where the operator is not exposed to energized parts and shall be arranged to open all ungrounded conductors of the circuit simultaneously with one operation. Switches shall be arranged to be locked in the open position. Metal-enclosed switches shall be operable from outside the enclosure.

(5) Stored Energy for Opening.

The stored-energy operator shall be permitted to be left in the uncharged position after the switch has been closed if a single movement of the operating handle charges the operator and opens the switch.

(6) Supply Terminals.

The supply terminals of fused interrupter switches shall be installed at the top of the switch enclosure, or, if the terminals are located elsewhere, the equipment shall

have barriers installed to prevent persons from accidentally contacting energized parts or dropping tools or fuses into energized parts.

245.26 Feeders and Branch Circuits.

(A) Location and Type of Protection.

Feeder and branch-circuit conductors shall have overcurrent protection in each ungrounded conductor located at the point where the conductor receives its supply or at an alternative location in the circuit when designed under engineering supervision that includes but is not limited to considering the appropriate fault studies and time-current coordination analysis of the protective devices and the conductor damage curves. The overcurrent protection shall be permitted to be provided by either 245.26(A)(1) or (A)(2).

(1) Overcurrent Relays and Current Transformers.

Circuit breakers used for overcurrent protection of 3-phase circuits shall have a minimum of three overcurrent relay elements operated from three current transformers. The separate overcurrent relay elements (or protective functions) shall be permitted to be part of a single electronic protective relay unit.

On 3-phase, 3-wire circuits, an overcurrent relay element in the residual circuit of the current transformers shall be permitted to replace one of the phase relay elements.

An overcurrent relay element, operated from a current transformer that links all phases of a 3-phase, 3-wire circuit, shall be permitted to replace the residual relay element and one of the phase-conductor current transformers. Where the neutral conductor is not regrounded on the load side of the circuit as permitted in 250.184(B), the current transformer shall be permitted to link all 3-phase conductors and the grounded circuit conductor (neutral).

(2) Fuses.

A fuse shall be connected in series with each ungrounded conductor.

(B) Protective Devices.

The protective device(s) shall be capable of detecting and interrupting all values of current that can occur at their location in excess of their trip-setting or melting point.

(C) Conductor Protection.

The operating time of the protective device, the available short-circuit current, and the conductor used shall be coordinated to prevent damaging or dangerous temperatures in conductors or conductor insulation under short-circuit conditions.

245.27 Additional Requirements for Feeders.

(A) Rating or Setting of Overcurrent Protective Devices.

The continuous ampere rating of a fuse shall not exceed three times the ampacity of the conductors. The long-time trip element setting of a breaker or the minimum trip setting of an electronically actuated fuse shall not exceed six times the ampacity of the conductor. For fire pumps, conductors shall be permitted to be protected for overcurrent in accordance with 695.4(B)(2).

(B) Feeder Taps.

Conductors tapped to a feeder shall be permitted to be protected by the feeder overcurrent device where that overcurrent device also protects the tap conductor.

Part III. Overvoltage Protection

245.40 Other Articles.

Equipment shall be protected against overvoltage in accordance with the article in this Code that covers the type of equipment or location specified in Table 245.40.

Table 245.40 Other Articles

<u>Equipment</u>	<u>Article</u>
<u>Equipment over 1000 volts, nominal</u>	<u>495</u>
<u>Outdoor overhead conductors over 1000 volts</u>	<u>399</u>

245.41 Uses Not Permitted.

A surge arrester shall not be installed where the rating of the surge arrester is less than the maximum continuous phase-to-ground voltage at the power frequency available at the point of application.

245.42 Surge Arrester Selection.

The surge arresters shall comply with 245.42(A) and (B).

(A) Rating.

The rating of a surge arrester shall be equal to or greater than the maximum continuous operating voltage available at the point of application.

(1) Solidly Grounded Systems.

The maximum continuous operating voltage shall be the phase-to-ground voltage of the system.

(2) Impedance or Ungrounded System.

The maximum continuous operating voltage shall be the phase-to-phase voltage of the system.

(B) Silicon Carbide Types.

The rating of a silicon carbide-type surge arrester shall be not less than 125 percent of the rating specified in 245.42(A).

Informational Note No. 1: For further information on surge arresters, see IEEE C62.11-2012, *Standard for Metal-Oxide Surge Arresters for Alternating-Current Power Circuits (>1 kV)*, and IEEE C62.22-2009, *Guide for the Application of Metal-Oxide Surge Arresters for Alternating-Current Systems*.

Informational Note No. 2: The selection of a properly rated metal oxide arrester is based on considerations of maximum continuous operating voltage and the magnitude and duration of overvoltages at the arrester location as affected by phase-to-ground faults, system grounding techniques, switching surges, and other causes. See the manufacturer's application rules for selection of the specific arrester to be used at a particular location.

245.44 Number Required.

Where used at a point on a circuit, a surge arrester shall be connected to each ungrounded conductor. A single installation of such surge arresters shall be permitted to protect a number of interconnected circuits if no circuit is exposed to surges while disconnected from the surge arresters.

245.46 Location.

Surge arresters shall be permitted to be located indoors or outdoors. Surge arresters shall be made inaccessible to unqualified persons unless listed for installation in accessible locations.

245.48 Routing of Surge-Arrester Equipment Grounding Conductors.

The conductor used to connect the surge arrester to line, bus, or equipment and to an equipment grounding conductor or grounding electrode connection point as provided in 245.50 shall not be any longer than necessary and shall avoid unnecessary bends.

245.50 Connection.

The arrester shall be connected to one of the following:

- (1) Grounded service conductor
- (2) Grounding electrode conductor
- (3) Grounding electrode for the service
- (4) Equipment grounding terminal in the service equipment

245.52 Surge-Arrester Conductors.

The conductor between the surge arrester and the line, and the surge arrester and the grounding connection, shall not be smaller than 6 AWG copper or aluminum.

245.54 Interconnections.

The surge arrester protecting a transformer that supplies a secondary distribution system shall be interconnected as specified in 245.54(A), (B), or (C).

(A) Metal Interconnections.

A metal interconnection shall be made to the secondary grounded circuit conductor or the secondary circuit grounding electrode conductor, if, in addition to the direct grounding connection at the surge arrester, the connection complies with 245.54(A)(1) or (A)(2).

(1) Additional Grounding Connection.

The grounded conductor of the secondary has a grounding connection elsewhere to a continuous metal underground water piping system. In urban water-pipe areas where there are at least four water-pipe connections on the neutral conductor and not fewer than four such connections in each mile of neutral conductor, the metal interconnection shall be permitted to be made to the secondary neutral conductor with omission of the direct grounding connection at the surge arrester.

(2) Multigrounded Neutral System Connection.

The grounded conductor of the secondary system is part of a multigrounded neutral system or static wire of which the primary neutral conductor or static wire has at

least four grounding connections in each 1.6 km (1 mile) of line in addition to a grounding connection at each service.

(B) Through Spark Gap or Device.

Where the surge-arrester grounding electrode conductor is not connected as in 245.54(A), or where the secondary is not grounded as in 245.54(A) but is otherwise grounded as in 250.52, an interconnection shall be made through a spark gap or listed device as required by 245.54(B)(1) or (B)(2).

(1) Ungrounded or Unigrounded Primary System.

For ungrounded or unigrounded primary systems, the spark gap for a listed device shall have a 60-Hz breakdown voltage of at least twice the primary circuit voltage but not necessarily more than 10 kV, and there shall be at least one other ground on the grounded conductor of the secondary that is not less than 6.0 m (20 ft) distant from the surge-arrester grounding electrode.

(2) Multigrounded Neutral Primary System.

For multigrounded neutral primary systems, the spark gap or listed device shall have a 60-Hz breakdown of not more than 3 kV, and there shall be at least one other ground on the grounded conductor of the secondary that is not less than 6.0 m (20 ft) distant from the surge-arrester grounding electrode.

(C) By Special Permission.

An interconnection of the surge-arrester ground and the secondary neutral conductor, other than as provided in 245.54(A) or (B), shall be permitted to be made only by special permission.

245.56 Grounding Electrode Conductor Connections and Enclosures.

Except as indicated in this article, surge-arrester grounding electrode conductor connections shall be made as specified in Article 250, Parts III and X. Grounding electrode conductors installed in metal enclosures shall comply with 250.64(E).

**First Revision No. 7941-NFPA 70-2020 [Global Input]****Use Word file****New_Article_495_Equipment_Over_1000_Volts_AC_1500_VDC_Nominal_RJR.docx****Supplemental Information**

<u>File Name</u>	<u>Description</u>	<u>Approved</u>
New_Article_495_Equipment_Over_1000_Volts_AC_1500_VDC_Nominal_RJR.docx	This file is for attachment to FR 7941. For staff use	
NEC_Global_FR-7941_Article_49_NEW_for_ballot.pdf	For ballot	

Submitter Information Verification**Committee:** NEC-P09**Submittal Date:** Fri Dec 11 06:40:54 EST 2020**Committee Statement**

Committee Statement: CMP-9 provides text for a revised Article 495 based on the actions and substantiation of the Medium Voltage Task Group.

The text of this FR is based on NEC 2020 text. CMP-9 acknowledges that changes made to Article 490 would need to be incorporated into Article 495. Article 495 as proposed would essentially replace Article 490.

Below is a summary of the changes that result in a new Article 495:

- Article 490 has been renumbered to become Article 495 and remains "Equipment over 1000 Volts, Nominal" Article 495 now includes flexible cords and flexible cables from Article 400 that are rated 2000 Volts and greater.
- Article 495 now consists of 10 parts:
- Parts I –V are existing 490 text relocated and renumbered to "New" Article 495
- Part VI consists of relocated materials from Article 430 Part XI "Over 1000 Volts, Nominal," with Sections 430.221 - 430.227 relocated to Sections 495.80 - 495.86. The over 1000 Volts portions of tables 430.249 and 430.250, including notes, have also been relocated o Part VI.
- Part VII contains the requirements from Article 450 regarding Transformers, Over 1000 Volts, including requirements for liquid-filled transformers. While liquid-filled transformers (including "less flammable," "non-flammable," "askarel-insulated") may be used in any installation, they are more common in installations over 1000 volts. While these requirements are relocated to Article 495, a new section 450.23 notes that the requirements in Part VII of 495 apply.
- Part VIII contains requirements from Article 450 Part III, Transformer Vaults. While transformer vaults may be used in any installation, they are more common in installations over 1000 volts. While these requirements are relocated to Article 495, a new section 450.40 notes that the requirements in Part VIII of 495 apply.
- Changes to Article 450 will be necessary when requirements are relocated. The attached document shows how these changes will impact Article 450 (based on the 2020 Code text).
- Part IX contains the Requirements from Article 460 Part II, Capacitors, Over 1000 volts, nominal, (previously numbered 460.24 - 460.28).
- Part X contains the requirements from Article 470 (Resistors and Reactors), Part II Over 1000 volts, Nominal (previously numbered 470.18 - 470.20).

Below is a summary of the revisions (unrelated to PI-3728) to Article 495 that must be considered in the PC Stage:

- Informational Notes - Revised to comply with Clause 3.1.3.1 of the NEC Style Manual.
- 490.2 - In accordance with 2.2.2 of the NEC Style Manual, the definition for “High Voltage” is relocated to Article 100.
- Table 495.24 (“Note”) and Section 495.48(A)(12) - Article 242 (new to the 2020 Code) covers “surge equipment”; however, the title of the Article is “Overvoltage Protection”, as that is a more generic term. This revision aligns this text with the title of Article 242, and also includes the term “surge” as this has historically been used to describe this equipment. The use of the generic term “overvoltage protection” allows for a broader application of products that provide this protection.
- 495.37 - Requirements in sections 490.36 and 490.37 address different equipment, but have the same requirement. Since “Equipment”, as defined in Article 100 is a generic term, it covers all items identified in both sections. Rather than repeat the same requirement twice, they are combined into a single section (now 495.37), and a reference to the section in Article 250 that covers equipment grounding is added.
- 495.49 - The Technical committee has eliminated the statement to remove previously installed labels, as this is a general requirement contained in Chapter 1. As stated in clause 4.1.2 of the NEC Style Manual, general requirements contained in Chapter 1 shall not be repeated in other Articles of the document.
- 495.51(B) - Section 4.1.4 of the 2020 NEC® Style Manual prohibits references to an entire articles, with the exception of Article 100. The intent here is to point to the bonding and grounding parts that would apply in Article 250, which is Part X since this is “high voltage equipment”, and requirements for portable equipment appear in Part X.
- 495.56 - Section 4.1.4 of the 2020 NEC® Style Manual prohibits references to an entire articles, with the exception of Article 100. The intent here is to point to the bonding and grounding parts that would apply in Article 250, which are Parts V, VI, and X since this is “high voltage equipment”. The structure of this section is reordered for consistency, with “Part” occurring prior to “Article”.
- Part V - The use of larger resistance type boilers is becoming more prevalent as users move to de-carbonization and away from fossil fuels for heating. Other standards are referencing the NEC for evaluation and resistance type boilers operating over 1000V are not addressed in Article 490. Part V already addresses “Electrode-Type Boilers”, and rather than create a new “Part VI” that has identical requirements, Part V is revised to refer to “Boilers” more generically. The existing requirements for “Electrode-Type Boilers” would apply equally to other types of Boilers, including “Resistance-Type Boilers”. Changes are made throughout Part V to refer generically to “Boilers”.

Response FR-7941-NFPA 70-2020

Message:

[Public Input No. 3728-NFPA 70-2020 \[Global Input\]](#)

Ballot Results

✓ **This item has passed ballot**

12 Eligible Voters

0 Not Returned

8 Affirmative All

1 Affirmative with Comments

3 Negative with Comments

0 Abstention

Affirmative All

Belisle, Rodney D.

Colvin, Carmon A.

Hollander, Richard

Miller, Kevin R.

Osborne, Robert D.

Ridgeway, Ronnie H.

Sullivan, Paul B.

Sumbera, Darrell M.

Affirmative with Comment

Sasso, Nick

Affirmative.

Negative with Comment

Hartwell, Frederic P.

Thankfully, this is a MS Word file due to the 4000 character limit, one that does indeed have carriage return/paragraph divisions, and it is therefore readable text in the English language. What a concept! Three cycles after this bogus voting system began with the 2017 cycle, and this foolishness persists. NFPA needs to revisit this.

Parker, Ryan

Medium voltage category is not defined

Schultheis, Timothy James

The deference needs to lie with correct action and disposition of the technical committees (CMP-10, CMP-5, CMP-8, CMP-11, CMP-1) and their wisdom and reasoning for not accepting these proposed damaging revisions in structure to the NEC. Creating these first revisions is a huge mistake and is a giant leap backwards for the NEC. Confusion will result and these revisions will undoubtedly take significant time and effort to correct to the point of restoring the current usability that was created the last time these issues were identified and fixed. Public Inputs of the assigned TG on Medium Voltage are not technically substantiated, which is out of step with the Regulations Governing the Development of Codes and Standards. There is no valid reason to revise the NEC with respect to installations over 1000 volts. The proposed restructuring of all these requirements throughout the NEC is related to claims of inability to find the information. The NEC is not broken, and all these public Inputs are unnecessary and were generated internally without one public input about this issue. Those that are adequately trained in the NEC history and use in applying it to medium and high voltage installations are not having problems. These 2023 Public Inputs also completely ignore the work of the NEC Correlating Committee in the early 1990s that addresses these exact issues at that time. Yes, it was the work of an NEC Correlating Committee assigned task group to resolve the circular references and significant issues of purview among the NEC committees. The primary reasons for establishing NEC structure at that time was to avoid the "vicious-circle problem" as they referred to it, reduce repetition of requirements, improve enforceability, and to allow for future growth. This proposed revision does nothing more than relocate existing requirements. The only substantiation provided for such a significant revision is to better align requirements. The substantiation additionally implies that the technical committee cannot focus on or fully understand requirements for the installation of branch circuits, feeders, and services 1000 volts and higher which is totally incorrect. These revisions do not better align or improve usability. There are sections of this that require the user to reference back to the entire Article 430 for motors and 450 for transformers for example. Most Importantly: The Correlating Committee has a responsibility to enforce the requirements of the 2020 NEC Style Manual (Section 2.1.3) which clearly indicates that articles must be on a "specific topic." Combining parts of Articles 430, 450, and 460 is completely in violation of the NEC Style Manual as this would bring multiple topics into the same article. A voltage range has not historically warranted a "specific topic" for an article, it is just a voltage range for a specific topic, consistent with the current NEC structure. The NEC Style Manual is also being violated by these first revisions, in addition to introducing multiple scope and purview problems, very indicative of the very problems once fixed by the NEC Correlating Committee in the 1990s. These significant issues will also need to be addressed in the FR creating new Articles 305 and 235; same problems that introduce scope and purview problems and most importantly create a clear violation of Section 2.1.3 of the NEC Style Manual. What good is having a Style Manual if the Code Panels do not follow it and the Correlating Committee does not enforce it, consistently? The style manual also prohibits reference to an entire article.

Explanation of Negative Vote, FR 7941 (Frederic P. Hartwell, Principal, CMP 9)

This FR should never have been voted. This and comparable first revisions represent change for the sake of change, and a solution in search of a problem. The proponents freely admit that it will take three code cycles to fully implement this reorganization, which in and of itself makes no technical improvements in the NEC. Every code reorganization is extremely challenging for the users, who have spent years learning where things are. It should be a last resort. This is why former CC Chair (and now Member Emeritus) Harold Ware so struggled with this problem when the current organization was put in place, and he strongly opposes this effort now. This is also why I view these votes as the most important that I will ever cast in over thirty years, and why I predict that they will be the most important cast by any members of this panel throughout their time on this panel, which will often extend long after I have left.

The proposed restructuring of all these requirements throughout the NEC is related to claims of inability to find the information. The NEC is not broken, and this entire effort was generated internally without a single public input raising a concern. These are manifestations of a personal agenda only. Those adequately trained in the NEC history and use in applying it to medium and high voltage installations are not having problems. In fact, it was the work of an NEC Correlating Committee assigned task group to resolve the circular references and significant issues of purview among the NEC committees. The primary reasons for establishing NEC structure at that time was to avoid the “vicious-circle problem” as they referred to it, reduce repetition of requirements, improve enforceability, and to allow for future growth. These revisions reverse those improvements.

I participated in the discussions within CMP 1 regarding the PI to create Article 115, an effort that CMP 1 resolved. Part of the discussion included debate offered by the utility representative supporting the PI, which related a conversation he had had with an engineer who had designed a medium voltage service that did not provide for simultaneous operation of poles. He was justifiably horrified by this, and concluded that the NEC must be deficient to allow such a design. Well, the deficiency was not within the NEC, but entirely on the part of the engineer, who was not qualified. Section 230.205(B) clearly requires simultaneous operation.

Medium voltage service equipment frequently looks like that shown in the excellent color photograph that was used to lead the presentation used to support these changes, with an overhead disconnecting means at one end. The supporters of the medium voltage restructuring assert gaps in NEC coverage without bothering to cite where they exist. This particular arrangement is of interest because it does illustrate a former gap in the NEC. As of the 2008 NEC, these switches no longer needed to be readily accessible; they could be overhead. The 2011 edition then completed the requirement by accepting my wording specifying a linkage to a readily accessible point. The present wording is complete, and does not require relocation to be understandable.

Electrical work requires years of training in order to achieve proficiency. Organizations like the NJATCs make good use of that extended training opportunity to school their trainees not just in the craft of electrical work, but in the intricacies of a Code that is not and can never be written for untrained people. My first panel 9 chair, Dale Deming, forcefully expressed this to me during my first panel meeting over thirty years ago. When the code gets reorganized to the degree imagined in this approach, it massively disrupts everyone’s mental references. That is the fundamental user unfriendliness about all this. When the old medium voltage Article 710 was broken apart twenty years ago, there were agonizing but compelling reasons to support it. There

are no such reasons to support this. And remember, even the reorganization originators admit that it will take three cycles to completely sort this mess out. Three cycles of disruption and user unfriendliness in search of a problem, and if the same issues recur, likely, we'll spend a few more cycles after that putting everything back the way it is now.

The supporters of this approach have failed to do the hard work of earning the right to complain about the current structure. I generally don't criticize a code rule unless I have done the hard work to suggest a constructive alternative. This should have been the cycle when the task group submitted carefully thought-out PIs aimed at whatever technical shortcomings, they felt burdened the current code. If those PIs were improperly or incompetently addressed, then they could, with some semblance of intellectual honesty, suggest in the 2026 cycle that the time had come to revisit the concept of a medium voltage panel, and here was a structure to support it. Well, this approach is exactly backwards.

The current organization works. If you are using pull boxes in a medium voltage installation, you visit the pull box article. If you are installing medium voltage busway, you visit the busway article. All completely intuitive, but not if the new approach makes it into the Code. We already have a medium-voltage conductor article, why renumber it? We have a transformer article, why split it in half? The NEC has covered medium voltage at least as far back as the 1920 edition. For example, for almost a century, medium voltage motor ratings have been integrated within the motor tables; but the new approach moves them into new Article 495. We have heard about unspecified gaps in the Code, but without any specific substantiation. Well, this should not be surprising. When a topic is covered for this long, doesn't stand to reason that most of the gaps will have been addressed?

. These 2023 Public Inputs also completely ignore the work of the NEC Correlating Committee in the early 1990s that addressed these exact issues at that time. Yes, it was the work of an NEC Correlating Committee assigned task group to resolve the circular references and significant issues of purview among the NEC committees. The primary reasons for establishing NEC structure at that time was to avoid the "vicious-circle problem" as they referred to it, reduce repetition of requirements, improve enforceability, and to allow for future growth.

Combining parts from what would now be dismembered Articles 400 (loses Part III), 430 (loses Part XI and 2300V columns from Part XIV), 450 [loses 450.3(A) and Parts II and III], 460 (loses Part II), and 470 (loses Part II) to create this new article is a plain violation of Section 2.1.3 of the Style Manual because such a grouping does not constitute a "specific topic." The fact that they all cover operation over 1000V does not make a motor the same as a transformer. This grouping also creates challenges in terms of assuring the required expertise within whatever panel(s) end up with such a disparate collection of topics. It is also incredible user-unfriendly, as article titles will no longer be able to clearly describe their content; the new Art. 305 being a huge case in point.

CMP 9 is a relative outlier here; in addition to CMPs 1 and 10, CMP 5 resolved the creation of a new Article 255. In addition, CMP 11, although restrained by NFPA staff from taking a formal vote in opposition to the CMP 9 poaching of medium voltage motor coverage from Article 430, made it clear that they were opposed to the action. Remember, the motor article has included 2300V motors for about 100 years. Our information is that CMP 8 would have taken the same position on the relocation of medium voltage busway.

Remember the adage, "First, do no harm." Please vote against this reorganization.

Article 495 Equipment Over 1000 Volts AC, 1500 Volts DC, Nominal

Part I. General

495.1 Scope.

This article covers the general requirements for equipment operating at more than 1000 volts ac, 1500 volts dc, nominal.

Informational Note No. 1: See NFPA 70E-2021, *Standard for Electrical Safety in the Workplace*, for electrical safety requirements for employee workplaces.

Informational Note No. 2: See ANSI Z535.4-2011, *Product Signs and Safety Labels*, for further information on hazard signs and labels.

Informational Note No. 3: See IEEE 3001.5-2013, *Recommended Practice for the Application of Power Distribution Apparatus in Industrial and Commercial Power Systems*, for information regarding power distribution apparatus.

495.2 Definition.

The definition in this section shall apply only within this article.

High Voltage.

A potential difference of more than 1000 volts, nominal.

495.3 Other Articles.

Enclosures in damp or wet locations shall meet the requirements of 312.2.

495.4 Flexible Cords and Flexible Cable Types.

Flexible cords and flexible cables over 1000 volts shall conform to the description in Table 495.4. The use of flexible cords and flexible cables other than those in Table 495.4 shall require permission by the authority having jurisdiction.

Table 495.4 Flexible Cords and Flexible Cables

<u>Trade Name</u>	<u>Type Letter</u>	<u>Voltage</u>	<u>AWG or kcmil</u>	<u>Number of Conductors</u>	<u>Insulation</u>	<u>Nominal Insulation Thickness</u>			<u>Braid on Each Conductor</u>	<u>Outer Covering</u>
						<u>AWG or kcmil</u>	<u>mm</u>	<u>mils</u>		
<u>Portable power cable</u>	<u>G</u>	<u>2000</u>	<u>12–500</u>	<u>2–6 plus equipment grounding conductor(s)</u>	<u>Thermoset</u>	<u>12–2</u>	<u>1.52</u>	<u>60</u>	<u>—</u>	<u>Oil-resistant thermoset</u>
						<u>1–4/0</u>	<u>2.03</u>	<u>80</u>		
						<u>•</u>	<u>2.41</u>	<u>95</u>		
						<u>250–</u>				
						<u>•</u>				
						<u>500</u>				

<u>G- GC*</u>	<u>2000</u>	<u>12- 500</u>	<u>3-6 plus equipment grounding conductors and 1 ground check conductor</u>	<u>Thermoset</u>	<u>12-2</u> . <u>1- 4/0</u> . <u>250- 500</u>	<u>1.52</u> . <u>2.03</u> . <u>2.41</u>	<u>60</u> . <u>80</u> . <u>95</u>	<u>=</u>	<u>Oil- resistan thermos</u>	
<u>Portable power cable</u>	<u>PPE*</u>	<u>2000</u>	<u>12- 500</u> <u>1-6 plus optional equipment grounding conductor(s)</u>	<u>Thermoplastic elastomer</u>	<u>12-2</u> . <u>1- 4/0</u> . <u>250- 500</u>	<u>1.52</u> . <u>2.03</u> . <u>2.41</u>	<u>60</u> . <u>80</u> . <u>95</u>	<u>=</u>	<u>Oil- resistan thermo- plastic elastom</u>	
<u>Portable power cable</u>	<u>W*</u>	<u>2000</u>	<u>12- 500</u> . <u>501- 1000</u>	<u>1-6</u> . <u>1</u>	<u>Thermoset</u>	<u>12-2</u> . <u>1- 4/0</u> . <u>250- 500</u> . <u>501- 1000</u>	<u>1.52</u> . <u>2.03</u> . <u>2.41</u> . <u>2.80</u>	<u>60</u> . <u>80</u> . <u>95</u> . <u>110</u>	<u>=</u>	<u>Oil- resistan thermos</u>

*Types G, G-GC, S, SC, SCE, SCT, SE, SEO, SEOO, SEOW, SEOOW, SO, SOO, SOW, SOOW, ST, STO, STOO, STW, STOW, STOOOW, PPE, and W shall be permitted for use on theater stages, in garages, and elsewhere where flexible cords are permitted by this Code.

Part II. Equipment — Specific Provisions

495.22 Isolating Means.

Means shall be provided to completely isolate an item of equipment from all ungrounded conductors. The use of isolating switches shall not be required where there are other ways of de-energizing the equipment for inspection and repairs, such as draw-out-type switchgear units and removable truck panels.

Isolating switches not interlocked with an approved circuit-interrupting device shall be provided with a sign warning against opening them under load. The warning sign(s) or label(s) shall comply with 110.21(B).

An identified fuseholder and fuse shall be permitted as an isolating switch.

495.23 Voltage Regulators.

Proper switching sequence for regulators shall be ensured by use of one of the following:

- (1) Mechanically sequenced regulator bypass switch(es)
- (2) Mechanical interlocks

(3) Switching procedure prominently displayed at the switching location

495.24 Minimum Space Separation.

In field-fabricated installations, the minimum air separation between bare live conductors and between such conductors and adjacent grounded surfaces shall not be less than the values given in Table 495.24. These values shall not apply to interior portions or exterior terminals of equipment designed, manufactured, and tested in accordance with accepted national standards.

Table 495.24 Minimum Clearance of Live Parts

<u>Nominal Voltage Rating (kV)</u>	<u>Impulse Withstand, Basic Impulse Level (BIL) (kV)</u>		<u>Minimum Clearance of Live Parts</u>							
			<u>Phase-to-Phase</u>				<u>Phase-to-Ground</u>			
			<u>Indoors</u>		<u>Outdoors</u>		<u>Indoors</u>		<u>Outdoors</u>	
	<u>Indoors</u>	<u>Outdoors</u>	<u>mm</u>	<u>in.</u>	<u>mm</u>	<u>in.</u>	<u>mm</u>	<u>in.</u>	<u>mm</u>	<u>in.</u>
<u>2.4–4.16</u>	<u>60</u>	<u>95</u>	<u>115</u>	<u>4.5</u>	<u>180</u>	<u>7</u>	<u>80</u>	<u>3.0</u>	<u>155</u>	<u>6</u>
<u>7.2</u>	<u>75</u>	<u>95</u>	<u>140</u>	<u>5.5</u>	<u>180</u>	<u>7</u>	<u>105</u>	<u>4.0</u>	<u>155</u>	<u>6</u>
<u>13.8</u>	<u>95</u>	<u>110</u>	<u>195</u>	<u>7.5</u>	<u>305</u>	<u>12</u>	<u>130</u>	<u>5.0</u>	<u>180</u>	<u>7</u>
<u>14.4</u>	<u>110</u>	<u>110</u>	<u>230</u>	<u>9.0</u>	<u>305</u>	<u>12</u>	<u>170</u>	<u>6.5</u>	<u>180</u>	<u>7</u>
<u>23</u>	<u>125</u>	<u>150</u>	<u>270</u>	<u>10.5</u>	<u>385</u>	<u>15</u>	<u>190</u>	<u>7.5</u>	<u>255</u>	<u>10</u>
<u>34.5</u>	<u>150</u>	<u>150</u>	<u>320</u>	<u>12.5</u>	<u>385</u>	<u>15</u>	<u>245</u>	<u>9.5</u>	<u>255</u>	<u>10</u>
	<u>200</u>	<u>200</u>	<u>460</u>	<u>18.0</u>	<u>460</u>	<u>18</u>	<u>335</u>	<u>13.0</u>	<u>335</u>	<u>13</u>
<u>46</u>	<u>=</u>	<u>200</u>	<u>=</u>	<u>=</u>	<u>460</u>	<u>18</u>	<u>=</u>	<u>=</u>	<u>335</u>	<u>13</u>
	<u>=</u>	<u>250</u>	<u>=</u>	<u>=</u>	<u>535</u>	<u>21</u>	<u>=</u>	<u>=</u>	<u>435</u>	<u>17</u>
<u>69</u>	<u>=</u>	<u>250</u>	<u>=</u>	<u>=</u>	<u>535</u>	<u>21</u>	<u>=</u>	<u>=</u>	<u>435</u>	<u>17</u>
	<u>=</u>	<u>350</u>	<u>=</u>	<u>=</u>	<u>790</u>	<u>31</u>	<u>=</u>	<u>=</u>	<u>635</u>	<u>25</u>
<u>115</u>	<u>=</u>	<u>550</u>	<u>=</u>	<u>=</u>	<u>1350</u>	<u>53</u>	<u>=</u>	<u>=</u>	<u>1070</u>	<u>42</u>
<u>138</u>	<u>=</u>	<u>550</u>	<u>=</u>	<u>=</u>	<u>1350</u>	<u>53</u>	<u>=</u>	<u>=</u>	<u>1070</u>	<u>42</u>
	<u>=</u>	<u>650</u>	<u>=</u>	<u>=</u>	<u>1605</u>	<u>63</u>	<u>=</u>	<u>=</u>	<u>1270</u>	<u>50</u>
<u>161</u>	<u>=</u>	<u>650</u>	<u>=</u>	<u>=</u>	<u>1605</u>	<u>63</u>	<u>=</u>	<u>=</u>	<u>1270</u>	<u>50</u>
	<u>=</u>	<u>750</u>	<u>=</u>	<u>=</u>	<u>1830</u>	<u>72</u>	<u>=</u>	<u>=</u>	<u>1475</u>	<u>58</u>
<u>230</u>	<u>=</u>	<u>750</u>	<u>=</u>	<u>=</u>	<u>1830</u>	<u>72</u>	<u>=</u>	<u>=</u>	<u>1475</u>	<u>58</u>
	<u>=</u>	<u>900</u>	<u>=</u>	<u>=</u>	<u>2265</u>	<u>89</u>	<u>=</u>	<u>=</u>	<u>1805</u>	<u>71</u>
	<u>=</u>	<u>1050</u>	<u>=</u>	<u>=</u>	<u>2670</u>	<u>105</u>	<u>=</u>	<u>=</u>	<u>2110</u>	<u>83</u>

Note: The values given are the minimum clearance for rigid parts and bare conductors under favorable service conditions. They shall be increased for conductor movement or under unfavorable service conditions or wherever space limitations

permit. The selection of the associated impulse withstand voltage for a particular system voltage is determined by the characteristics of the surge protective equipment.

495.25 Backfeed.

Installations where the possibility of backfeed exists shall comply with 495.25(A) and (B).

(A) Sign.

A permanent sign in accordance with 110.21(B) shall be installed on the disconnecting means enclosure or immediately adjacent to open disconnecting means with the following words or equivalent:

DANGER — CONTACTS ON EITHER SIDE OF THIS DEVICE MAY BE ENERGIZED BY BACKFEED.

(B) Diagram.

A permanent and legible single-line diagram of the local switching arrangement, clearly identifying each point of connection to the high-voltage section, shall be provided within sight of each point of connection.

495.26 Oil-Filled Equipment.

Installation of electrical equipment, other than transformers covered in Part VII containing more than 38 L (10 gal) of flammable oil per unit, shall meet the requirements of Part VII.

Informational Note: The same requirements for oil used in oil-filled transformers are also applicable to other oil-filled equipment.

Part III. Equipment — Switchgear and Industrial Control Assemblies

495.30 General.

Part III covers assemblies of switchgear and industrial control equipment, including, but not limited to, switches and interrupting devices and their control, metering, protection, and regulating equipment where they are an integral part of the assembly, with associated interconnections and supporting structures.

495.31 Arrangement of Devices in Assemblies.

Arrangement of devices in assemblies shall be such that individual components can safely perform their intended function without adversely affecting the safe operation of other components in the assembly.

495.32 Guarding of High-Voltage Energized Parts Within a Compartment.

Where access for other than visual inspection is required to a compartment that contains energized high-voltage parts, barriers shall be provided to prevent accidental contact by persons, tools, or other equipment with energized parts. Exposed live parts shall only be permitted in compartments accessible to qualified persons. Fuses and fuseholders designed to enable future replacement without de-energizing the fuseholder shall only be permitted for use by qualified persons.

495.33 Guarding of Energized Parts Operating at 1000 Volts, Nominal, or Less Within Compartments.

Energized bare parts mounted on doors shall be guarded where the door must be opened for maintenance of equipment or removal of draw-out equipment.

495.34 Clearance for Cable Conductors Entering Enclosure.

The unobstructed space opposite terminals or opposite raceways or cables entering a switchgear or control assembly shall be approved for the type of conductor and method of termination.

495.35 Accessibility of Energized Parts.

(A) High-Voltage Equipment.

Doors that would provide unqualified persons access to high-voltage energized parts shall be locked. Permanent signs in accordance with 110.21(B) shall be installed on panels or doors that provide access to live parts over 1000 volts and shall read DANGER — HIGH VOLTAGE — KEEP OUT.

(B) Control Equipment.

Where operating at 1000 volts, nominal, or less, control equipment, relays, motors, and the like shall not be installed in compartments with high-voltage parts or high-voltage wiring, unless both of the following apply:

- (1) The access means is interlocked with the high-voltage switch or disconnecting means to prevent the access means from being opened or removed when the high-voltage switch is in the closed position or a withdrawable disconnecting means is in the connected position.
- (2) All high-voltage parts or high-voltage wiring in the compartment that remains energized when a fixed mounted high-voltage switch is in the open position or a withdrawable disconnecting means is in the isolating (fully withdrawn) position are protected by insulating or grounded metal barriers to prevent accidental contact with energized high-voltage parts or wiring.

(C) High-Voltage Instruments or Control Transformers and Space Heaters.

High-voltage instrument or control transformers and space heaters shall be permitted to be installed in the high-voltage compartment without access restrictions beyond those that apply to the high-voltage compartment generally.

495.36 Grounding.

Frames of switchgear and control assemblies shall be connected to an equipment grounding conductor or, where permitted, the grounded conductor.

495.37 Grounding of Devices.

The metal cases or frames, or both, such as those of instruments, relays, meters, and instrument and control transformers, located in or on switchgear or control assemblies, shall be connected to an equipment grounding conductor or, where permitted, the grounded conductor.

496.38 Door Stops and Cover Plates.

External hinged doors or covers shall be provided with stops to hold them in the open position. Cover plates intended to be removed for inspection of energized parts or wiring shall be equipped with lifting handles and shall not exceed 1.1 m² (12 ft²) in area or 27 kg (60 lb) in weight, unless they are hinged and bolted or locked.

495.39 Gas Discharge from Interrupting Devices.

Gas discharged during operating of interrupting devices shall be directed so as not to endanger personnel.

495.40 Visual Inspection Windows.

Windows intended for visual inspection of disconnecting switches or other devices shall be of suitable transparent material.

495.41 Location of Industrial Control Equipment.

Routinely operated industrial control equipment shall meet the requirements of 495.41(A) unless infrequently operated, as covered in 495.41(B).

(A) Control and Instrument Transfer Switch Handles or Push Buttons.

Control and instrument transfer switch handles or push buttons shall be in a readily accessible location at an elevation of not over 2.0 m (6 ft 7 in.).

Exception: Operating handles requiring more than 23 kg (50 lb) of force shall be located no higher than 1.7 m (66 in.) in either the open or closed position.

(B) Infrequently Operated Devices.

Where operating handles for such devices as draw-out fuses, fused potential or control transformers and their primary disconnects, and bus transfer and isolating switches are only operated infrequently, the handles shall be permitted to be located where they are safely operable and serviceable from a portable platform.

495.42 Interlocks — Interrupter Switches.

Interrupter switches equipped with stored energy mechanisms shall have mechanical interlocks to prevent access to the switch compartment unless the stored energy mechanism is in the discharged or blocked position.

495.43 Stored Energy for Opening.

The stored energy operator shall be permitted to be left in the uncharged position after the switch has been closed if a single movement of the operating handle charges the operator and opens the switch.

495.44 Fused Interrupter Switches.

(A) Supply Terminals.

The supply terminals of fused interrupter switches shall be installed at the top of the switch enclosure or, if the terminals are located elsewhere, the equipment shall have barriers installed to prevent persons from accidentally contacting energized parts or dropping tools or fuses into energized parts.

(B) Backfeed.

Where fuses can be energized by backfeed, a sign shall be placed on the enclosure door identifying this hazard.

(C) Switching Mechanism.

The switching mechanism shall be arranged to be operated from a location outside the enclosure where the operator is not exposed to energized parts and shall be arranged to open all ungrounded conductors of the circuit simultaneously with one operation. Switches shall be lockable open in accordance with 110.25.

495.45 Circuit Breakers — Interlocks.

(A) Circuit Breakers.

Circuit breakers equipped with stored energy mechanisms shall be designed to prevent the release of the stored energy unless the mechanism has been fully charged.

(B) Mechanical Interlocks.

Mechanical interlocks shall be provided in the housing to prevent the complete withdrawal of the circuit breaker from the housing when the stored energy mechanism is in the fully charged position, unless a suitable device is provided to block the closing function of the circuit breaker before complete withdrawal.

495.46 Circuit Breaker Locking.

Circuit breakers shall be capable of being locked in the open position or, if they are installed in a draw-out mechanism, that mechanism shall be capable of being locked in such a position that the mechanism cannot be moved into the connected position. In either case, the provision for locking shall be lockable open in accordance with 110.25.

495.47 Switchgear Used as Service Equipment.

Switchgear installed as high-voltage service equipment shall include a ground bus for the connection of service cable shields and to facilitate the attachment of safety grounds for personnel protection. This bus shall be extended into the compartment where the service conductors are terminated. Where the compartment door or panel provides access to parts that can only be de-energized and visibly isolated by the serving utility, the warning sign required by 495.35(A) shall include a notice that access is limited to the serving utility or is permitted only following an authorization of the serving utility.

495.48 Substation Design, Documentation, and Required Diagram.

(A) Design and Documentation.

Substations shall be designed by a qualified licensed professional engineer. Where components or the entirety of the substation is listed by a qualified electrical testing laboratory, documentation of internal design features subject to the listing investigation shall not be required. The design shall address but not be limited to the following topics, and the documentation of this design shall be made available to the authority having jurisdiction:

- (1) Clearances and exits
- (2) Electrical enclosures
- (3) Securing and support of electrical equipment
- (4) Fire protection
- (5) Safety ground connection provisions
- (6) Guarding live parts
- (7) Transformers and voltage regulation equipment
- (8) Conductor insulation, electrical and mechanical protection, isolation, and terminations

(9) Application, arrangement, and disconnection of circuit breakers, switches, and fuses

(10) Provisions for oil-filled equipment

(11) Switchgear

(12) Surge arresters

(B) Diagram.

A permanent, single-line diagram of the switchgear shall be provided in a readily visible location within the same room or enclosed area with the switchgear and shall clearly identify the following:

(1) Interlocks

(2) Isolation means

(3) All possible sources of voltage to the installation under normal or emergency conditions

The marking on the switchgear shall cross-reference the diagram.

Exception: Where the equipment consists solely of a single cubicle or metal-enclosed substation containing only one high-voltage switching device, diagrams shall not be required.

495.49 Reconditioned Switchgear.

Switchgear, or sections of switchgear, within the scope of this article shall be permitted to be reconditioned. The reconditioning process shall use design qualified parts verified under applicable standards and be performed in accordance with any instructions provided by the manufacturer. Reconditioned switchgear shall be listed or field labeled as reconditioned, and previously applied listing marks, if any, within the portions reconditioned shall be removed. If equipment has been damaged by fire, products of combustion, or water, it shall be specifically evaluated by its manufacturer or a qualified testing laboratory prior to being returned to service.

Part IV. Mobile and Portable Equipment

495.51 General.

(A) Covered.

The provisions of this part shall apply to installations and use of high-voltage power distribution and utilization equipment that is portable, mobile, or both, and include but not be limited to the following:

(1) Substations and switch houses mounted on skids

(2) Trailers or cars

(3) Mobile shovels

(4) Draglines

(5) Cranes

(6) Hoists

(7) Drills

(8) Dredges

(9) Compressors

(10) Pumps

(11) Conveyors

(12) Underground excavators

(B) Other Requirements.

The requirements of this part shall be additional to, or amendatory of, those prescribed in Articles 100 through 725 of this Code. Special attention shall be paid to Article 250.

(C) Protection.

Approved enclosures or guarding, or both, shall be provided to protect portable and mobile equipment from physical damage.

(D) Disconnecting Means.

Disconnecting means shall be installed for mobile and portable high-voltage equipment according to the requirements of Part VIII of Article 230 and shall disconnect all ungrounded conductors.

495.52 Overcurrent Protection.

Motors driving single or multiple dc generators supplying a system operating on a cyclic load basis shall not require overload protection if the thermal rating of the ac drive motor cannot be exceeded under any operating condition. The branch-circuit protective device(s) shall provide short-circuit and locked-rotor protection and shall be permitted to be external to the equipment.

495.53 Enclosures.

All energized switching and control parts shall be enclosed in grounded metal cabinets or enclosures. These cabinets or enclosures shall be marked DANGER — HIGH VOLTAGE — KEEP OUT and shall be locked so that only authorized and qualified persons can enter. The danger marking(s) or label(s) shall comply with 110.21(B). Circuit breakers and protective equipment shall have the operating means projecting through the metal cabinet or enclosure so these units can be reset without opening locked doors. With doors closed, safe access for normal operation of these units shall be provided.

495.54 Collector Rings.

The collector ring assemblies on revolving-type machines (shovels, draglines, etc.) shall be guarded to prevent accidental contact with energized parts by personnel on or off the machine.

495.55 Power Cable Connections to Mobile Machines.

A metallic enclosure shall be provided on the mobile machine for enclosing the terminals of the power cable. The enclosure shall include terminal connections to the machine frame for the equipment grounding conductor. Ungrounded conductors shall be attached to insulators or be terminated in approved high-voltage cable couplers (which include equipment grounding conductor connectors) of proper voltage and

ampere rating. The method of cable termination used shall prevent any strain or pull on the cable from stressing the electrical connections. The enclosure shall have provision for locking so that only authorized and qualified persons can open it and shall be marked as follows:

DANGER — HIGH VOLTAGE — KEEP OUT.

The danger marking(s) or label(s) shall comply with 110.21(B).

495.56 High-Voltage Portable Cable for Main Power Supply.

Flexible high-voltage cable supplying power to portable or mobile equipment shall comply with Article 250 and Article 400, Part III.

Part V. Electrode-Type Boilers

495.70 General.

The provisions of Part V shall apply to boilers operating over 1000 volts, nominal, in which heat is generated by the passage of current between electrodes through the liquid being heated.

495.71 Electrical Supply System.

Electrode-type boilers shall be supplied only from a 3-phase, 4-wire solidly grounded wye system, or from isolating transformers arranged to provide such a system. Control circuit voltages shall not exceed 150 volts, shall be supplied from a grounded system, and shall have the controls in the ungrounded conductor.

495.72 Branch-Circuit Requirements.

(A) Rating.

Each boiler shall be supplied from an individual branch circuit rated not less than 100 percent of the total load.

(B) Common-Trip Fault-Interrupting Device.

The circuit shall be protected by a 3-phase, common-trip fault-interrupting device, which shall be permitted to automatically reclose the circuit upon removal of an overload condition but shall not reclose after a fault condition.

(C) Phase-Fault Protection.

Phase-fault protection shall be provided in each phase, consisting of a separate phase-overcurrent relay connected to a separate current transformer in the phase.

(D) Ground Current Detection.

Means shall be provided for detection of the sum of the neutral conductor and equipment grounding conductor currents and shall trip the circuit-interrupting device if the sum of those currents exceeds the greater of 5 amperes or 7 1/2 percent of the boiler full-load current for 10 seconds or exceeds an instantaneous value of 25 percent of the boiler full-load current.

(E) Grounded Neutral Conductor.

The grounded neutral conductor shall be as follows:

- (1) Connected to the pressure vessel containing the electrodes
- (2) Insulated for not less than 1000 volts

- (3) Have not less than the ampacity of the largest ungrounded branch-circuit conductor
- (4) Installed with the ungrounded conductors in the same raceway, cable, or cable tray, or, where installed as open conductors, in close proximity to the ungrounded conductors
- (5) Not used for any other circuit

495.73 Pressure and Temperature Limit Control.

Each boiler shall be equipped with a means to limit the maximum temperature, pressure, or both, by directly or indirectly interrupting all current flow through the electrodes. Such means shall be in addition to the temperature, pressure, or both, regulating systems and pressure relief or safety valves.

495.74 Bonding.

All exposed non-current-carrying metal parts of the boiler and associated exposed metal structures or equipment shall be bonded to the pressure vessel or to the neutral conductor to which the vessel is connected in accordance with 250.102, except the ampacity of the bonding jumper shall not be less than the ampacity of the neutral conductor.

Part VI. Motors, Motor Circuits, and Controllers

495.80 General.

Part VI recognizes the additional hazard due to the use of higher voltages. It adds to or amends the other revisions of Article 430.

495.81 Marking on Controllers.

In addition to the marking required by 430.8, a controller shall be marked with the control voltage.

495.82 Raceway Connection to Motors.

Flexible metal conduit or liquidtight flexible metal conduit not exceeding 1.8 m (6 ft) in length shall be permitted to be employed for raceway connection to a motor terminal enclosure.

495.83 Size of Conductors.

Conductors supplying motors shall have an ampacity not less than the current at which the motor overload protective device(s) is selected to trip.

495.84 Motor-Circuit Overcurrent Protection.

(A) General.

Each motor circuit shall include coordinated protection to automatically interrupt overload and fault currents in the motor, the motor-circuit conductors, and the motor control apparatus.

Exception: Where a motor is critical to an operation and the motor should operate to failure if necessary to prevent a greater hazard to persons, the sensing device(s) shall be permitted to be connected to a supervised annunciator or alarm instead of interrupting the motor circuit.

(B) Overload Protection.

(1) Type of Overload Device.

Each motor shall be protected against dangerous heating due to motor overloads and failure to start by a thermal protector integral with the motor or external current-sensing devices, or both. Protective device settings for each motor circuit shall be determined under engineering supervision.

(2) Wound-Rotor Alternating-Current Motors.

The secondary circuits of wound-rotor ac motors, including conductors, controllers, and resistors rated for the application, shall be considered as protected against overcurrent by the motor overload protection means.

(3) Operation.

Operation of the overload interrupting device shall simultaneously disconnect all ungrounded conductors.

(4) Automatic Reset.

Overload sensing devices shall not automatically reset after trip unless resetting of the overload sensing device does not cause automatic restarting of the motor or there is no hazard to persons created by automatic restarting of the motor and its connected machinery.

(C) Fault-Current Protection.

(1) Type of Protection.

Fault-current protection shall be provided in each motor circuit as specified by either 495.84(C)(1)(a) or (C)(1)(b).

- (a) A circuit breaker of suitable type and rating shall be arranged so that it can be serviced without hazard. The circuit breaker shall simultaneously disconnect all ungrounded conductors. The circuit breaker shall be permitted to sense the fault current by means of integral or external sensing elements.
- (b) Fuses of a suitable type and rating shall be placed in each ungrounded conductor. Fuses shall be used with suitable disconnecting means, or they shall be of a type that can also serve as the disconnecting means. They shall be arranged so that they cannot be serviced while they are energized.

(2) Reclosing.

Fault-current interrupting devices shall not automatically reclose the circuit.

Exception: Automatic reclosing of a circuit shall be permitted where the circuit is exposed to transient faults and where such automatic reclosing does not create a hazard to persons.

(3) Combination Protection.

Overload protection and fault-current protection shall be permitted to be provided by the same device.

495.85 Rating of Motor Control Apparatus.

The ultimate trip current of overcurrent (overload) relays or other motor-protective devices used shall not exceed 115 percent of the controller's continuous current

rating. Where the motor branch-circuit disconnecting means is separate from the controller, the disconnecting means current rating shall not be less than the ultimate trip setting of the overcurrent relays in the circuit.

495.86 Disconnecting Means.

The controller disconnecting means shall be lockable in accordance with 110.25.

495.87 Tables for Part VI.

The full load currents for two-phase and three-phase alternating-current motors shall be as specified in Table 495.87(a) and Table 495.87(b).

Table 495.87(a) Full-Load Current, Two-Phase Alternating-Current Motors (4-Wire)
The values of full-load current are for motors running at speeds usual for belted motors and motors with normal torque characteristics. Current in the common conductor of a 2-phase, 3-wire system will be 1.41 times the value given. The voltages listed are rated motor voltages. The currents listed shall be permitted for system voltage ranges of 2300 volts to 2400 volts.

<u>Horsepower</u>	<u>Induction-Type Squirrel Cage and Wound Rotor (Amperes)</u>
	<u>2300 Volts</u>
<u>60</u>	<u>14</u>
<u>75</u>	<u>18</u>
<u>100</u>	<u>23</u>
<u>125</u>	<u>27</u>
<u>150</u>	<u>32</u>
<u>200</u>	<u>43</u>

Table 495.87(b) Full-Load Current, Three-Phase Alternating-Current Motors
The values of full-load currents are typical for motors running at speeds usual for belted motors and motors with normal torque characteristics. The voltages listed are rated motor voltages. The currents listed shall be permitted for system voltage ranges of 2300 volts to 2400 volts.

<u>Horsepower</u>	<u>Induction-Type Squirrel Cage and Wound Rotor (Amperes)</u>	<u>Synchronous-Type Unity Power Factor * (Amperes)</u>
	<u>2300 Volts</u>	<u>2300 Volts</u>
<u>60</u>	<u>16</u>	<u>12</u>
<u>100</u>	<u>26</u>	<u>20</u>
<u>125</u>	<u>31</u>	<u>25</u>
<u>150</u>	<u>37</u>	<u>30</u>
<u>200</u>	<u>49</u>	<u>40</u>

*For 90 and 80 percent power factor, the figures shall be multiplied by 1.1 and 1.25, respectively.

Part VII. Transformers

495.100 General Provisions.

This part covers the installation of all transformers over 1000 volts on either the primary or secondary. Part VII supplements or amends the other provisions of Article 450. This part does not cover the following:

- (1) Current transformers
- (2) Dry-type transformers that constitute a component part of other apparatus and comply with the requirements for such apparatus
- (3) Transformers that are an integral part of an X-ray, high-frequency, or electrostatic-coating apparatus
- (4) Transformers for sign and outline lighting
- (5) Transformers for electric-discharge lighting
- (6) Transformers used for research, development, or testing, where effective arrangements are provided to safeguard persons from contacting energized parts

495.102 Exposed Energized Parts.

Switches or other equipment operating at 1000 volts, nominal, or less, and serving only equipment within a transformer enclosure shall be permitted to be installed in the transformer enclosure if accessible only to qualified persons. All energized parts shall be guarded in accordance with 110.27 and 110.34.

495.103 Overcurrent Protection.

Overcurrent protection of transformers shall comply with Table 495.103. As used in this section, the word *transformer* shall mean a transformer or polyphase bank of two or more single-phase transformers operating as a unit.

Informational Note No. 1: See 240.4, 240.21, 240.100, and 240.101 for overcurrent protection of conductors.

Informational Note No. 2: Nonlinear loads can increase heat in a transformer without operating its overcurrent protective device.

Table 495.103 Maximum Rating or Setting of Overcurrent Protection for Transformers Over 1000 Volts (as a Percentage of Transformer-Rated Current)

		<u>Secondary Protection²</u>				
		<u>Primary Protection over 1000 Volts</u>		<u>Over 1000 Volts</u>		<u>1000 Volts or Less</u>
<u>Location Limitations</u>	<u>Transformer Rated Impedance</u>	<u>Circuit Breaker⁴</u>	<u>Fuse Rating</u>	<u>Circuit Breaker⁴</u>	<u>Fuse Rating</u>	<u>Circuit Breaker or Fuse Rating</u>
<u>Any location</u>	<u>Not more than 6%</u>	<u>600%¹</u>	<u>300%¹</u>	<u>300%¹</u>	<u>250%¹</u>	<u>125%¹</u>
	<u>More than 6% and not more than 10%</u>	<u>400%¹</u>	<u>300%¹</u>	<u>250%¹</u>	<u>225%¹</u>	<u>125%¹</u>

<u>Supervised locations only³</u>	<u>Secondary Protection²</u>					
	<u>Any</u>	<u>300%¹</u>	<u>250%¹</u>	<u>Not required</u>	<u>Not required</u>	<u>Not required</u>
<u>Not more than 6%</u>		<u>600%</u>	<u>300%</u>	<u>300%⁵</u>	<u>250%⁵</u>	<u>250%⁵</u>
<u>More than 6% and not more than 10%</u>		<u>400%</u>	<u>300%</u>	<u>250%⁵</u>	<u>225%⁵</u>	<u>250%⁵</u>

¹Where the required fuse rating or circuit breaker setting does not correspond to a standard rating or setting, a higher rating or setting that does not exceed the following shall be permitted:

(1) The next higher standard rating or setting for fuses and circuit breakers 1000 volts and below, or

(2) The next higher commercially available rating or setting for fuses and circuit breakers above 1000 volts.

²Where secondary overcurrent protection is required, the secondary overcurrent device shall be permitted to consist of not more than six circuit breakers or six sets of fuses grouped in one location. Where multiple overcurrent devices are utilized, the total of all the device ratings shall not exceed the allowed value of a single overcurrent device. If both circuit breakers and fuses are used as the overcurrent device, the total of the device ratings shall not exceed that allowed for fuses.

³A supervised location is a location where conditions of maintenance and supervision ensure that only qualified persons monitor and service the transformer installation.

⁴Electronically actuated fuses that may be set to open at a specific current shall be set in accordance with settings for circuit breakers.

⁵A transformer equipped with coordinated thermal overload protection by the manufacturer shall be permitted to have separate secondary protection omitted.

495.104 Dry-Type Transformers Installed Indoors.

(A) Not Over 1121/2 kVA.

Dry-type transformers installed indoors and rated 1121/2 kVA or less shall have a separation of at least 300 mm (12 in.) from combustible material unless separated from the combustible material by a fire-resistant, heat-insulated barrier.

(B) Over 1121/2 kVA.

Individual dry-type transformers of more than 1121/2 kVA rating shall be installed in a transformer room of fire-resistant construction having a minimum fire rating of 1 hour.

Exception No. 1: Transformers with Class 155 or higher insulation systems and separated from combustible material by a fire-resistant, heat-insulating barrier or by not less than 1.83 m (6 ft) horizontally and 3.7 m (12 ft) vertically shall not be required to be installed in a transformer room.

Exception No. 2: Transformers with Class 155 or higher insulation systems and completely enclosed except for ventilating openings shall not be required to be installed in a transformer room.

Informational Note: See ASTM E119-18a, *Standard Test Methods for Fire Tests of Building Construction and Materials*, for additional information on fire-resistance ratings.

(C) Over 35,000 Volts.

Dry-type transformers rated over 35,000 volts shall be installed in a vault complying with the provisions of this article.

495.105 Dry-Type Transformers Installed Outdoors.

Dry-type transformers installed outdoors shall have a weatherproof enclosure.

Transformers exceeding 112½ kVA shall not be located within 300 mm (12 in.) of combustible materials of buildings unless the transformer has Class 155 insulation systems or higher and is completely enclosed except for ventilating openings.

495.106 Less-Flammable Liquid-Insulated Transformers.

Transformers insulated with listed less-flammable liquids that have a fire point of not less than 300°C shall be permitted to be installed in accordance with 495.106(A) or 495.106(B).

(A) Indoor Installations.

Indoor installations shall be permitted in accordance with one of the following:

- (1) In Type I or Type II buildings, in areas where all of the following requirements are met:
 - a The transformer is rated 35,000 volts or less.
 - b. No combustible materials are stored.
 - c A liquid confinement area is provided.
 - d. The installation complies with all the restrictions provided for in the listing of the liquid.

Informational Note: Such restrictions can include, but are not limited to, maximum pressure of the tank, use of a pressure relief valve, appropriate fuse types, and proper sizing of overcurrent protection.

- (2) If an automatic fire extinguishing system and a liquid confinement area are present, provided the transformer is rated 35,000 volts or less
- (3) If the installation complies with 495.109

(B) Outdoor Installations.

Less-flammable liquid-filled transformers shall be permitted to be installed outdoors, attached to, adjacent to, or on the roof of buildings, if installed in accordance with the following:

- (1) For Type I and Type II buildings, the installation shall comply with all the restrictions provided for in the listing of the liquid.

Informational Note No. 1: See 495.110 for information about installations adjacent to combustible material, fire escapes, or door and window openings that might require additional safeguards .

Informational Note No. 2: Such restrictions can include, but are not limited to, maximum pressure of the tank, use of a pressure relief valve, appropriate fuse types, and proper sizing of overcurrent protection.

(2) In accordance with 495.110.

Informational Note No. 3: See NFPA 220-2021, *Standard on Types of Building Construction*, for definitions of Type I and Type II building constructions.

Informational Note No. 4: See Article 100 for the definition of *Listed*.

495.107 Nonflammable Fluid-Insulated Transformers.

Transformers insulated with a dielectric fluid identified as nonflammable shall be permitted to be installed indoors or outdoors. Such transformers installed indoors and rated over 35,000 volts shall be installed in a vault. Such transformers installed indoors shall be furnished with a liquid confinement area and a pressure-relief vent. The transformers shall be furnished with a means for absorbing any gases generated by arcing inside the tank, or the pressure-relief vent shall be connected to a chimney or flue that will carry such gases to an environmentally safe area.

Informational Note: Safety can be increased if fire hazard analyses are performed for such transformer installations.

For the purposes of this section, a nonflammable dielectric fluid is one that does not have a flash point or fire point and is not flammable in air.

495.108 Askarel-Insulated Transformers Installed Indoors.

Askarel-insulated transformers installed indoors and rated over 25 kVA shall be furnished with a pressure-relief vent. Where installed in a poorly ventilated place, they shall be furnished with a means for absorbing any gases generated by arcing inside the case, or the pressure-relief vent shall be connected to a chimney or flue that carries such gases outside the building. Askarel-insulated transformers rated over 35,000 volts shall be installed in a vault.

495.109 Oil-Insulated Transformers Installed Indoors.

Oil-insulated transformers installed indoors shall be installed in a vault constructed as specified in Part VII of this article.

Exception No. 1: Where the total capacity does not exceed 112½ kVA, the vault specified in Part VII of this article shall be permitted to be constructed of reinforced concrete that is not less than 100 mm (4 in.) thick.

Exception No. 2: Where the nominal voltage does not exceed 1000, a vault shall not be required if suitable arrangements are made to prevent a transformer oil fire from igniting other materials and the total capacity in one location does not exceed 10 kVA in a section of the building classified as combustible or 75 kVA where the surrounding structure is classified as fire-resistant construction.

Exception No. 3: Electric furnace transformers that have a total rating not exceeding 75 kVA shall be permitted to be installed without a vault in a building or room of

fire-resistant construction if suitable arrangements are made to prevent a transformer oil fire from spreading to other combustible material.

Exception No. 4: A transformer that has a total rating not exceeding 75 kVA and a supply voltage of 1000 volts or less that is an integral part of charged-particle-accelerating equipment shall be permitted to be installed without a vault in a building or room of noncombustible or fire-resistant construction if suitable arrangements are made to prevent a transformer oil fire from spreading to other combustible material.

Exception No. 5: Transformers shall be permitted to be installed in a detached building that does not comply with Part III of this article if neither the building nor its contents present a fire hazard to any other building or property, and if the building is used only in supplying electric service and the interior is accessible only to qualified persons.

Exception No. 6: Oil-insulated transformers shall be permitted to be used without a vault in portable and mobile surface mining equipment (such as electric excavators) if each of the following conditions is met:

- (1) Provision is made for draining leaking fluid to the ground.
- (2) Safe egress is provided for personnel.
- (3) A minimum 6-mm (1/4-in.) steel barrier is provided for personnel protection.

495.110 Oil-Insulated Transformers Installed Outdoors.

Combustible material, combustible buildings, and parts of buildings, fire escapes, and door and window openings shall be safeguarded from fires originating in oil-insulated transformers installed on roofs, attached to or adjacent to a building or combustible material.

In cases where the transformer installation presents a fire hazard, one or more of the following safeguards shall be applied according to the degree of hazard involved:

- (1) Space separations
- (2) Fire-resistant barriers
- (3) Automatic fire suppression systems
- (4) Enclosures that confine the oil of a ruptured transformer tank

Oil enclosures shall be permitted to consist of fire-resistant dikes, curbed areas or basins, or trenches filled with coarse, crushed stone. Oil enclosures shall be provided with trapped drains where the exposure and the quantity of oil involved are such that removal of oil is important.

Informational Note: See ANSI/IEEE C2-2017, *National Electrical Safety Code*, for additional information on transformers installed on poles or structures or underground.

495.111 Modification of Transformers.

When modifications are made to a transformer in an existing installation that change the type of the transformer with respect to Part VII of this article, such transformer shall be marked to show the type of insulating liquid installed, and the modified transformer installation shall comply with the applicable requirements for that type of transformer.

495.112 Transformer Vaults

Vaults shall be located where they can be ventilated to the outside air without using flues or ducts wherever such an arrangement is practicable.

495.113 Accessibility.

All transformer vaults shall be readily accessible to qualified personnel for inspection and maintenance or shall meet the requirements of 450.13(A) or (B).

495.114 Walls, Roofs, and Floors.

The walls and roofs of vaults shall be constructed of materials that have approved structural strength for the conditions with a minimum fire resistance of 3 hours. The floors of vaults in contact with the earth shall be of concrete that is not less than 100 mm (4 in.) thick, but, where the vault is constructed with a vacant space or other stories below it, the floor shall have approved structural strength for the load imposed thereon and a minimum fire resistance of 3 hours. For the purposes of this section, studs and wallboard construction shall not be permitted.

Exception: Where transformers are protected with automatic sprinkler, water spray, carbon dioxide, or halon, construction of 1-hour rating shall be permitted.

Informational Note No. 1: See ASTM E119-18a, *Methods for Fire Tests of Building Construction and Materials*, for additional information.

Informational Note No. 2: A typical 3-hour construction is 150 mm (6 in.) thick reinforced concrete.

495.115 Doorways.

Vault doorways shall be protected in accordance with 495.115(A) through (C).

(A) Type of Door.

Each doorway leading into a vault from the building interior shall be provided with a tight-fitting door that has a minimum fire rating of 3 hours. The authority having jurisdiction shall be permitted to require such a door for an exterior wall opening where conditions warrant.

Exception: Where transformers are protected with automatic sprinkler, water spray, carbon dioxide, or halon, construction of 1-hour rating shall be permitted.

Informational Note: See NFPA 80-2022, *Standard for Fire Doors and Other Opening Protectives*, for additional information.

(B) Sills.

A door sill or curb that is of an approved height that will confine the oil from the largest transformer within the vault shall be provided, and in no case shall the height be less than 100 mm (4 in.).

(C) Accessibility.

Doors shall be equipped with locks, and doors shall be kept locked, with access being allowed only to qualified persons. Personnel doors shall be capable of opening not less than 90 degrees in the direction of egress and be equipped with listed fire exit hardware.

495.116 Ventilation Openings.

Where required by 450.9, openings for ventilation shall be provided in accordance with 495.116(A) through (F).

(A) Location.

Ventilation openings shall be located as far as possible from doors, windows, fire escapes, and combustible material.

(B) Arrangement.

A vault ventilated by natural circulation of air shall be permitted to have roughly half of the total area of openings required for ventilation in one or more openings near the floor and the remainder in one or more openings in the roof or in the sidewalls near the roof, or all of the area required for ventilation shall be permitted in one or more openings in or near the roof.

(C) Size.

For a vault ventilated by natural circulation of air to an outdoor area, the combined net area of all ventilating openings, after deducting the area occupied by screens, gratings, or louvers, shall not be less than 1900 mm² (3 in.²) per kVA of transformer capacity in service, and in no case shall the net area be less than 0.1 m² (1 ft²) for any capacity under 50 kVA.

(D) Covering.

Ventilation openings shall be covered with durable gratings, screens, or louvers, according to the treatment required in order to avoid unsafe conditions.

(E) Dampers.

All ventilation openings to the indoors shall be provided with automatic closing fire dampers that operate in response to a vault fire. Such dampers shall possess a standard fire rating of not less than 1½ hours.

Informational Note: See ANSI/UL 555-2016, *Standard for Fire Dampers*, for additional information on fire dampers.

(F) Ducts.

Ventilating ducts shall be constructed of fire-resistant material.

495.117 Drainage.

Where practicable, vaults containing more than 100 kVA transformer capacity shall be provided with a drain or other means that will carry off any accumulation of oil or water in the vault unless local conditions make this impracticable. The floor shall be pitched to the drain where provided.

495.118 Water Pipes and Accessories.

Any pipe or duct system foreign to the electrical installation shall not enter or pass through a transformer vault. Piping or other facilities provided for vault fire protection, or for transformer cooling, shall not be considered foreign to the electrical installation.

495.119 Storage in Vaults.

Materials shall not be stored in transformer vaults.

Part IX. Capacitors

495.120 Enclosing and Guarding.

(A) Containing More Than 11 L (3 gal) of Flammable Liquid.

Capacitors containing more than 11 L (3 gal) of flammable liquid shall be enclosed in vaults or outdoor fenced enclosures complying with Article 110, Part III. This limit shall apply to any single unit in an installation of capacitors.

(B) Accidental Contact.

Where capacitors are accessible to unauthorized and unqualified persons, they shall be enclosed, located, or guarded so that persons cannot come into accidental contact or bring conducting materials into accidental contact with exposed energized parts, terminals, or buses associated with them. However, no additional guarding is required for enclosures accessible only to authorized and qualified persons.

495.121 Not Covered.

Surge capacitors or capacitors included as a component part of other apparatus and conforming with the requirements of such apparatus are excluded from these requirements.

This part also covers the installation of capacitors in hazardous (classified) locations as modified by Articles 501 through 503 .

495.122 Switching.

(A) Load Current.

(1)

Group-operated switches shall be used for capacitor switching and shall be capable of the following:

- (1) Carrying continuously not less than 135 percent of the rated current of the capacitor installation
- (2) Interrupting the maximum continuous load current of each capacitor, capacitor bank, or capacitor installation that will be switched as a unit
- (3) Withstanding the maximum inrush current, including contributions from adjacent capacitor installations
- (4) Carrying currents due to faults on capacitor side of switch

(B) Isolation.

(1) General.

A means shall be installed to isolate from all sources of voltage each capacitor, capacitor bank, or capacitor installation that will be removed from service as a unit. The isolating means shall provide a visible gap in the electrical circuit adequate for the operating voltage.

(2) Isolating or Disconnecting Switches with No Interrupting Rating.

Isolating or disconnecting switches (with no interrupting rating) shall be interlocked with the load-interrupting device or shall be provided with prominently displayed caution signs in accordance with 495.22 to prevent switching load current.

(C) Additional Requirements for Series Capacitors.

The proper switching sequence shall be ensured by use of one of the following:

- (1) Mechanically sequenced isolating and bypass switches
- (2) Interlocks
- (3) Switching procedure prominently displayed at the switching location

495.123 Overcurrent Protection.

(A) Provided to Detect and Interrupt Fault Current.

A means shall be provided to detect and interrupt fault current likely to cause dangerous pressure within an individual capacitor.

(B) Single-Pole or Multipole Devices.

Single-pole or multipole devices shall be permitted for this purpose.

(C) Protected Individually or in Groups.

Capacitors shall be permitted to be protected individually or in groups.

(D) Protective Devices Rated or Adjusted.

Protective devices for capacitors or capacitor equipment shall be rated or adjusted to operate within the limits of the safe zone for individual capacitors.

495.124 Identification.

Each capacitor shall be provided with a permanent nameplate giving the manufacturer's name, rated voltage, frequency, kilovar or amperes, number of phases, and the volume of liquid identified as flammable, if such is the case.

495.125 Grounding.

Capacitor cases shall be connected to the equipment grounding conductor. If the capacitor neutral point is connected to a grounding electrode conductor, the connection shall be made in accordance with Part III of Article 250.

Exception: Capacitor cases shall not be connected to the equipment grounding conductor where the capacitor units are supported on a structure designed to operate at other than ground potential.

495.126 Means for Discharge.

(A) Means to Reduce the Residual Voltage.

A means shall be provided to reduce the residual voltage of a capacitor to 50 volts or less within 5 minutes after the capacitor is disconnected from the source of supply.

(B) Connection to Terminals.

A discharge circuit shall be either permanently connected to the terminals of the capacitor or provided with automatic means of connecting it to the terminals of the capacitor bank after disconnection of the capacitor from the source of supply. The windings of motors, transformers, or other equipment directly connected to

capacitors without a switch or overcurrent device interposed shall meet the requirements of 495.126(A).

Part X. Resistors and Reactors

495.130 General.

(A) Protected Against Physical Damage.

Resistors and reactors shall be protected against physical damage.

(B) Isolated by Enclosure or Elevation.

Resistors and reactors shall be isolated by enclosure or elevation to protect personnel from accidental contact with energized parts.

(C) Combustible Materials.

Resistors and reactors shall not be installed in close enough proximity to combustible materials to constitute a fire hazard and shall have a clearance of not less than 305 mm (12 in.) from combustible materials.

(D) Clearances.

Clearances from resistors and reactors to grounded surfaces shall be adequate for the voltage involved.

(E) Temperature Rise from Induced Circulating Currents.

Metallic enclosures of reactors and adjacent metal parts shall be installed so that the temperature rise from induced circulating currents is not hazardous to personnel or does not constitute a fire hazard.

495.131 Grounding.

Resistor and reactor cases or enclosures shall be connected to the equipment grounding conductor.

Exception: Resistor or reactor cases or enclosures supported on a structure designed to operate at other than ground potential shall not be connected to the equipment grounding conductor.

495.132 Oil-Filled Reactors.

Installation of oil-filled reactors, in addition to the above requirements, shall comply with applicable requirements of Article 495, Part VII.

**First Revision No. 7942-NFPA 70-2020 [Global Input]**

Renumber 314 and relocate as below:

Part III to be Part IV

314.40 to be 314.100

314.41 to be 314.101

314.42 to be 314.102

314.43 to be 314.103

314.44 to be 314.104

Part IV to be Part III

Submitter Information Verification

Committee: NEC-P09

Submission Date: Fri Dec 11 08:10:05 EST 2020

Committee Statement

Committee Statement: CMP-9 is renumbering the sections in Part III to comply with the decade numbering rule in the Style Manual at 2.4.2.1, as well as the general rules for parallel numbering in 2.4.1 with respect to most Chapter 3 wiring methods where the numbering in Construction parts begins at three figures. In this case, CMP 9 is retaining the units digit in all renumbered sections to provide a point of mental reference for current NEC users. CMP 9 followed the same procedure when it renumbered Art. 314 in the 1993 cycle (Comment 9-3). The result of this process is that this part (on "Construction Specifications") becomes Part IV, and existing Part IV becomes Part III with no change in section numbering.

Response Message: FR-7942-NFPA 70-2020

Ballot Results

✓ **This item has passed ballot**

12 Eligible Voters

0 Not Returned

11 Affirmative All

1 Affirmative with Comments

0 Negative with Comments

0 Abstention

Affirmative All

Belisle, Rodney D.

Colvin, Carmon A.

Hartwell, Frederic P.

Hollander, Richard

Miller, Kevin R.

Osborne, Robert D.

Parker, Ryan

Ridgeway, Ronnie H.

Schultheis, Timothy James

Sullivan, Paul B.

Sumbera, Darrell M.

Affirmative with Comment

Sasso, Nick

Affirmative.

**First Revision No. 7969-NFPA 70-2020 [Global Input]****Renumber Part IV as below:**

490.51 General to 490.61
490.52 Overcurrent Protection to 490.62
490.53 Enclosures to 490.63
490.54 Collector Rings to 490.64
490.55 Power Cable Connections to Mobile Machines to 490.65
490.56 High Voltage Portable Cable for Main Power Supply to 490.66

Submitter Information Verification

Committee: NEC-P09

Submission Date: Fri Dec 11 14:14:10 EST 2020

Committee Statement

Committee Statement: CMP-9 is renumbering the Part IV to comply with the decade numbering rule in the Style Manual at 2.4.2.1. In this case, CMP-9 is retaining the units digit in all renumbered sections to provide a point of mental reference for current NEC users. CMP-9 followed the same procedure when it renumbered Art. 314 in the 1993 cycle (Comment 9-3).

CMP-9 notes to the Correlating Committee that 490.55 is referenced in 250.188(F).

CMP-9 notes to the CC that 490.55 is referenced in 250.188(F).

Response Message: FR-7969-NFPA 70-2020

Ballot Results

✓ **This item has passed ballot**

12 Eligible Voters

0 Not Returned

11 Affirmative All

1 Affirmative with Comments

0 Negative with Comments

0 Abstention

Affirmative All

Belisle, Rodney D.

Colvin, Carmon A.

Hartwell, Frederic P.

Hollander, Richard

Miller, Kevin R.

Osborne, Robert D.

Parker, Ryan

Ridgeway, Ronnie H.

Schultheis, Timothy James

Sullivan, Paul B.

Sumbera, Darrell M.

Affirmative with Comment

Sasso, Nick

Affirmative.

**First Revision No. 7975-NFPA 70-2020 [Global Input]**

See attached Word document for relocation and revisions to existing definitions under the purview of CMP-09

Supplemental Information

<u>File Name</u>	<u>Description Approved</u>
NEC_CMP-9_Defs_to_100_for_Attachment_to_Global_FR.1607748541637_3_1-27.docx	For ballot

Submitter Information Verification

Committee: NEC-P09

Submittal Date: Fri Dec 11 23:46:02 EST 2020

Committee Statement

Committee Statement: This FR moves all existing definitions under the purview of CMP-9 to Article 100 and revises these definitions for compliance with Section 2.2.2 of the NEC Style Manual. Additionally all definition sections (XXX.2) in the articles under the responsibility of CMP-9 are deleted.

The term "Medium Voltage" is commonly used to describe circuits and equipment operating at voltage levels greater than 1000 volts, and up to 52 kV. As this is a commonly used term, it is included in an Informational Note. CMP-9 chooses not to change the term "High Voltage", as this term is specific to Article 490, and it has not been suggested to change the usage of that term within that Article. Additionally, product Standards and their associated listings do not consistently apply the terms "Medium" vs. "High" voltage.

Response Message: FR-7975-NFPA 70-2020

[Public Input No. 3639-NFPA 70-2020 \[Section No. 490.2\]](#)

[Public Input No. 3634-NFPA 70-2020 \[Section No. 450.2\]](#)

Ballot Results

✔ This item has passed ballot

12 Eligible Voters
0 Not Returned
9 Affirmative All
3 Affirmative with Comments
0 Negative with Comments
0 Abstention

Affirmative All

Belisle, Rodney D.
Colvin, Carmon A.
Miller, Kevin R.
Osborne, Robert D.
Parker, Ryan
Ridgeway, Ronnie H.
Schultheis, Timothy James
Sullivan, Paul B.

Sumbera, Darrell M.

Affirmative with Comment

Hartwell, Frederic P.

Note that the text of the Informational Note is provided by FR 8279, and the action on these items will need to be correlated.

Hollander, Richard

"Based on the recollection of multiple Committee Members, it was not the intent to refer to "this article", but "that article"

Sasso, Nick

Affirmative.

NEC_CMP-9 Definitions moving to Article 100

~~450.2 Definition.~~

~~The definitions in this section shall apply only within this article.~~

Transformer.

An individual transformer, single- or polyphase, identified by a single nameplate, unless otherwise indicated in this article.

~~490.2 Definition.~~

~~The definition in this section shall apply only within this article.~~

High Voltage.

A potential difference of more than 1000 volts, nominal.

**First Revision No. 7777-NFPA 70-2020 [Detail]****Make the following changes to 314.70(A)**

- (1) Part I, 314.2; 314.3; 314.4; and 314.4 ~~5~~
- (2) Part II, 314.15; 314.17; 314.20; 314.23(A), (B), or (G); 314.28(B); and 314.29
- (3) Part IV, 314.100(A) and (C); and 314.41 ~~101~~

Submitter Information Verification**Committee:** NEC-P09**Submittal Date:** Tue Dec 08 14:44:46 EST 2020**Committee Statement**

Committee Statement: CMP-9 edits the number references to correlate with renumeration of Part III and position change of Part IV. What is now Part III becomes Part IV; what is now Part IV becomes Part III. For correlation, CMP-9 is also inserting references to this rule throughout 314.70(A). CMP-9 is also inserting a reference to new section 314.5.

Response Message: FR-7777-NFPA 70-2020

Ballot Results

✓ **This item has passed ballot**

12 Eligible Voters
0 Not Returned
11 Affirmative All
1 Affirmative with Comments
0 Negative with Comments
0 Abstention

Affirmative All

Belisle, Rodney D.
Colvin, Carmon A.
Hartwell, Frederic P.
Hollander, Richard
Miller, Kevin R.
Osborne, Robert D.
Parker, Ryan
Ridgeway, Ronnie H.
Schultheis, Timothy James
Sullivan, Paul B.
Sumbera, Darrell M.

Affirmative with Comment

Sasso, Nick

Affirmative.

**First Revision No. 7779-NFPA 70-2020 [Detail]****Make the following changes to 314.70(B)**

- (1) Part I, 314.4 and 314.5
- (2) Part II, 314.15; 314.17; 314.23(A), (E), or (G); 314.28(A)(3); and 314.29
- (3) Part IV, 314.100(A) and 314.~~41~~ 101

Submitter Information Verification**Committee:** NEC-P09**Submittal Date:** Tue Dec 08 15:09:38 EST 2020**Committee Statement**

Committee Statement: CMP-9 edits the number references to correlate with renumeration of Part III and position change of Part IV. What is now Part III becomes Part IV; what is now Part IV becomes Part III. CMP-9 is also inserting a reference to new section 314.5.

Response Message: FR-7779-NFPA 70-2020

Ballot Results

✔ This item has passed ballot

12 Eligible Voters

0 Not Returned

11 Affirmative All

1 Affirmative with Comments

0 Negative with Comments

0 Abstention

Affirmative All

Belisle, Rodney D.

Colvin, Carmon A.

Hartwell, Frederic P.

Hollander, Richard

Miller, Kevin R.

Osborne, Robert D.

Parker, Ryan

Ridgeway, Ronnie H.

Schultheis, Timothy James

Sullivan, Paul B.

Sumbera, Darrell M.

Affirmative with Comment

Sasso, Nick

Affirmative.

**First Revision No. 7780-NFPA 70-2020 [Detail]****Make the following changes to 314.70(C)**

- (1) Part I, 314.3; ~~and~~ 314.4; and 314.5
- (2) Part II, 314.15; 314.17; 314.23(G); 314.28(B); 314.29; and 314.30

Submitter Information Verification

Committee: NEC-P09

Submittal Date: Tue Dec 08 15:13:52 EST 2020

Committee Statement

Committee Statement: CMP-9 is inserting a reference to new section 314.5.

Response Message: FR-7780-NFPA 70-2020

Ballot Results

✔ This item has passed ballot

12 Eligible Voters

0 Not Returned

11 Affirmative All

1 Affirmative with Comments

0 Negative with Comments

0 Abstention

Affirmative All

Belisle, Rodney D.

Colvin, Carmon A.

Hartwell, Frederic P.

Hollander, Richard

Miller, Kevin R.

Osborne, Robert D.

Parker, Ryan

Ridgeway, Ronnie H.

Schultheis, Timothy James

Sullivan, Paul B.

Sumbera, Darrell M.

Affirmative with Comment

Sasso, Nick

Affirmative.

**First Revision No. 7868-NFPA 70-2020 [Detail]**

Add new (6) to 314.16(B):

(6) Terminal Block Fill.

Where a terminal block is present in a box, a single volume allowance in accordance with Table 314.16(B) shall be made based on the largest conductor(s) terminated within it.

Submitter Information Verification

Committee: NEC-P09

Submittal Date: Thu Dec 10 06:35:29 EST 2020

Committee Statement

Committee Statement: CMP-9 is addressing the use of terminal blocks in outlet and device boxes. These are not commonly installed, but where provided, they take up enough volume to merit a conductor allowance. One example of this usage occurs in 680.23(F)(2)(b). CMP-9 concludes the double fill suggested in PI 412 is excessive, and is reducing it to a single allowance. In addition, CMP-9 is basing the allowance on the size of conductors actually landed in the terminal block; the size of an unterminated conductor should not be a factor in this calculation.

CMP- 9 notes that the reference to “a GUA or conduit body” may indicate a lack of understanding on the part of the submitter as to the distinction between boxes and conduit bodies, particularly in the realm of hazardous location enclosures. Terminal blocks are not located in conduit bodies, and the fact that GUA boxes have threaded hubs does not make them conduit bodies. In addition, if such terminal blocks are attached by screws to a GUA box by drilling and tapping in the field, the continued suitability for use in hazardous locations would need to be reevaluated.

Response Message: FR-7868-NFPA 70-2020

Ballot Results

✓ **This item has passed ballot**

12 Eligible Voters

0 Not Returned

10 Affirmative All

2 Affirmative with Comments

0 Negative with Comments

0 Abstention

Affirmative All

Belisle, Rodney D.

Colvin, Carmon A.

Hollander, Richard

Miller, Kevin R.

Osborne, Robert D.

Parker, Ryan

Ridgeway, Ronnie H.

Schultheis, Timothy James

Sullivan, Paul B.

Sumbera, Darrell M.

Affirmative with Comment

Hartwell, Frederic P.

Note that this is the text made possible by the action on FR 7977

Sasso, Nick

Affirmative.

**First Revision No. 7870-NFPA 70-2020 [Detail]****Add new (C) to 314.24:****(C) Clearances for Side-Wiring Entrances.**

The rearward projection of devices or equipment shall not be greater than the depth of a knockout being used for a side-wiring entrance, as measured to its centerline parallel to the rear of the box opposite to the equipment, unless the clearance from the inside wall of the box equals or exceeds 13 mm (1/2 in.). The term *side* applies to any wall of a box other than the one opposite to the opening.

Submitter Information Verification

Committee: NEC-P09

Submittal Date: Thu Dec 10 06:49:02 EST 2020

Committee Statement

Committee Statement: CMP-9 is adjusting the language by broadening the reach of this section to address side entries. CMP-9 is aware of actual damage to conductors from installed devices or other equipment of sufficient size to create a conflict with entering conductors. The prevailing product standards create an acceptable size envelope for devices (or other equipment) mounted within boxes using yokes secured to customary gang points. This envelope is 1 3/4 in. wide by 2 13/16 in. high, with rounded corners having a radius of 7/16 in., and a plethora of devices take full advantage of this allotted profile. The same standards place no limitations on equipment depth. CMP 9 has informally surveyed available designs and found enormous depth variations in the market, very much complicating the creation of this requirement.

For nominal 3 by 2 device boxes, any side entrance at the level of the device is a non-starter and will fail the new rule. For a 4-in. square box with two device yokes, either on internal gang mounts or the more usual case of a plaster ring (or raised cover), the rule gets interesting. The box interior will exceed the maximum device length by about 1 1/8 in, and therefore accommodate a top or bottom entry (considered in this statement as being in line with the yoke) at either end.

However, an entry at right angles to the yoke orientation (the standard gang spacing is 1 13/16 in.) would enter less than 1/4-in. of available space to accommodate both a cable or raceway connection as well as wire manipulation. Attempts to force large devices into such spaces are what caused the loss experience cited in the substantiation for PI-2448. The NEC has not previously addressed this; the new rule will now prohibit such attempts.

CMP-9 does recognize that there are legitimate applications for which an entry, particularly in the case of rigid raceway methods, is preferred in this orientation. One solution is to use a larger (presumably a 4 11/16 in. square) box. Another solution is to lower the entry point by using a deeper box. The rule compares the depth of the equipment under its mounting yoke to the centerline of the wiring entry. If that line is equal to or below the equipment limit, then the entry can be used.

This may seem odd, but it is based on a careful geometric analysis that positioned the NEC limit of 9 No. 12 THHN conductors in a cross-section of 1/2 trade size EMT, and they all fit below the horizontal diameter of the EMT. In fact, as long as half the connector opening is unobstructed, in practice the entire wire fill can be routed to safely enter the enclosure. There are listed raceway connectors that have a minimal (less than 1/4 in. and no threads) extension inside a box and that make this approach practical.

Response Message: FR-7870-NFPA 70-2020

Ballot Results

✓ **This item has passed ballot**

12 Eligible Voters

0 Not Returned

11 Affirmative All
1 Affirmative with Comments
0 Negative with Comments
0 Abstention

Affirmative All

Belisle, Rodney D.
Colvin, Carmon A.
Hartwell, Frederic P.
Hollander, Richard
Miller, Kevin R.
Osborne, Robert D.
Parker, Ryan
Ridgeway, Ronnie H.
Schultheis, Timothy James
Sullivan, Paul B.
Sumbera, Darrell M.

Affirmative with Comment

Sasso, Nick
Affirmative.

**First Revision No. 8279-NFPA 70-2020 [Detail]**

490.2-Add Informational Note to this definition

High Voltage.

A potential difference of more than 1000 volts, nominal.

Informational Note: Circuits and equipment rated at potential differences of more than 1000 volts, and up to 52kv are also commonly referred to as medium voltage.

Submitter Information Verification

Committee: NEC-P09

Submittal Date: Mon Dec 21 13:44:51 EST 2020

Committee Statement

Committee Statement: The term "Medium Voltage" is commonly used to describe circuits and equipment operating at voltage levels greater than 1000 volts, and up to 52 kV. As this is a commonly used term, it is included in an Informational Note. CMP-9 chooses not to change the term "High Voltage", as this term is specific to Article 490, and it has not been suggested to change the usage of that term within that Article. Additionally, product Standards and their associated listings do not consistently apply the terms "Medium" vs. "High" voltage.

Response Message: FR-8279-NFPA 70-2020

Public Input No. 1089-NFPA 70-2020 [Definition: High Voltage.]

Ballot Results

✓ **This item has passed ballot**

12 Eligible Voters

0 Not Returned

9 Affirmative All

1 Affirmative with Comments

2 Negative with Comments

0 Abstention

Affirmative All

Belisle, Rodney D.

Colvin, Carmon A.

Hollander, Richard

Miller, Kevin R.

Osborne, Robert D.

Ridgeway, Ronnie H.

Schultheis, Timothy James

Sullivan, Paul B.

Sumbera, Darrell M.

Affirmative with Comment

Hartwell, Frederic P.

Note that this is the text of the Informational Note being added to the definition covered in FR 7975, and the two actions will require correlation.

Negative with Comment

Parker, Ryan

Put definition in article 100, not as an informational note in the section.

Sasso, Nick

Confusing. So now medium voltage = high voltage?

**First Revision No. 7946-NFPA 70-2020 [Definition: Panelboard.]****Panelboard.**

A single panel or group of panel units designed for assembly in the form of a single panel, including buses and automatic overcurrent devices, and equipped with or without switches for the control of light, heat, or power circuits; designed to be placed in a cabinet, enclosure , or cutout box placed in or against a wall, partition, or other support; and accessible only from the front or, where placed within a floor-mounted commercial appliance outlet center, from the top . (CMP-9)

Supplemental Information

<u>File Name</u>	<u>Description</u> <u>Approved</u>
Panelboard.docx	For staff use

Submitter Information Verification

Committee: NEC-P09

Submittal Date: Fri Dec 11 11:13:21 EST 2020

Committee Statement

Committee Statement: Panelboards are commonly installed in cabinets and cutout boxes but may be installed in many types of equipment so this addition would cover other applications with the term identified equipment.

Response Message: FR-7946-NFPA 70-2020

[Public Input No. 892-NFPA 70-2020 \[Definition: Panelboard.\]](#)

[Public Input No. 1731-NFPA 70-2020 \[Definition: Panelboard.\]](#)

Ballot Results

✔ **This item has passed ballot**

12 Eligible Voters

0 Not Returned

3 Affirmative All

6 Affirmative with Comments

3 Negative with Comments

0 Abstention

Affirmative All

Colvin, Carmon A.

Ridgeway, Ronnie H.

Sullivan, Paul B.

Affirmative with Comment

Belisle, Rodney D.

"Based on the recollection of multiple Committee Members, it was not the intent to add the last part of the sentence, the portion stating "or, where placed within a floor-mounted commercial appliance outlet center, from the top". While this change was debated as part of modifying 408.43 based on PI 1705, the CMP did not modify 408.43 to allow panelboards to be mounted in the face-up position. There was another opportunity for having a special condition where this construction is allowed (refer to PI 1761, which would have provided a modification for "commercial appliance outlet centers" in Section 518.5); however, CMP 15 Resolved that PI. Based on the actions of CMP 9 in Section 408.43, and CMP 15's Resolution of PI 1761, the last part of this revision to the definition should not be added. It is also noted the discussion involving PI 1705

was obvious that there is some confusion as to what a panelboard is and what is an enclosed panelboard. The NEC would benefit with the addition of a new definition for enclosed panelboard.

Hartwell, Frederic P.

The final clause of the definition, "or, where placed within a floor-mounted commercial appliance outlet center, from the top" was never supported by CMP 9. It is a ballot error. First, it is a mandatory provision that is masquerading as a component of a definition, and as such, a violation of the Style Manual. Second, CMP 9 rejected this approach in its final wording of 408.43 (see FR 7944) which prohibits face down orientations, and also makes no allowances for panels of any description being located face-up in a floor. PI 1705 did indeed request such allowance, but CMP 9 declined to grant it.

Hollander, Richard

Based on the recollection of multiple Committee Members, it was not the intent to add the last part of the sentence, the portion stating "or, where placed within a floor-mounted commercial appliance outlet center, from the top". While this change was debated as part of modifying 408.43 based on PI 1705, the CMP did not modify 408.43 to allow panelboards to be mounted in the face-up position. There was another opportunity for having a special condition where this construction is allowed (refer to PI 1761, which would have provided a modification for "commercial appliance outlet centers" in Section 518.5); however, CMP 15 Resolved that PI. Based on the actions of CMP 9 in Section 408.43, and CMP 15's Resolution of PI 1761, the last part of this revision to the definition should not be added.

Miller, Kevin R.

"Based on the recollection of multiple Committee Members, it was not the intent to add the last part of the sentence, the portion stating "or, where placed within a floor-mounted commercial appliance outlet center, from the top". While this change was debated as part of modifying 408.43 based on PI 1705, the CMP did not modify 408.43 to allow panelboards to be mounted in the face-up position. There was another opportunity for having a special condition where this construction is allowed (refer to PI 1761, which would have provided a modification for "commercial appliance outlet centers" in Section 518.5); however, CMP 15 Resolved that PI. Based on the actions of CMP 9 in Section 408.43, and CMP 15's Resolution of PI 1761, the last part of this revision to the definition should not be added.

Osborne, Robert D.

Based on the recollection of multiple Committee Members, it was not the intent to add the last part of the sentence, the portion stating "or, where placed within a floor-mounted commercial appliance outlet center, from the top". While this change was debated as part of modifying 408.43 based on PI 1705, the CMP did not modify 408.43 to allow panelboards to be mounted in the face-up position. There was another opportunity for having a special condition where this construction is allowed (refer to PI 1761, which would have provided a modification for "commercial appliance outlet centers" in Section 518.5); however, CMP 15 Resolved that PI. Based on the actions of CMP 9 in Section 408.43, and CMP 15's Resolution of PI 1761, the last part of this revision to the definition should not be added. In addition, the Committee Statement references the term "identified equipment", which was intended to be added, rather than just the term "enclosure". This First Revision needs to be revisited during the Public Comment stage to address these errors.

Sumner, Darrell M.

"Based on the recollection of multiple Committee Members, it was not the intent to add the last part of the sentence, the portion stating "or, where placed within a floor-mounted commercial appliance outlet center, from the top". While this change was debated as part of modifying 408.43 based on PI 1705, the CMP did not modify 408.43 to allow panelboards to be mounted in the face-up position. There was another opportunity for having a special condition where this construction is allowed (refer to PI 1761, which would have provided a modification for "commercial appliance outlet centers" in Section 518.5); however, CMP 15 Resolved that PI. Based on the actions of CMP 9 in Section 408.43, and CMP 15's Resolution of PI 1761, the last part of this revision to the definition should not be added.

Negative with Comment

Parker, Ryan

"Based on the recollection of multiple Committee Members, it was not the intent to add the last part of the sentence, the portion stating "or, where placed within a floor-mounted commercial appliance outlet center, from the top". While this change was debated as part of modifying 408.43 based on PI 1705, the CMP did not modify 408.43 to allow panelboards to be mounted in the face-up position. There was another opportunity for having a special condition where this construction is allowed (refer to PI 1761, which would have provided a modification for "commercial appliance outlet centers" in Section 518.5); however, CMP 15 Resolved that PI. Based on the actions of CMP 9 in Section 408.43, and CMP 15's Resolution of PI 1761, the last part of this revision to the definition should not be added.

Sasso, Nick

The new language is confusing and will probably result in unintended consequences and more issues for the electrical inspector to deal with, as far as floor-mounted commercial appliance outlet centers is concerned.

Schultheis, Timothy James

In no case should a panelboard be allowed to be mounted so access to the face of the panelboard is from above or below. This is a significant safety hazard that must be avoided.

**First Revision No. 8422-NFPA 70-2021 [Definition: Switch, General-Use Snap.]****Switch, General-Use Snap. (General-Use Snap Switch)**

A form of general-use switch constructed so that it can be installed in device boxes or on box covers, or otherwise used in conjunction with wiring systems recognized by this *Code*. (CMP-9)

Submitter Information Verification

Committee: NEC-P09

Submission Date: Tue Jan 05 19:51:30 EST 2021

Committee Statement

Committee Statement: The revision provides compliance with Section 2.2.2.3.1 of the NEC Style Manual.

Response Message: FR-8422-NFPA 70-2021

Ballot Results

✓ **This item has passed ballot**

12 Eligible Voters

0 Not Returned

11 Affirmative All

1 Affirmative with Comments

0 Negative with Comments

0 Abstention

Affirmative All

Belisle, Rodney D.

Colvin, Carmon A.

Hartwell, Frederic P.

Hollander, Richard

Miller, Kevin R.

Osborne, Robert D.

Parker, Ryan

Ridgeway, Ronnie H.

Schultheis, Timothy James

Sullivan, Paul B.

Sumbera, Darrell M.

Affirmative with Comment

Sasso, Nick

Affirmative.

**First Revision No. 8421-NFPA 70-2021 [Definition: Switch, General-Use.]****Switch, General-Use. (General-Use Switch)**

A switch intended for use in general distribution and branch circuits. It is rated in amperes, and it is capable of interrupting its rated current at its rated voltage. (CMP-9)

Submitter Information Verification

Committee: NEC-P09

Submittal Date: Tue Jan 05 19:47:14 EST 2021

Committee Statement

Committee Statement: The revision provides compliance with Section 2.2.2.3.1 of the NEC Style Manual.

Response Message: FR-8421-NFPA 70-2021

Ballot Results

✔ **This item has passed ballot**

12 Eligible Voters

0 Not Returned

11 Affirmative All

1 Affirmative with Comments

0 Negative with Comments

0 Abstention

Affirmative All

Belisle, Rodney D.

Colvin, Carmon A.

Hartwell, Frederic P.

Hollander, Richard

Miller, Kevin R.

Osborne, Robert D.

Parker, Ryan

Ridgeway, Ronnie H.

Schultheis, Timothy James

Sullivan, Paul B.

Sumbera, Darrell M.

Affirmative with Comment

Sasso, Nick

Affirmative.

**First Revision No. 8423-NFPA 70-2021 [Definition: Switch, Isolating.]****Switch, Isolating_ (Isolating Switch)**

A switch intended for isolating an electrical circuit from the source of power. It has no interrupting rating, and it is intended to be operated only after the circuit has been opened by some other means. (CMP-9)

Submitter Information Verification

Committee: NEC-P09

Submission Date: Tue Jan 05 19:55:13 EST 2021

Committee Statement

Committee Statement: The revision provides compliance with Section 2.2.2.3.1 of the NEC Style Manual.

Response Message: FR-8423-NFPA 70-2021

Ballot Results

✓ **This item has passed ballot**

12 Eligible Voters

0 Not Returned

11 Affirmative All

1 Affirmative with Comments

0 Negative with Comments

0 Abstention

Affirmative All

Belisle, Rodney D.

Colvin, Carmon A.

Hartwell, Frederic P.

Hollander, Richard

Miller, Kevin R.

Osborne, Robert D.

Parker, Ryan

Ridgeway, Ronnie H.

Schultheis, Timothy James

Sullivan, Paul B.

Sumbera, Darrell M.

Affirmative with Comment

Sasso, Nick

Affirmative.

**First Revision No. 7702-NFPA 70-2020 [Section No. 312.2]****312.2 Damp and or Wet Locations.**

In damp or wet locations, surface-type enclosures within the scope of this article shall be placed or equipped so as to prevent moisture or water from entering and accumulating within the cabinet or cutout box, and shall be mounted so there is at least 6-mm (1/4-in.) airspace between the enclosure and the wall or other supporting surface. Enclosures installed in wet locations shall be weatherproof. For enclosures in wet locations, raceways or cables entering above the level of uninsulated live parts shall use fittings listed for wet locations.

Exception: Nonmetallic enclosures shall be permitted to be installed without the airspace on a concrete, masonry, tile, or similar surface.

Informational Note: For See 300.6 for protection against corrosion, ~~see 300.6~~.

Submitter Information Verification

Committee: NEC-P09

Submittal Date: Mon Dec 07 14:57:58 EST 2020

Committee Statement

Committee Statement: CMP-9 is revising the section title to agree with the text. A given location cannot be both damp and wet.

CMP-9 is placing the reference at the beginning of the Informational Note, to comply with the new NEC Style Manual at 3.1.3.1

Response Message: FR-7702-NFPA 70-2020

Public Input No. 457-NFPA 70-2020 [Section No. 312.2]

Ballot Results

✔ **This item has passed ballot**

12 Eligible Voters

0 Not Returned

11 Affirmative All

1 Affirmative with Comments

0 Negative with Comments

0 Abstention

Affirmative All

Belisle, Rodney D.

Colvin, Carmon A.

Hartwell, Frederic P.

Hollander, Richard

Miller, Kevin R.

Osborne, Robert D.

Parker, Ryan

Ridgeway, Ronnie H.

Schultheis, Timothy James

Sullivan, Paul B.

Sumner, Darrell M.

Affirmative with Comment

Sasso, Nick

Affirmative.

**First Revision No. 7704-NFPA 70-2020 [Section No. 312.5 [Excluding any Sub-Sections]]**

~~Conductors~~ Cable assemblies and insulated conductors entering enclosures within the scope of this article shall be protected from abrasion and shall comply with 312.5(A) through (C).

Submitter Information Verification

Committee: NEC-P09

Submittal Date: Mon Dec 07 15:20:48 EST 2020

Committee Statement

Committee Statement: Cmp-9 is correcting the parent language to accurately cover the intended coverage of this section.

Response Message: FR-7704-NFPA 70-2020

[Public Input No. 353-NFPA 70-2020 \[Section No. 312.5 \[Excluding any Sub-Sections\]\]](#)

Ballot Results

✓ **This item has passed ballot**

12 Eligible Voters

0 Not Returned

11 Affirmative All

1 Affirmative with Comments

0 Negative with Comments

0 Abstention

Affirmative All

Belisle, Rodney D.

Colvin, Carmon A.

Hartwell, Frederic P.

Hollander, Richard

Miller, Kevin R.

Osborne, Robert D.

Parker, Ryan

Ridgeway, Ronnie H.

Schultheis, Timothy James

Sullivan, Paul B.

Sumbera, Darrell M.

Affirmative with Comment

Sasso, Nick

Affirmative.

**First Revision No. 7708-NFPA 70-2020 [Section No. 312.8(A)]****(A) Splices, Taps, and Feed-Through Conductors.**

The wiring space of enclosures for switches or overcurrent devices shall be permitted for conductors feeding through, spliced, or tapping off to other enclosures, switches, or overcurrent devices where all of the following conditions are met:

- (1) The total of all conductors installed at any cross section of the wiring space does not exceed 40 percent of the cross-sectional area of that space.
- (2) The total area of all conductors, splices, and taps installed at any cross section of the wiring space does not exceed 75 percent of the cross-sectional area of that space.
- (3) The bending space for conductors 4 AWG and larger complies with 314.28(A)(2) .
- (4) A warning label complying with 110.21(B) is applied to the enclosure that identifies the closest disconnecting means for any feed-through conductors.

Submitter Information Verification

Committee: NEC-P09

Submittal Date: Mon Dec 07 16:19:08 EST 2020

Committee Statement

Committee Statement: If large conductors (4 AWG and up) are installed in these wiring spaces, the dimensions in 314.28(A)(2) should be applied. These enclosures do not differ in terms of minimum bending space concerns from comparable enclosures in Art. 314.

Response Message: FR-7708-NFPA 70-2020

Public Input No. 409-NFPA 70-2020 [Section No. 312.8(A)]

Ballot Results

✔ **This item has passed ballot**

12 Eligible Voters

0 Not Returned

11 Affirmative All

1 Affirmative with Comments

0 Negative with Comments

0 Abstention

Affirmative All

Belisle, Rodney D.

Colvin, Carmon A.

Hartwell, Frederic P.

Hollander, Richard

Miller, Kevin R.

Osborne, Robert D.

Parker, Ryan

Ridgeway, Ronnie H.

Schultheis, Timothy James

Sullivan, Paul B.

Sumbera, Darrell M.

Affirmative with Comment

Sasso, Nick

Affirmative.

**First Revision No. 7709-NFPA 70-2020 [Section No. 312.8(B)(1)]****(1) Identification.**

The ~~power~~ **Power** monitoring or energy management equipment shall either be identified as a field installable accessory as part of the listed equipment or is be a listed kit evaluated for field installation in switch or overcurrent device enclosures.

Submitter Information Verification

Committee: NEC-P09

Submittal Date: Mon Dec 07 16:27:06 EST 2020

Committee Statement

Committee Statement: CMP-9 is editorially correcting the syntax of the existing text to clarify that the equipment in any given enclosure may be either an accessory or a kit, with differing standards of product acceptance as applicable.

Response Message: FR-7709-NFPA 70-2020

Public Input No. [2295-NFPA 70-2020 \[Section No. 312.8\(B\)\(1\)\]](#)

Ballot Results

✓ **This item has passed ballot**

12 Eligible Voters

0 Not Returned

11 Affirmative All

1 Affirmative with Comments

0 Negative with Comments

0 Abstention

Affirmative All

Belisle, Rodney D.

Colvin, Carmon A.

Hartwell, Frederic P.

Hollander, Richard

Miller, Kevin R.

Osborne, Robert D.

Parker, Ryan

Ridgeway, Ronnie H.

Schultheis, Timothy James

Sullivan, Paul B.

Sumbera, Darrell M.

Affirmative with Comment

Sasso, Nick

Affirmative.



First Revision No. 7820-NFPA 70-2020 [New Section after 312.9]

312.10 Screws or Other Fasteners.

Screws or other fasteners used for attaching covers or devices shall be as provided by or as specified by the manufacturer. Screws or fasteners installed in the field for labels or other equipment and that enter wiring spaces shall comply with the following as applicable:

- (1) Screws shall be machine type with blunt ends.
- (2) Other fasteners shall have blunt ends.
- (3) Screws or other fasteners shall extend into the enclosure no more than 6 mm ($\frac{1}{4}$ in.) unless the end is protected with an approved means.

Exception to (3): Screws or other fasteners shall be permitted to extend into the enclosure not more than 11 mm ($\frac{7}{16}$ in.) if located within 10 mm ($\frac{3}{8}$ in.) of an enclosure wall.

Submitter Information Verification

Committee: NEC-P09

Submittal Date: Wed Dec 09 11:19:28 EST 2020

Committee Statement

Committee Statement: CMP-9 is addressing the hazards involved in the insertion, blind or otherwise, of screws into enclosures within the scope of Art. 312. Any screw sanctioned by the equipment manufacturer will be automatically acceptable. Other screws, such as those used to attach identifying medallions must have machine threads and have blunt ends. This eliminates sharp points and coarse threads with the attendant sharp-edged thread exposures of typical sheet metal screws. The length of penetration is also limited in areas of an enclosure that form a boundary of a wiring gutter or other wiring space. For such exposures, the penetration is limited to $\frac{1}{4}$ inch. However, if the penetration in such cases is near (within $\frac{3}{8}$ inch) an adjacent wall, the length increases to allow a $\frac{1}{2}$ inch screw (expressed in terms of the amount of actual penetration, or $\frac{7}{16}$ ths inch). This reflects the successful use of screws to attach covers on boxes and wireways.

Response Message: FR-7820-NFPA 70-2020

[Public Input No. 1214-NFPA 70-2020 \[New Section after 312.10\(C\)\]](#)

[Public Input No. 1097-NFPA 70-2020 \[New Section after 312.11\(D\)\]](#)

Ballot Results

✔ This item has passed ballot

12 Eligible Voters

0 Not Returned

11 Affirmative All

0 Affirmative with Comments

1 Negative with Comments

0 Abstention

Affirmative All

Belisle, Rodney D.

Colvin, Carmon A.

Hartwell, Frederic P.

Hollander, Richard

Miller, Kevin R.

Osborne, Robert D.

Parker, Ryan
Ridgeway, Ronnie H.
Schultheis, Timothy James
Sullivan, Paul B.
Sumbera, Darrell M.

Negative with Comment

Sasso, Nick

Good in principle, but the language in subsection (3) is for the most part unenforceable and VAGUE. Also - what is the "approved means" for protecting the end of a sharp screw? It's easy to state this. Unfortunately, there was no thought behind the words and this language in subsection 3 may create MORE PROBLEMS FOR THE ELECTRICAL INSPECTOR in the field, IMHO. What exactly, is an "approved means?" Would a small block of wood, strategically placed somewhere inside the panelboard, be an approved means? If the electrician takes his lineman pliers and cuts off the screw tip, would this suffice? Would pieces of plastic, constitute an approved means? WHAT IS AN APPROVED MEANS? Place yourself, if you can, in the position of the electrical inspector, because this is exactly what is going to happen. We run across very creative ECs from time to time. So if the CMP-9 language states "approved means" then the Panel should have at least a few examples of what constitutes an approved means. Please tell me what they are - just one or two examples... I'm listening... If none come to mind, then maybe the screw should simply extend no more than 1/4-inch (period) and don't give an easy out by stating "approved means" if the Code Panel can't even think up what an "approved means" would be. Simple. Also I feel that the exception to 3 is pretty much nonsense. It's cumbersome, unenforceable, and will create MORE PROBLEMS FOR THE ELECTRICAL INSPECTOR in the field. This needs to be stricken. I hope that CMP-9 will start to listen to the electrical inspectors more as time moves forward. If not, then I don't think that the panel can succeed with NFPA's mission.

**First Revision No. 7743-NFPA 70-2020 [Section No. 312.10]****312.100 Material.**

Cabinets, cutout boxes, and meter socket enclosures shall comply with 312.100(A) through (C).

(A) Metal Cabinets and Cutout Boxes.

Metal enclosures within the scope of this article shall be protected both inside and outside against corrosion.

(B) Strength.

The design and construction of enclosures within the scope of this article shall be such as to secure ample strength and rigidity. If constructed of sheet steel, the metal thickness shall not be less than 1.35 mm (0.053 in.) uncoated.

(C) Nonmetallic Cabinets.

Nonmetallic cabinets shall be listed, or they shall be submitted for approval prior to installation.

Submitter Information Verification

Committee: NEC-P09

Submittal Date: Tue Dec 08 08:13:54 EST 2020

Committee Statement

Committee Statement: CMP-9 is renumbering the two sections in Part II to comply with the decade numbering rule in the Style Manual at 2.4.2.1, as well as the general rules for parallel numbering in 2.4.1 with respect to most Chapter 3 wiring methods where the numbering in Construction parts begins at three figures. In this case, CMP-9 is retaining the units digit in both renumbered sections to provide a point of mental reference for current NEC users. CMP-9 followed the same procedure when it renumbered Art. 314 in the 1993 cycle (Comment 9-3). (This is related to FR 7744)

Response Message: FR-7743-NFPA 70-2020

Ballot Results

✔ This item has passed ballot

12 Eligible Voters

0 Not Returned

11 Affirmative All

1 Affirmative with Comments

0 Negative with Comments

0 Abstention

Affirmative All

Belisle, Rodney D.

Colvin, Carmon A.

Hartwell, Frederic P.

Hollander, Richard

Miller, Kevin R.

Osborne, Robert D.

Parker, Ryan

Ridgeway, Ronnie H.

Schultheis, Timothy James

Sullivan, Paul B.

Sumbera, Darrell M.

Affirmative with Comment

Sasso, Nick

Affirmative.

**First Revision No. 7711-NFPA 70-2020 [New Section after 312.11]****312.102 Doors or Covers.**

Cabinets, cutout boxes, and meter socket enclosures shall be equipped with doors or covers.

Submitter Information Verification

Committee: NEC-P09

Submission Date: Mon Dec 07 16:42:09 EST 2020

Committee Statement

Committee Statement: CMP-9 is inserting a rule that will assure that covers are provided. Unlike the comparable requirement for boxes in 314.25, this rule is being inserted in Part II of the article that addresses product standards. The covers for these enclosures are highly specialized and therefore should be created by the equipment manufacturers involved and included in the product acceptance evaluation. Although this action does fill a gap in the Code, CMP-9 concludes such covers are routinely being manufactured and shipped with equipment now being installed in the field.

Response Message: FR-7711-NFPA 70-2020

Public Input No. 2901-NFPA 70-2020 [New Section after 312.11]

Ballot Results

✔ **This item has passed ballot**

12 Eligible Voters

0 Not Returned

11 Affirmative All

1 Affirmative with Comments

0 Negative with Comments

0 Abstention

Affirmative All

Belisle, Rodney D.

Colvin, Carmon A.

Hartwell, Frederic P.

Hollander, Richard

Miller, Kevin R.

Osborne, Robert D.

Parker, Ryan

Ridgeway, Ronnie H.

Schultheis, Timothy James

Sullivan, Paul B.

Sumbera, Darrell M.

Affirmative with Comment

Sasso, Nick

Affirmative.



First Revision No. 7744-NFPA 70-2020 [Section No. 312.11]

312.101 Spacing.

The spacing within cabinets and cutout boxes shall comply with 312.101(A) through (D).

(A) General.

Spacing within cabinets and cutout boxes shall provide approved spacing for the distribution of wires and cables placed in them and for a separation between metal parts of devices and apparatus mounted within them in accordance with 312.101(A)(1), (A)(2), and (A)(3).

(1) Base.

Other than at points of support, there shall be an airspace of at least 1.59 mm (0.0625 in.) between the base of the device and the wall of any metal cabinet or cutout box in which the device is mounted.

(2) Doors.

There shall be an airspace of at least 25.4 mm (1.00 in.) between any live metal part, including live metal parts of enclosed fuses, and the door.

Exception: Where the door is lined with an approved insulating material or is of a thickness of metal not less than 2.36 mm (0.093 in.) uncoated, the airspace shall not be less than 12.7 mm (0.500 in.).

(3) Live Parts.

There shall be an airspace of at least 12.7 mm (0.500 in.) between the walls, back, gutter partition, if of metal, or door of any cabinet or cutout box and the nearest exposed current-carrying part of devices mounted within the cabinet where the voltage does not exceed 250. This spacing shall be increased to at least 25.4 mm (1.00 in.) for voltages of 251 to 1000, nominal.

Exception: Where the conditions in 312.101(A)(2), Exception, are met, the airspace for nominal voltages from 251 to 600 shall be permitted to be not less than 12.7 mm (0.500 in.).

(B) Switch Clearance.

Cabinets and cutout boxes shall be deep enough to allow the closing of the doors when 30-ampere branch-circuit panelboard switches are in any position, when combination cutout switches are in any position, or when other single-throw switches are opened as far as their construction permits.

(C) Wiring Space.

Cabinets and cutout boxes that contain devices or apparatus connected within the cabinet or box to more than eight conductors, including those of branch circuits, meter loops, feeder circuits, power circuits, and similar circuits, but not including the supply circuit or a continuation thereof, shall have back-wiring spaces or one or more side-wiring spaces, side gutters, or wiring compartments.

(D) Wiring Space — Enclosure.

Side-wiring spaces, side gutters, or side-wiring compartments of cabinets and cutout boxes shall be made tight enclosures by means of covers, barriers, or partitions extending from the bases of the devices contained in the cabinet, to the door, frame, or sides of the cabinet.

Exception: Side-wiring spaces, side gutters, and side-wiring compartments of cabinets shall not be required to be made tight enclosures where those side spaces contain only conductors that enter the cabinet directly opposite to the devices where they terminate.

Partially enclosed back-wiring spaces shall be provided with covers to complete the enclosure. Wiring spaces that are required by 312.101(C) and are exposed when doors are open shall be provided with covers to complete the enclosure. Where space is provided for feed-through conductors and for splices as required in 312.8, additional barriers shall not be required.

Submitter Information Verification

Committee: NEC-P09

Submittal Date: Tue Dec 08 08:16:04 EST 2020

Committee Statement

Committee Statement: CMP-9 is renumbering the two sections in Part II to comply with the decade numbering rule in the Style Manual at 2.4.2.1, as well as the general rules for parallel numbering in 2.4.1 with respect to most Chapter 3 wiring methods where the numbering in Construction parts begins at three figures. In this case, CMP-9 is

retaining the units digit in both renumbered sections to provide a point of mental reference for current NEC users. CMP-9 followed the same procedure when it renumbered Art. 314 in the 1993 cycle (Comment 9-3). (This is related to FR 7743 and Global PI 3335).

Response FR-7744-NFPA 70-2020
Message:

Ballot Results

✔ This item has passed ballot

12 Eligible Voters

0 Not Returned

11 Affirmative All

1 Affirmative with Comments

0 Negative with Comments

0 Abstention

Affirmative All

Belisle, Rodney D.

Colvin, Carmon A.

Hartwell, Frederic P.

Hollander, Richard

Miller, Kevin R.

Osborne, Robert D.

Parker, Ryan

Ridgeway, Ronnie H.

Schultheis, Timothy James

Sullivan, Paul B.

Sumbera, Darrell M.

Affirmative with Comment

Sasso, Nick

Affirmative.



First Revision No. 7821-NFPA 70-2020 [New Section after 314.4]

314.5 Screws or Other Fasteners.

Screws or other fasteners that enter a box through a cover or a wall shall be machine-type screws or other fasteners with blunt ends, having an extension length into the box limited in accordance with the following as applicable.

- (1) Screws attaching a cover shall extend no more than 10 mm ($\frac{3}{8}$ in.).
- (2) Screws or other fasteners, other than in (1), penetrating a cover shall extend no more than 8 mm ($\frac{5}{16}$ in.).
- (3) Screws or other fasteners penetrating a wall of a box exceeding 1650 cm³ (100 in. ³) shall extend no more than 6 mm ($\frac{1}{4}$ in.), or more than 11 mm ($\frac{7}{16}$ in.) if located within 10 mm ($\frac{3}{8}$ in.) of an adjacent box wall.
- (4) Screws or other fasteners penetrating the wall of a box not exceeding 1650 cm³ (100 in. ³) and not covered in 314.23(B)(1) shall be made flush with the box interior.
- (5) Screws or other fasteners penetrating the wall of a conduit body shall be made flush with the conduit body interior.

Exception No.1 to (1) through (4): A screw shall be permitted to be longer if the end of the screw is protected.

Exception No. 2 to (4): Screws provided by a box manufacturer for the purpose of creating multiple-gang boxes from single device boxes shall not be required to be made flush with the box interior.

Submitter Information Verification

Committee: NEC-P09

Submittal Date: Wed Dec 09 12:03:14 EST 2020

Committee Statement

Committee Statement: CMP-9 is inserting language to protect against damage to conductors resulting from sharp projections from exposed threads of screws run through covers or sides of boxes. The location in Part I will make the requirement apply throughout the entire article. For correlation, CMP-9 is also inserting references to this rule throughout 314.70(A).

In all instances, the only permitted style of screw will be one with machine threads and a blunt end. This eliminates sharp points and coarse threads with the attendant sharp-edged thread exposures of typical sheet metal screws. The penetrating length varies depending on the application and location. First, a cover screw is the customary $\frac{1}{2}$ inch screw provided with boxes, expressed as the penetrating amount, or 7/16 inch. They penetrate adjacent to a box wall at or near a corner, which tends to offer additional protection to an enclosed conductor. Other screws penetrating the cover are limited to 5/16-inch penetration, which allows the customary 3/8-inch faceplate screws used to attach devices to raised covers. It is understood that work directly with a cover inherently affords greater control over wire positioning than elsewhere in the box.

Large boxes, generally those covered in Sec. 314.28, have covers supplied with $\frac{1}{2}$ -in. long screws that enter close to an enclosure wall, and that therefore allow for a 7/16ths inch penetration. Outlet and device boxes (usually not over 100 in³) are more difficult because they are often more tightly packed and with severe visual obstruction of how wires are arranging themselves against a wall of the box. For that reason, screws added to a wall of such boxes are prohibited from any extension beyond the interior wall surface. There is correlating language with 314.23(B)(1) that allows for protected screws to run through the rearward portion of such boxes for mounting purposes.

A similar limitation is imposed on screws applied to conduit bodies. A screw entering any part of a conduit bodies is likely to create damage during any stage of the process of pulling wires, and in such cases the objection stands even with a cap nut on a projecting screw end.

The second exception addresses the short gang screws that are shipped with most steel device boxes holding the sides in place; when such boxes are ganged the same screws hold the ganged boxes together. These screws are made long enough to hold the sides in place, and extend into the box by about 3/32 in. when securing adjacent gangs. They are supplied by the box manufacturers and cannot be easily shortened

to the point of being flush. CMP-9 is excusing them as well.

Response FR-7821-NFPA 70-2020
Message:

[Public Input No. 1217-NFPA 70-2020 \[Section No. 314.28\(C\)\]](#)

[Public Input No. 1101-NFPA 70-2020 \[New Section after 314.25\(C\)\]](#)

Ballot Results

✔ **This item has passed ballot**

12 Eligible Voters

0 Not Returned

11 Affirmative All

0 Affirmative with Comments

1 Negative with Comments

0 Abstention

Affirmative All

Belisle, Rodney D.

Colvin, Carmon A.

Hartwell, Frederic P.

Hollander, Richard

Miller, Kevin R.

Osborne, Robert D.

Parker, Ryan

Ridgeway, Ronnie H.

Schultheis, Timothy James

Sullivan, Paul B.

Sumbera, Darrell M.

Negative with Comment

Sasso, Nick

Good in principle, but the language in subsection (5) is for the most part unenforceable and VAGUE. Also - what does "protected" mean, for protecting the end of a sharp screw? Will a small piece of wood suffice? It's easy to state this language. Unfortunately, there was no thought behind the words and this language in subsection 5 may create MORE PROBLEMS FOR THE ELECTRICAL INSPECTOR in the field, IMHO. Place yourself, if you can, in the position of the electrical inspector, because this is exactly what is going to happen. We run across very creative ECs from time to time. So if the CMP-9 language states "protected" then the Panel should have at least a few examples of what constitutes an approved means. Please tell me what they are - just one or two examples... I'm listening... It becomes clear that the screw should be required to have a blunt end and give no other option. Exception 1 should be stricken. How do you protect a screw with a sharp end that you are screwing into a box, anyway? Can the screw be "protected" after the cover is in place? Would dipping the end of a sharp screw in hot wax constitute the required "protection?" Again, it's easy to state a word like "protected" but very little thought was put into this. It only sounds good on the surface but when one actually takes the time to THINK ABOUT IT, it's confusing and it will create MORE PROBLEMS FOR THE ELECTRICAL INSPECTOR in the field. I hope that CMP-9 will start to listen to the electrical inspectors more as time moves forward. If not, then I don't think that the panel can succeed with NFPA's mission.


First Revision No. 7727-NFPA 70-2020 [Section No. 314.16(A)(2)]
(2) Other Boxes.

Boxes 1650 cm³ (100 in.³) or less, other than those described in Table 314.16(A), and nonmetallic boxes shall be durably and legibly marked by the manufacturer with their volume(s). Boxes described in Table 314.16(A) that have a volume larger than is designated in the table shall be permitted to have their volume marked as required by this section.

Table 314.16(A) Metal Boxes

<u>Box Trade Size</u>			<u>Minimum Volume</u>		<u>Maximum Number of Conductors*</u> (arranged by AWG size)							
<u>mm</u>	<u>in.</u>	-	<u>cm³</u>	<u>in.³</u>	<u>18</u>	<u>16</u>	<u>14</u>	<u>12</u>	<u>10</u>	<u>8</u>	<u>6</u>	
100 × 32	(4 × 1¼)	round/octagonal	205	12.5	8	7	6	5	5	5	4	2
100 × 38	(4 × 1½)	round/octagonal	254	15.5	10	8	7	6	6	5	3	
100 × 54	(4 × 2⅛)	round/octagonal	353	21.5	14	12	10	9	8	7	4	
100 × 32	(4 × 1¼)	square	295	18.0	12	10	9	8	7	6	3	
100 × 38	(4 × 1½)	square	344	21.0	14	12	10	9	8	7	4	
100 × 54	(4 × 2⅛)	square	497	30.3	20	17	15	13	12	10	6	
120 × 32	(4⅞ × 1¼)	square	418	25.5	17	14	12	11	10	8	5	
120 × 38	(4⅞ × 1½)	square	484	29.5	19	16	14	13	11	9	5	
120 × 54	(4⅞ × 2⅛)	square	689	42.0	28	24	21	18	16	14	8	
75 × 50 × 38	(3 × 2 × 1½)	device	123	7.5	5	4	3	3	3	2	1	
75 × 50 × 50	(3 × 2 × 2)	device	164	10.0	6	5	5	4	4	3	2	
75 × 50 × 57	(3 × 2 × 2¼)	device	172	10.5	7	6	5	4	4	3	2	
75 × 50 × 65	(3 × 2 × 2½)	device	205	12.5	8	7	6	5	5	4	2	
75 × 50 × 70	(3 × 2 × 2¾)	device	230	14.0	9	8	7	6	5	4	2	
75 × 50 × 90	(3 × 2 × 3½)	device	295	18.0	12	10	9	8	7	6	3	
100 × 54 × 38	(4 × 2⅛ × 1½)	device	169	10.3	6	5	5	4	4	3	2	
100 × 54 × 48	(4 × 2⅛ × 1⅞)	device	213	13.0	8	7	6	5	5	4	2	
100 × 54 × 54	(4 × 2⅛ × 2⅛)	device	238	14.5	9	8	7	6	5	4	2	
95 × 50 × 65	(3¾ × 2 × 2½)	masonry box/gang	230	14.0	9	8	7	6	5	4	2	
95 × 50 × 90	(3¾ × 2 × 3½)	masonry box/gang	344	21.0	14	12	10	9	8	7	4	
min. 44.5 depth	FS — single cover/gang (1¾)		221	13.5	9	7	6	6	5	4	2	
min. 60.3 depth	FD — single cover/gang (2¾)		295	18.0	12	10	9	8	7	6	3	
min. 44.5 depth	FS — multiple cover/gang (1¾)		295	18.0	12	10	9	8	7	6	3	
min. 60.3 depth	FD — multiple cover/gang (2¾)		395	24.0	16	13	12	10	9	8	4	

*Where no volume allowances are required by 314.16(B)(2) through (B)(5) (6).

Supplemental Information

<u>File Name</u>	<u>Description</u>	<u>Approved</u>
FR_7727_70_314.16_A_2_.docx	Table 70_314.16(A)(2). For staff use.	

Submitter Information Verification

Committee: NEC-P09
Submission Date: Mon Dec 07 19:28:12 EST 2020

Committee Statement

Committee Statement: CMP-9 is correcting an error in the top row only of Table 314.16(A), in the 8 AWG column, by reducing it from 5 conductors to 4 conductors. This reflects the division of the rated volume (12.5 in³) by the required volume allowance for 8 AWG of 3 in³. This column was correct until the metrication task group made comprehensive changes throughout the 2002 NEC to shift from soft conversions to hard conversions as the default method. CMP-9 was presented with a new table (Proposal 9-14) set up with hard conversions. Every one of these values needed to be changed to soft conversions in one column, and dimensionless trade sizes in another column, all as allowed in 90.9. Had this work not been done, the NEC would have conflicted with established product standards and created chaos. During the process of making all the recalculations and related edits, the error in the 8 AWG column in the Table as submitted, which read 5 and not 4, was overlooked and it has continued until this cycle.

Response Message: FR-7727-NFPA 70-2020

Public Input No. 1954-NFPA 70-2020 [Section No. 314.16(A)(2)]

Ballot Results

✔ This item has passed ballot

12 Eligible Voters

0 Not Returned

11 Affirmative All

1 Affirmative with Comments

0 Negative with Comments

0 Abstention

Affirmative All

Belisle, Rodney D.

Colvin, Carmon A.

Hartwell, Frederic P.

Hollander, Richard

Miller, Kevin R.

Osborne, Robert D.

Parker, Ryan

Ridgeway, Ronnie H.

Schultheis, Timothy James

Sullivan, Paul B.

Sumbera, Darrell M.

Affirmative with Comment

Sasso, Nick

Affirmative.



First Revision No. 7731-NFPA 70-2020 [Section No. 314.16(B)(2)]

(2) Clamp Fill.

Where one or more internal cable clamps, whether factory or field supplied, are present in the box, a single volume allowance in accordance with Table 314.16(B)(1) shall be made based on the largest conductor present in the box. No allowance shall be required for a cable connector with its clamping mechanism outside the box.

~~A clamp assembly that incorporates a cable termination for the cable conductors shall be listed and marked for use with specific nonmetallic boxes. Conductors that originate within the clamp assembly shall be included in conductor fill calculations covered in 314.16(B)(1) as though they entered from outside the box. The clamp assembly shall not require a fill allowance, but the volume of the portion of the assembly that remains within the box after installation shall be excluded from the box volume as marked in 314.16(A)(2) .~~

Submitter Information Verification

Committee: NEC-P09

Submission Date: Mon Dec 07 19:40:00 EST 2020

Committee Statement

Committee Statement: CMP-9 is deleting the second paragraph of 314.16(B)(2) because the product line it was intended to cover is not being produced for market. It was incorporated in the 2014 NEC (Proposal 9-37) for this purpose, and the inclusion was made contingent on CMP 7 (now CMP-6) accepting correlating language in Art. 334. The panel statement supporting this action concluded by saying "CMP-9 believes the principal responsibility for determining the technical merit of this new approach should rest with CMP-7."

CMP-7 (now CMP-6) rejected that language in the 2014 cycle, with a statement to the effect that the code at that time in 334.30 did not disallow it. However, both the 2017 and the 2020 NEC refer (in 334.30) to "every cable entry into enclosures", and this method does not comply because it terminates NM cable on the outside of a box. To accomplish this, in the case of three-conductor applications, a special configuration of NM cable was developed. No challenges have been registered to this disqualifying wording (in Art. 334) to date.

CMP-9 will revisit this action during the comment period in the event there is credible reason to believe the method will actually come to market.

Response Message: FR-7731-NFPA 70-2020

[Public Input No. 2297-NFPA 70-2020 \[Section No. 314.16\(B\)\(2\)\]](#)

Ballot Results

✓ **This item has passed ballot**

12 Eligible Voters

0 Not Returned

11 Affirmative All

1 Affirmative with Comments

0 Negative with Comments

0 Abstention

Affirmative All

Belisle, Rodney D.

Colvin, Carmon A.

Hartwell, Frederic P.

Hollander, Richard

Miller, Kevin R.

Osborne, Robert D.
Parker, Ryan
Ridgeway, Ronnie H.
Schultheis, Timothy James
Sullivan, Paul B.
Sumbera, Darrell M.

Affirmative with Comment

Sasso, Nick
Affirmative.



First Revision No. 7734-NFPA 70-2020 [Section No. 314.16(B)(5)]

(5) Equipment Grounding Conductor Fill.

Where up to four equipment grounding conductors ~~or equipment bonding jumpers~~ enter a box, a single volume allowance in accordance with Table 314.16(B)(1) shall be made based on the largest equipment grounding conductor ~~or equipment bonding jumper~~ entering the box. A $\frac{1}{4}$ volume allowance shall be made for each additional equipment grounding conductor ~~or equipment bonding jumper~~ that enters the box, based on the largest equipment grounding conductor ~~or equipment bonding conductor~~ in the box.

Submitter Information Verification

Committee: NEC-P09

Submittal Date: Mon Dec 07 20:14:21 EST 2020

Committee Statement

Committee Statement: CMP-9 has decided to revisit the action taken in the comment period of the 1996 cycle, when the reference to equipment bonding jumpers was initially added (Comment 9-5). It was substantiated on the basis that these components can run within raceways. CMP-9 now concludes that any such application, if even possible, would constitute an extension of an equipment grounding conductor, and would be addressable as such. In general, such jumpers begin and end within the box. As such, counting them would conflict with the general principle of not counting such wires, as stated in the final sentence of 314.16(B)(1). Removal of this phrasing simplifies the wording of the paragraph, and increases usability.

CMP-9 is also clarifying how the $\frac{1}{4}$ volume allowance is applied when different sizes of equipment grounding conductors enter the box. The current wording bases the basic fill allowance on the largest EGC entering the box; the revised wording makes clear the logical extension of that concept when the $\frac{1}{4}$ volume adder applies. For example, the EGC allowance for eight 12 AWG EGCs is $(1+4 \times \frac{1}{4})2\frac{1}{4} = 4\frac{1}{2}$ in³. If even one of those EGCs is a 10 AWG, then the allowance increases to $(1+4 \times \frac{1}{4})2\frac{1}{2} = 5$ in³.

Response Message: FR-7734-NFPA 70-2020

[Public Input No. 2343-NFPA 70-2020 \[Section No. 314.16\(B\)\(5\)\]](#)

[Public Input No. 1291-NFPA 70-2020 \[Section No. 314.16\]](#)

Ballot Results

✓ **This item has passed ballot**

12 Eligible Voters

0 Not Returned

11 Affirmative All

1 Affirmative with Comments

0 Negative with Comments

0 Abstention

Affirmative All

Belisle, Rodney D.

Colvin, Carmon A.

Hartwell, Frederic P.

Hollander, Richard

Miller, Kevin R.

Osborne, Robert D.

Parker, Ryan

Ridgeway, Ronnie H.

Schultheis, Timothy James

Sullivan, Paul B.

Sumbera, Darrell M.

Affirmative with Comment

Sasso, Nick

Affirmative

**First Revision No. 7977-NFPA 70-2020 [Section No. 314.16(B) [Excluding any Sub-Sections]]**

The volumes in paragraphs 314.16(B)(1) through (B)(5) (B)(6) , as applicable, shall be added together. No allowance shall be required for small fittings such as locknuts and bushings. Each space within a box installed with a barrier shall be calculated separately.

Submitter Information Verification

Committee: NEC-P09

Submission Date: Mon Dec 14 06:40:08 EST 2020

Committee Statement

Committee Statement: CMP-9 is addressing the use of terminal blocks in outlet and device boxes. These are not commonly installed, but where provided, they take up enough volume to merit a conductor allowance. One example of this usage occurs in 680.23(F)(2)(b). CMP-9 concludes the double fill suggested in PI 412 is excessive, and is reducing it to a single allowance. In addition, CMP-9 is basing the allowance on the size of conductors actually landed in the terminal block; the size of an unterminated conductor should not be a factor in this calculation.

CMP 9 notes that the reference to "a GUA or conduit body" may indicate a lack of understanding on the part of the submitter as to the distinction between boxes and conduit bodies, particularly in the realm of hazardous location enclosures. Terminal blocks are not located in conduit bodies, and the fact that GUA boxes have threaded hubs does not make them conduit bodies. In addition, if such terminal blocks are attached by screws to a GUA box by drilling and tapping in the field, the continued suitability for use in hazardous locations would need to be reevaluated.

Response Message: FR-7977-NFPA 70-2020

Public Input No. 412-NFPA 70-2020 [Section No. 314.16(B) [Excluding any Sub-Sections]]

Ballot Results

✓ **This item has passed ballot**

12 Eligible Voters

0 Not Returned

10 Affirmative All

2 Affirmative with Comments

0 Negative with Comments

0 Abstention

Affirmative All

Belisle, Rodney D.

Colvin, Carmon A.

Hollander, Richard

Miller, Kevin R.

Osborne, Robert D.

Parker, Ryan

Ridgeway, Ronnie H.

Schultheis, Timothy James

Sullivan, Paul B.

Sumner, Darrell M.

Affirmative with Comment

Hartwell, Frederic P.

The enabling text for this revision is found at FR 7868; the two FRs must be correlated.

Sasso, Nick

Affirmative.

**First Revision No. 7726-NFPA 70-2020 [Section No. 314.16 [Excluding any Sub-Sections]]**

Boxes and conduit bodies shall be of an approved size to provide free space for all enclosed conductors. In no case shall the volume of the box, as calculated in 314.16(A), be less than the fill calculation as calculated in 314.16(B). The minimum volume for conduit bodies shall be as calculated in 314.16(C).

~~The provisions of this~~ This section shall not apply to terminal housings supplied with motors or generators.

Informational Note: ~~For See 430.12 for~~ volume requirements of motor or generator terminal housings, ~~see 430.12~~.

Boxes and conduit bodies enclosing conductors 4 AWG or larger shall also comply with ~~the provisions of~~ 314.28. Outlet and device boxes shall also comply with 314.24.

Submitter Information Verification

Committee: NEC-P09

Submission Date: Mon Dec 07 19:19:25 EST 2020

Committee Statement

Committee Statement: CMP-9 is removing two superfluous references to “the provisions of” that do not add substance to the Code. Although the PI only refers to 314.16, CMP-9 is reviewing all such usage within Art. 312 and 314.

CMP-9 is also correcting the structure of the Informational Note to comply with the Style Manual.

Response Message: FR-7726-NFPA 70-2020

Public Input No. 4131-NFPA 70-2020 [Section No. 314.16 [Excluding any Sub-Sections]]

Ballot Results

✓ **This item has passed ballot**

12 Eligible Voters

0 Not Returned

11 Affirmative All

1 Affirmative with Comments

0 Negative with Comments

0 Abstention

Affirmative All

Belisle, Rodney D.

Colvin, Carmon A.

Hartwell, Frederic P.

Hollander, Richard

Miller, Kevin R.

Osborne, Robert D.

Parker, Ryan

Ridgeway, Ronnie H.

Schultheis, Timothy James

Sullivan, Paul B.

Sumbera, Darrell M.

Affirmative with Comment

Sasso, Nick

Affirmative.



First Revision No. 7738-NFPA 70-2020 [Section No. 314.17]

314.17 Conductors and Cables Entering Boxes, Conduit Bodies, or Fittings.

Conductors entering boxes, conduit bodies, or fittings shall be protected from abrasion. Conductors and cables shall comply with 314.17(A) through (D) (C).

(A) Openings to Be Closed.

Openings through which conductors enter shall be closed in a an approved manner ~~identified for the application~~.

(B) Boxes and Conduit Bodies.

The installation of the conductors and cables in boxes and conduit bodies shall comply with 314.17(B)(1) through (B)(4).

(1) Conductors Entering Through Individual Holes or Through Flexible Tubing.

For messenger-supported wiring, open wiring on insulators, or concealed knob-and-tube wiring, the conductors shall enter the box through individual holes. In installations where metal boxes or conduit bodies are used with conductors unprotected by flexible tubing, the individual openings shall be provided with insulating bushings. Where flexible tubing is used to enclose the conductors, the tubing shall extend from the last insulating support to not less than 6 mm ($\frac{1}{4}$ in.) inside the box or conduit body and 6 mm ($\frac{1}{4}$ in.) beyond the end of any cable clamp. The wiring method shall be secured to the box or conduit body.

(2) Conductors Cables Entering Through Cable Clamps.

Where cable assemblies with nonmetallic ~~sheathes~~ sheaths are used, the sheath shall extend not less than 6 mm ($\frac{1}{4}$ in.) inside the box and 6 mm ($\frac{1}{4}$ in.) beyond the end of any cable clamp. Except as ~~provided~~ covered in 300.15(C), the wiring method shall be secured to the box or conduit body.

Exception: Where nonmetallic-sheathed cable is used with single gang nonmetallic boxes not larger than a nominal size 57 mm × 100 mm (2 $\frac{1}{4}$ in. × 4 in.) mounted in walls or ceilings, and where the cable is fastened within 200 mm (8 in.) of the box measured along the sheath and where the sheath extends through a cable knockout not less than 6 mm ($\frac{1}{4}$ in.), securing the cable to the box shall not be required. Multiple cable entries shall be permitted in a single cable knockout opening.

(3) Conductors and Cables Entering Through Raceways.

Where the raceway is complete between boxes, conduit bodies, or both and encloses individual conductors or nonmetallic cable assemblies or both, the conductors or cable assemblies shall not be required to be additionally secured. Where raceways enclose cable assemblies as ~~provided~~ covered in 300.15(C), the cable assembly shall not be required to be additionally secured within the box or conduit body.

(4) Temperature Limitation.

Nonmetallic boxes and conduit bodies shall be suitable for the lowest temperature-rated conductor entering the box or conduit body.

(C) Conductors 4 AWG or Larger.

Installation shall comply with 300.4(G).

Informational Note: See 110.12(A) for requirements on closing unused cable and raceway knockout openings.

Submitter Information Verification

Committee: NEC-P09

Submittal Date: Mon Dec 07 20:36:21 EST 2020

Committee Statement

Committee Statement: CMP-9 is making editorial corrections and improvements to this section. Specifically, the title and parent language now specifically include the usual application to cables, and the application is corrected to (A) through (C). The current reference to (D) is a typo left over from the 2020 NEC reorganization of this section. The standard of product acceptance is revised to “approved” allowing some flexibility on the part of an AHJ. The spelling error on the plural form of the word “sheath” is corrected to “sheaths”. The reference in (B)(3) to “as provided” is changed to “as covered” which is more correct.

CMP-9 is also adjusting the wording regarding the length of cable sheaths to clarify that the $\frac{1}{4}$ -inch dimension is taken from the point where the cable emerges from the clamping mechanism and not from the

point where it enters the box.

Response FR-7738-NFPA 70-2020
Message:

[Public Input No. 3737-NFPA 70-2020 \[Section No. 314.17\(B\)\(2\)\]](#)

[Public Input No. 1293-NFPA 70-2020 \[Section No. 314.17\]](#)

[Public Input No. 372-NFPA 70-2020 \[Section No. 314.17\]](#)

Ballot Results

✔ **This item has passed ballot**

12 Eligible Voters

0 Not Returned

11 Affirmative All

1 Affirmative with Comments

0 Negative with Comments

0 Abstention

Affirmative All

Belisle, Rodney D.

Colvin, Carmon A.

Hartwell, Frederic P.

Hollander, Richard

Miller, Kevin R.

Osborne, Robert D.

Parker, Ryan

Ridgeway, Ronnie H.

Schultheis, Timothy James

Sullivan, Paul B.

Sumbera, Darrell M.

Affirmative with Comment

Sasso, Nick

Affirmative.

**First Revision No. 7860-NFPA 70-2020 [Section No. 314.23(A)]****(A) Surface Mounting.**

An enclosure mounted on a building or other surface shall be rigidly and securely fastened in place. If the surface does not provide rigid and secure support, additional support in accordance with ~~other provisions of~~ this section shall be provided.

Submitter Information Verification

Committee: NEC-P09

Submittal Date: Wed Dec 09 21:15:03 EST 2020

Committee Statement

Committee Statement: CMP-9 is generally removing phrasing with respect to following the provisions of another section in favor of a simple reference to the necessary location.

Response Message: FR-7860-NFPA 70-2020

Ballot Results

✓ **This item has passed ballot**

12 Eligible Voters

0 Not Returned

11 Affirmative All

1 Affirmative with Comments

0 Negative with Comments

0 Abstention

Affirmative All

Belisle, Rodney D.

Colvin, Carmon A.

Hartwell, Frederic P.

Hollander, Richard

Miller, Kevin R.

Osborne, Robert D.

Parker, Ryan

Ridgeway, Ronnie H.

Schultheis, Timothy James

Sullivan, Paul B.

Sumbera, Darrell M.

Affirmative with Comment

Sasso, Nick

Affirmative.

**First Revision No. 7742-NFPA 70-2020 [Section No. 314.23(D)(2)]****(2) Support Wires.**

The installation shall comply with ~~300.11(A)~~ 300.11(B). The enclosure shall be secured, using identified methods, to ceiling support wire(s), including any additional support wire(s) installed for ceiling support. Support wire(s) used for enclosure support shall be fastened at each end so as to be taut within the ceiling cavity.

Submitter Information Verification

Committee: NEC-P09

Submission Date: Mon Dec 07 21:03:00 EST 2020

Committee Statement

Committee Statement: CMP-9 is correcting the reference in Art. 300 from 300.11(A) to 300.11(B). Sec. 300.11 was reorganized in the 2017 cycle and this reference was not correlated at that time.

Response Message: FR-7742-NFPA 70-2020

Public Input No. 3852-NFPA 70-2020 [Section No. 314.23(D)(2)]

Ballot Results

✔ **This item has passed ballot**

12 Eligible Voters

0 Not Returned

11 Affirmative All

1 Affirmative with Comments

0 Negative with Comments

0 Abstention

Affirmative All

Belisle, Rodney D.

Colvin, Carmon A.

Hartwell, Frederic P.

Hollander, Richard

Miller, Kevin R.

Osborne, Robert D.

Parker, Ryan

Ridgeway, Ronnie H.

Schultheis, Timothy James

Sullivan, Paul B.

Sumbera, Darrell M.

Affirmative with Comment

Sasso, Nick

Affirmative.

**First Revision No. 7749-NFPA 70-2020 [Section No. 314.23(H)(1)]****(1) Flexible Cord.**

A box shall be supported from a multiconductor cord or cable in an approved manner that protects the conductors against strain, ~~such as a strain-relief connector threaded into a box with a hub~~. A connection to a box equipped with a hub shall be made with a listed cord grip attachment fitting marked for use with a threaded hub.

Submitter Information Verification

Committee: NEC-P09

Submittal Date: Tue Dec 08 11:04:51 EST 2020

Committee Statement

Committee Statement: CMP-9 is revising the language of this paragraph to correctly integrate the provisions of the applicable UL guide card requirements that apply to fittings that connect flexible cord to enclosures equipped with hubs. Such applications require the use of tapered NPT threads.

CMP-9 is resolving the part of this PI that addresses supply connections because this section does not apply to the provisions regarding the securement of flexible cord from a ceiling box or comparable exit point. See 400.14 for coverage of this topic, a location within the jurisdiction of CMP-6.

Response Message: FR-7749-NFPA 70-2020

Public Input No. 1100-NFPA 70-2020 [Section No. 314.23(H)(1)]

Ballot Results

✔ **This item has passed ballot**

12 Eligible Voters

0 Not Returned

11 Affirmative All

1 Affirmative with Comments

0 Negative with Comments

0 Abstention

Affirmative All

Belisle, Rodney D.

Colvin, Carmon A.

Hartwell, Frederic P.

Hollander, Richard

Miller, Kevin R.

Osborne, Robert D.

Parker, Ryan

Ridgeway, Ronnie H.

Schultheis, Timothy James

Sullivan, Paul B.

Sumbera, Darrell M.

Affirmative with Comment

Sasso, Nick

Affirmative.

**First Revision No. 7858-NFPA 70-2020 [Section No. 314.23 [Excluding any Sub-Sections]]**

Enclosures within the scope of this article shall be supported in accordance with ~~one or more of the provisions in~~ 314.23(A) through (H) as applicable .

Submitter Information Verification

Committee: NEC-P09

Submittal Date: Wed Dec 09 21:10:46 EST 2020

Committee Statement

Committee Statement: CMP-9 is generally removing phrasing with respect to following the provisions of another section in favor of a simple reference to the necessary location.

Response Message: FR-7858-NFPA 70-2020

Ballot Results

✓ **This item has passed ballot**

12 Eligible Voters

0 Not Returned

11 Affirmative All

1 Affirmative with Comments

0 Negative with Comments

0 Abstention

Affirmative All

Belisle, Rodney D.

Colvin, Carmon A.

Hartwell, Frederic P.

Hollander, Richard

Miller, Kevin R.

Osborne, Robert D.

Parker, Ryan

Ridgeway, Ronnie H.

Schultheis, Timothy James

Sullivan, Paul B.

Sumbera, Darrell M.

Affirmative with Comment

Sasso, Nick

Affirmative.



First Revision No. 7869-NFPA 70-2020 [Section No. 314.24]

314.24 Depth Dimensions of Boxes.

Outlet and device boxes shall have an approved depth dimensions to allow equipment installed within them to be mounted properly and without likelihood of damage to conductors within the box.

(A) Depth of Outlet Boxes Without Enclosed Devices or Utilization Equipment.

Outlet boxes that do not enclose devices or utilization equipment shall have a minimum internal depth of 12.7 mm ($\frac{1}{2}$ in.).

(B) Depth of Outlet and Device Boxes with Enclosed Devices or Utilization Equipment.

Outlet and device boxes that enclose devices or utilization equipment shall have a minimum internal depth that accommodates the rearward projection of the equipment and the size of the conductors that supply the equipment. The internal depth shall include, where used, that of any extension boxes, plaster rings, or raised covers. The internal depth shall comply with ~~all applicable provisions of 314.24(B)(1) through (B)(5)~~ as applicable.

(1) Large Equipment.

Boxes that enclose devices or utilization equipment that projects more than 48 mm ($1\frac{7}{8}$ in.) rearward from the mounting plane of the box shall have a depth that is not less than the depth of the equipment plus 6 mm ($\frac{1}{4}$ in.).

(2) Conductors Larger Than 4 AWG.

Boxes that enclose devices or utilization equipment supplied by conductors larger than 4 AWG shall be identified for their specific function.

Exception to (2): Devices or utilization equipment supplied by conductors larger than 4 AWG shall be permitted to be mounted on or in junction and pull boxes larger than 1650 cm³ (100 in.³) if the spacing at the terminals meets the requirements of 312.6.

(3) Conductors 8, 6, or 4 AWG.

Boxes that enclose devices or utilization equipment supplied by 8, 6, or 4 AWG conductors shall have an internal depth that is not less than 52.4 mm ($2\frac{1}{16}$ in.).

(4) Conductors 12 or 10 AWG.

Boxes that enclose devices or utilization equipment supplied by 12 or 10 AWG conductors shall have an internal depth that is not less than 30.2 mm ($1\frac{3}{16}$ in.). Where the equipment projects rearward from the mounting plane of the box by more than 25 mm (1 in.), the box shall have a depth not less than that of the equipment plus 6 mm ($\frac{1}{4}$ in.). Where wiring enters the center portion of the rear of a box opposite to the equipment, the minimum clearance shall be increased to 13 mm ($\frac{1}{2}$ in.).

(5) Conductors 14 AWG and Smaller.

Boxes that enclose devices or utilization equipment supplied by 14 AWG or smaller conductors shall have a depth that is not less than 23.8 mm ($1\frac{5}{16}$ in.).

Exception to (1) through (5): Devices or utilization equipment that is listed to be installed with specified boxes shall be permitted.

Detail FR-7870

(C) Clearances for Side-Wiring Entrances.

The rearward projection of devices or equipment shall not be greater than the depth of a knockout being used for a side-wiring entrance, as measured to its centerline parallel to the rear of the box opposite to the equipment, unless the clearance from the inside wall of the box equals or exceeds 13 mm ($\frac{1}{2}$ in.). The term *side* applies to any wall of a box other than the one opposite to the opening.

Submitter Information Verification

Committee: NEC-P09

Submittal Date: Thu Dec 10 06:41:50 EST 2020

Committee Statement

Committee Statement: CMP-9 is adjusting the language by broadening the reach of this section to address side entries. CMP-9 is aware of actual damage to conductors from installed devices or other equipment of sufficient size to create a

conflict with entering conductors. The prevailing product standards create an acceptable size envelope for devices (or other equipment) mounted within boxes using yokes secured to customary gang points. This envelope is 1 3/4 in. wide by 2 13/16 in. high, with rounded corners having a radius of 7/16 in., and a plethora of devices take full advantage of this allotted profile. The same standards place no limitations on equipment depth. CMP 9 has informally surveyed available designs and found enormous depth variations in the market, very much complicating the creation of this requirement.

For nominal 3 by 2 device boxes, any side entrance at the level of the device is a non-starter and will fail the new rule. For a 4-in. square box with two device yokes, either on internal gang mounts or the more usual case of a plaster ring (or raised cover), the rule gets interesting. The box interior will exceed the maximum device length by about 1 1/8 in, and therefore accommodate a top or bottom entry (considered in this statement as being in line with the yoke) at either end.

However, an entry at right angles to the yoke orientation (the standard gang spacing is 1 13/16 in.) would enter less than 1/4-in. of available space to accommodate both a cable or raceway connection as well as wire manipulation. Attempts to force large devices into such spaces are what caused the loss experience cited in the substantiation for PI-2448. The NEC has not previously addressed this; the new rule will now prohibit such attempts.

CMP-9 does recognize that there are legitimate applications for which an entry, particularly in the case of rigid raceway methods, is preferred in this orientation. One solution is to use a larger (presumably a 4 11/16 in. square) box. Another solution is to lower the entry point by using a deeper box. The rule compares the depth of the equipment under its mounting yoke to the centerline of the wiring entry. If that line is equal to or below the equipment limit, then the entry can be used.

This may seem odd, but it is based on a careful geometric analysis that positioned the NEC limit of 9 No. 12 THHN conductors in a cross-section of 1/2 trade size EMT, and they all fit below the horizontal diameter of the EMT. In fact, as long as half the connector opening is unobstructed, in practice the entire wire fill can be routed to safely enter the enclosure. There are listed raceway connectors that have a minimal (less than 1/4 in. and no threads) extension inside a box and that make this approach practical.

CMP-9 is adjusting the wording to assure that the depth of boxes accommodates wiring method entries where those entry points line up with the backs of installed devices or equipment.

Response Message: FR-7869-NFPA 70-2020

[Public Input No. 3690-NFPA 70-2020 \[Section No. 314.24 \[Excluding any Sub-Sections\]\]](#)

[Public Input No. 3711-NFPA 70-2020 \[Section No. 314.24\(B\)\(4\)\]](#)

[Public Input No. 2448-NFPA 70-2020 \[Section No. 314.24\(B\) \[Excluding any Sub-Sections\]\]](#)

Ballot Results

✓ **This item has passed ballot**

12 Eligible Voters

0 Not Returned

11 Affirmative All

1 Affirmative with Comments

0 Negative with Comments

0 Abstention

Affirmative All

Belisle, Rodney D.

Colvin, Carmon A.

Hartwell, Frederic P.

Hollander, Richard

Miller, Kevin R.

Osborne, Robert D.

Parker, Ryan

Ridgeway, Ronnie H.

Schultheis, Timothy James

Sullivan, Paul B.

Sumbera, Darrell M.

Affirmative with Comment

Sasso, Nick

Affirmative.

**First Revision No. 7752-NFPA 70-2020 [Section No. 314.25(A)]****(A) Nonmetallic or Metal Covers and Plates.**

Nonmetallic or metal covers and plates shall be permitted. Where metal covers or plates are used, they shall comply with be connected to the equipment grounding requirements of conductor in accordance with 250.110.

Informational Note: For additional equipment grounding connection requirements, see 410.42 for metal luminaire canopies, and 404.42 404.9(B) and 406.6(B) for metal faceplates.

Submitter Information Verification

Committee: NEC-P09

Submission Date: Tue Dec 08 11:26:40 EST 2020

Committee Statement

Committee Statement: CMP-9 is removing overly simplistic references to grounding in favor of references to equipment grounding connections. CMP-9 is making comparable corrections in the informational note. However, CMP-9 is not reordering the note to place the references first, as preferred in the Style Manual at Sec. 3.1.3.1, because the compound nature of this note is more clearly expressed, and with greater economy of wording, by having the common topic first, followed by the two references expressed sequentially. CMP-9 is also correcting the Art. 404 reference in the note.

Response Message: FR-7752-NFPA 70-2020

Public Input No. 1737-NFPA 70-2020 [Section No. 314.25]

Ballot Results

✔ **This item has passed ballot**

12 Eligible Voters

0 Not Returned

11 Affirmative All

1 Affirmative with Comments

0 Negative with Comments

0 Abstention

Affirmative All

Belisle, Rodney D.

Colvin, Carmon A.

Hartwell, Frederic P.

Hollander, Richard

Miller, Kevin R.

Osborne, Robert D.

Parker, Ryan

Ridgeway, Ronnie H.

Schultheis, Timothy James

Sullivan, Paul B.

Sumner, Darrell M.

Affirmative with Comment

Sasso, Nick

Affirmative.

**First Revision No. 7755-NFPA 70-2020 [Section No. 314.25(C)]****(C) Flexible Cord Pendants.**

Covers of outlet boxes and conduit bodies having holes through which flexible cord pendants pass shall be provided with identified bushings or shall have smooth, well-rounded surfaces on which the cords ~~may~~ can bear. So-called hard rubber or composition bushings shall not be used.

Submitter Information Verification

Committee: NEC-P09

Submittal Date: Tue Dec 08 11:41:03 EST 2020

Committee Statement

Committee Statement: CMP-9 is removing instances of the word “may” because as used in its articles it does not refer to a discretionary finding on the part of an AHJ, in violation of the Style Manual at 3.1.2.

Response Message: FR-7755-NFPA 70-2020

Ballot Results

✓ **This item has passed ballot**

12 Eligible Voters

0 Not Returned

11 Affirmative All

1 Affirmative with Comments

0 Negative with Comments

0 Abstention

Affirmative All

Belisle, Rodney D.

Colvin, Carmon A.

Hartwell, Frederic P.

Hollander, Richard

Miller, Kevin R.

Osborne, Robert D.

Parker, Ryan

Ridgeway, Ronnie H.

Schultheis, Timothy James

Sullivan, Paul B.

Sumbera, Darrell M.

Affirmative with Comment

Sasso, Nick

Affirmative.

**First Revision No. 7751-NFPA 70-2020 [Section No. 314.25 [Excluding any Sub-Sections]]**

In completed installations, each box shall have a cover, faceplate, lampholder, or luminaire canopy, except where the installation complies with 410.24(B). Conduit body enclosures shall be installed with a cover, lampholder, or device. Screws used for the purpose of attaching covers, or other equipment, to the box shall be either machine screws matching the thread gauge and size that is integral to the box or shall be in accordance with the manufacturer's instructions.

Submitter Information Verification

Committee: NEC-P09

Submittal Date: Tue Dec 08 11:17:30 EST 2020

Committee Statement

Committee Statement: CMP-9 is inserting a requirement that conduit bodies must be covered after installation, and the covering options differ from those for boxes generally, as expressed in an added sentence on the topic.

Response Message: FR-7751-NFPA 70-2020

[Public Input No. 458-NFPA 70-2020 \[Section No. 314.25 \[Excluding any Sub-Sections\]\]](#)

Ballot Results

✓ **This item has passed ballot**

12 Eligible Voters

0 Not Returned

11 Affirmative All

1 Affirmative with Comments

0 Negative with Comments

0 Abstention

Affirmative All

Belisle, Rodney D.

Colvin, Carmon A.

Hartwell, Frederic P.

Hollander, Richard

Miller, Kevin R.

Osborne, Robert D.

Parker, Ryan

Ridgeway, Ronnie H.

Schultheis, Timothy James

Sullivan, Paul B.

Sumbera, Darrell M.

Affirmative with Comment

Sasso, Nick

Affirmative.

**First Revision No. 7867-NFPA 70-2020 [Section No. 314.27(A)(2)]****(2) Ceiling Outlets.**

At every outlet used exclusively for lighting, the box shall be designed or installed so that a luminaire or lampholder may can be attached. Boxes shall be required to support a luminaire weighing a minimum of 23 kg (50 lb). A luminaire that weighs more than 23 kg (50 lb) shall be supported independently of the outlet box, unless the outlet box is listed for not less than the weight to be supported. The interior of the box shall be marked by the manufacturer to indicate the maximum weight the box shall be permitted to support.

Submitter Information Verification

Committee: NEC-P09

Submission Date: Wed Dec 09 21:59:30 EST 2020

Committee Statement

Committee Statement: CMP-9 is removing instances of the word "may" because as used in its articles it does not refer to a discretionary finding on the part of an AHJ, in violation of the Style Manual at 3.1.2.

Response Message: FR-7867-NFPA 70-2020

Ballot Results

✓ **This item has passed ballot**

12 Eligible Voters

0 Not Returned

11 Affirmative All

1 Affirmative with Comments

0 Negative with Comments

0 Abstention

Affirmative All

Belisle, Rodney D.

Colvin, Carmon A.

Hartwell, Frederic P.

Hollander, Richard

Miller, Kevin R.

Osborne, Robert D.

Parker, Ryan

Ridgeway, Ronnie H.

Schultheis, Timothy James

Sullivan, Paul B.

Sumbera, Darrell M.

Affirmative with Comment

Sasso, Nick

Affirmative.

**First Revision No. 7760-NFPA 70-2020 [Section No. 314.27(C)]****(C) Boxes at Ceiling-Suspended (Paddle) Fan Outlets.**

Outlet boxes or outlet box systems used as the sole support of a ceiling-suspended (paddle) fan shall be listed, shall be marked by their manufacturer on the interior of the box as suitable for this purpose, and shall not support ceiling-suspended (paddle) fans that weigh more than 32 kg (70 lb). For outlet boxes or outlet box systems designed to support ceiling-suspended (paddle) fans that weigh more than 16 kg (35 lb), the required marking shall include the maximum weight to be supported.

Outlet boxes mounted in the ceilings of habitable rooms of dwelling occupancies in a location acceptable for the installation of a ceiling-suspended (paddle) fan shall comply with one of the following:

- (1) Listed for the sole support of ceiling-suspended (paddle) fans
- (2) ~~An outlet box complying with the applicable requirements of 314.27 and providing access to structural framing capable of supporting of a ceiling-suspended (paddle) fan bracket or equivalent~~ Installed so as to allow direct access through the box to structural framing capable of supporting a ceiling-suspended (paddle) fan without removing the box

Submitter Information Verification

Committee: NEC-P09

Submittal Date: Tue Dec 08 12:27:56 EST 2020

Committee Statement

Committee Statement: CMP-9 is inserting a marking requirement on fan boxes on their interior so the suitability is evident during a rough inspection. This is consistent with the approach taken in 314.27(A)(1) and (A)(2). CMP-9 is also clarifying the wording of (2) to the effect that the access to framing is to be directly through the box, and not dependent of the box being removed for this purpose.

Response Message: FR-7760-NFPA 70-2020

[Public Input No. 1292-NFPA 70-2020 \[Section No. 314.27\(C\)\]](#)

[Public Input No. 1216-NFPA 70-2020 \[Section No. 314.27\(C\)\]](#)

Ballot Results

✓ **This item has passed ballot**

12 Eligible Voters

0 Not Returned

10 Affirmative All

1 Affirmative with Comments

1 Negative with Comments

0 Abstention

Affirmative All

Belisle, Rodney D.

Colvin, Carmon A.

Hollander, Richard

Miller, Kevin R.

Osborne, Robert D.

Parker, Ryan

Ridgeway, Ronnie H.

Schultheis, Timothy James

Sullivan, Paul B.

Sumbera, Darrell M.

Affirmative with Comment

Hartwell, Frederic P.

CMP 9 has a solid record of responding to allegations of misuse. For the 2011 NEC, CMP 9 received credible reports of disreputable building contractors installing inexpensive luminaires hung from conventional outlet boxes in bedrooms fed by a cable assembly from the single pole switch at entry that had a spare wire in it. The obvious intent was to replace the luminaire with a paddle fan/luminaire combination after the final inspection. The 2011 NEC included a general requirement for a fan box in such cases. The wording change in the 2020 NEC responded to the advent of wireless technology that eliminated the need for a spare wire to trigger the rule. However, in all cases, the essential principle of a fan mounted to structure remained sacrosanct. The reason for the 1987 rule remains valid (paraphrasing Proposal 9-43 in the 1987 cycle); an off-balance rotational load condition subjects conventional boxes to conditions for which they are not evaluated. When a paddle fan is supported by structure, no rotational forces are imposed on the box. The safety objective of the requirement is fulfilled. Completely.

Negative with Comment

Sasso, Nick

The proposed language does not codify that a FAN BOX is required to hang a fan. This language does NOT provide a reasonable duty of care to the public. This topic of fan boxes is a hot-button topic. Some members of Code Panel 9 have expressed that they are not opposed to requiring a box capable of fan support. Some panel members say that "any box can be used" for this purpose yet provide no further instruction on how the box is to be mounted, and how the fan is to attach to the box. This is in my opinion, being irresponsible with our duty to the installers, and to the public. The "approved fan box" uses larger machine threads than a normal box, because it is actually these screws that support and attach the fan to the box. With today's rapid pace of construction, and the sheer volume of track homes and multifamily housing that is being built, it makes perfect sense to require a fan box for a ceiling fan. Whatever happened in 1985 needs to stay in 1985 and no longer warrants any argument for a regular box to be used for a ceiling fan. The year is 2021. Most contractors, builders, electricians, electrical engineers, code panel members, electrical inspectors, electrical plans examiner, building officials, and public citizens agree that a fan box is necessary. I hope that CMP-9 will start to listen to the electrical inspectors and plans examiners more, as time moves forward. If changes are not forthcoming, then it is my opinion that the panel cannot succeed at NFPA's mission with its current composition.



First Revision No. 7761-NFPA 70-2020 [Section No. 314.27(E)]

(E) Separable Weight-Supporting Ceiling Receptacles (WSCR) and Weight-Supporting Attachment Fittings (WSAF) .

Outlet boxes required in 314.27 shall be permitted to support listed ~~locking support and mounting weight-supporting ceiling~~ receptacles (WSCR) used in combination with compatible ~~weight-supporting~~ attachment fittings (WSAF) . The combination shall be identified for the support of equipment within the weight and mounting orientation limits of the listing. Where the ~~supporting receptacle~~ WSCR is installed within a box, it shall be included in the fill calculation covered in 314.16(B)(4).

Submitter Information Verification

Committee: NEC-P09

Submittal Date: Tue Dec 08 12:53:35 EST 2020

Committee Statement

Committee Statement: CMP-9 is updating the names for the existing terminology "locking support and mounting receptacles" and "attachment fitting" to correlate with newly defined terminology in Article 100, terminology that will include associated acronyms. Although optional, CMP-9 is electing to repeat the full names of the terms ["Weight Supporting Ceiling Receptacle (WSCR) and "Weight Supporting Attachment Fittings (WSAF)] in this section, their first such use in Article 314, in order to support usability.

CMP-9 is resolving all other portions of PI- 3592. The mandatory requirement for these receptacles cannot move forward here until luminaires that incorporate the attachment fittings are mandated in Art. 410. CMP-9 understands that CMP--18 is resolving PI 3423 that would accomplish this, due in part to a lack of industry standards. Optional usage of this equipment will remain acceptable under the new text.

Response Message: FR-7761-NFPA 70-2020

Public Input No. 3592-NFPA 70-2020 [Section No. 314.27(E)]

Ballot Results

✔ This item has passed ballot

12 Eligible Voters

0 Not Returned

11 Affirmative All

1 Affirmative with Comments

0 Negative with Comments

0 Abstention

Affirmative All

Belisle, Rodney D.

Colvin, Carmon A.

Hartwell, Frederic P.

Hollander, Richard

Miller, Kevin R.

Osborne, Robert D.

Parker, Ryan

Ridgeway, Ronnie H.

Schultheis, Timothy James

Sullivan, Paul B.

Sumbera, Darrell M.

Affirmative with Comment

Sasso, Nick

Affirmative.



First Revision No. 7764-NFPA 70-2020 [Section No. 314.29]

314.29 Boxes, Conduit Bodies, and Handhole Enclosures to Be Accessible.

Boxes, conduit bodies, and handhole enclosures shall be installed so that wiring ~~contained in them~~ and devices ~~contained in the boxes, conduit bodies, or handhole enclosures~~ can be rendered accessible in accordance with 314.29(A) and (B).

(A) In Buildings and Other Structures.

Boxes and conduit bodies shall be installed so the contained wiring ~~can be accessed without removing any part of the building or structure~~ and devices are accessible .

(B) Underground.

Underground boxes and handhole enclosures shall be installed so they are accessible without excavating sidewalks, paving, earth, or other substance that is to be used to establish the finished grade.

Exception: Listed boxes and handhole enclosures shall be permitted where covered by gravel, light aggregate, or noncohesive granulated soil if their location is effectively identified described and accessible for excavation. The location description shall be available to those authorized to access, maintain, or inspect the wiring.

Submitter Information Verification

Committee: NEC-P09

Submittal Date: Tue Dec 08 13:14:05 EST 2020

Committee Statement

Committee Statement: CMP-9 is making editorial improvements to the wording in this section following the restructuring in the 2020 cycle. The operational parent text now will include the exact locations intended as the targets of the rules, along with the addition of devices, if any, that may be contained within them. Part (A) is simplified by the use of the term "accessible." This term is defined in Art. 100 and the remainder of the former text covering the removal of parts of the building is redundant to the defined term as it applies to wiring methods. The underground wiring exception will now be specifically tied to Part (B), which is the part under exception. This is a NEC Style Manual requirement, at 2.6.1.

The panel is also removing the word "identified" from the exception, because the word is not being used in accordance with its Art. 100 definition. The objective of this requirement, now appropriately stated, is for there to be an accessible description of the box location so it can be easily found in the field.

Response Message: FR-7764-NFPA 70-2020

[Public Input No. 13-NFPA 70-2019 \[Section No. 314.29\]](#)

[Public Input No. 505-NFPA 70-2020 \[Section No. 314.29\(A\)\]](#)

Ballot Results

✓ This item has passed ballot

12 Eligible Voters

0 Not Returned

11 Affirmative All

1 Affirmative with Comments

0 Negative with Comments

0 Abstention

Affirmative All

Belisle, Rodney D.

Colvin, Carmon A.

Hartwell, Frederic P.
Hollander, Richard
Miller, Kevin R.
Osborne, Robert D.
Parker, Ryan
Ridgeway, Ronnie H.
Schultheis, Timothy James
Sullivan, Paul B.
Sumbera, Darrell M.

Affirmative with Comment

Sasso, Nick
Affirmative.

**First Revision No. 7767-NFPA 70-2020 [Section No. 314.42]****314.102 Bushings.**

Covers of outlet boxes and conduit bodies having holes through which flexible cord pendants ~~may~~ pass shall be provided with approved bushings or shall have smooth, well-rounded surfaces on which the cord ~~may~~ will bear. Where individual conductors pass through a metal cover, a separate hole equipped with a bushing of suitable insulating material shall be provided for each conductor. Such separate holes shall be connected by a slot as required by 300.20.

Submitter Information Verification

Committee: NEC-P09

Submittal Date: Tue Dec 08 13:26:26 EST 2020

Committee Statement

Committee Statement: CMP-9 is removing instances of the word "may" because as used in its articles it does not refer to a discretionary finding on the part of an AHJ, in violation of the Style Manual at 3.1.2.

Response Message: FR-7767-NFPA 70-2020

Ballot Results

✓ **This item has passed ballot**

12 Eligible Voters

0 Not Returned

11 Affirmative All

1 Affirmative with Comments

0 Negative with Comments

0 Abstention

Affirmative All

Belisle, Rodney D.

Colvin, Carmon A.

Hartwell, Frederic P.

Hollander, Richard

Miller, Kevin R.

Osborne, Robert D.

Parker, Ryan

Ridgeway, Ronnie H.

Schultheis, Timothy James

Sullivan, Paul B.

Sumbera, Darrell M.

Affirmative with Comment

Sasso, Nick

Affirmative.

**First Revision No. 7772-NFPA 70-2020 [Section No. 314.70(A)]**[Detail FR-7772](#)**(A) Pull and Junction Boxes.**

Where pull and junction boxes are used on systems over 1000 volts, the installation shall comply with the provisions of ~~Part IV~~ Part III and with the following general provisions of this article:

- (1) Part I, 314.2; 314.3; ~~and 314.4~~, and 314.5
- (2) Part II, 314.15; 314.17; 314.20; 314.23(A), (B), or (G); 314.28(B); and 314.29
- (3) Part III, ~~314.40(A)~~ 314.100(A) and (C); and ~~314.41~~ 314.101

Submitter Information Verification

Committee: NEC-P09

Submittal Date: Tue Dec 08 14:06:00 EST 2020

Committee Statement

Committee Statement: CMP-9 is generally removing phrasing with respect to following the provisions of another section in favor of a simple reference to the necessary location. CMP-9 is also improving on the PI by specifying the subsection designations of the referenced text.

Part IV is changed to Part III.

Response Message: FR-7772-NFPA 70-2020

Public Input No. 4135-NFPA 70-2020 [Section No. 314.70(A)]

Ballot Results

✓ **This item has passed ballot**

12 Eligible Voters

0 Not Returned

11 Affirmative All

1 Affirmative with Comments

0 Negative with Comments

0 Abstention

Affirmative All

Belisle, Rodney D.

Colvin, Carmon A.

Hartwell, Frederic P.

Hollander, Richard

Miller, Kevin R.

Osborne, Robert D.

Parker, Ryan

Ridgeway, Ronnie H.

Schultheis, Timothy James

Sullivan, Paul B.

Sumbera, Darrell M.

Affirmative with Comment

Sasso, Nick

Affirmative.

**First Revision No. 7774-NFPA 70-2020 [Section No. 314.70(B)]**[Detail FR-7779](#)**(B) Conduit Bodies.**

Where conduit bodies are used on systems over 1000 volts, the installation shall comply with ~~the provisions of Part IV~~Part III and with the following general provisions of this article:

- (1) Part I, 314.4 and 314.5
- (2) Part II, 314.15; 314.17; 314.23(A), (E), or (G); 314.28(A)(3); and 314.29
- (3) Part III, 314.40(A) 314.100(A) and 314.41 314.101

Submitter Information Verification

Committee: NEC-P09

Submittal Date: Tue Dec 08 14:26:58 EST 2020

Committee Statement

Committee Statement: CMP-9 is generally removing phrasing with respect to following the provisions of another section in favor of a simple reference to the necessary location. CMP-9 is also improving on the PI by specifying the subsection designations of the referenced text.

Part IV is changed to Part III.

Response Message: FR-7774-NFPA 70-2020

[Public Input No. 4136-NFPA 70-2020 \[Section No. 314.70\(B\)\]](#)

Ballot Results

✔ **This item has passed ballot**

12 Eligible Voters

0 Not Returned

11 Affirmative All

1 Affirmative with Comments

0 Negative with Comments

0 Abstention

Affirmative All

Belisle, Rodney D.

Colvin, Carmon A.

Hartwell, Frederic P.

Hollander, Richard

Miller, Kevin R.

Osborne, Robert D.

Parker, Ryan

Ridgeway, Ronnie H.

Schultheis, Timothy James

Sullivan, Paul B.

Sumbera, Darrell M.

Affirmative with Comment

Sasso, Nick

Affirmative.

**First Revision No. 7775-NFPA 70-2020 [Section No. 314.70(C)]**[Detail FR-7780](#)**(C) Handhole Enclosures.**

Where handhole enclosures are used on systems over 1000 volts, the installation shall comply with the provisions of ~~Part IV~~ Part III and with the following general provisions of this article:

- (1) Part I, 314.3, ~~and~~ 314.4, and 314.5
- (2) Part II, 314.15, 314.17, 314.23(G), 314.28(B), 314.29, and 314.30

Submitter Information Verification

Committee: NEC-P09

Submittal Date: Tue Dec 08 14:38:18 EST 2020

Committee Statement

Committee Statement: CMP-9 is generally removing phrasing with respect to following the provisions of another section in favor of a simple reference to the necessary location. CMP-9 is also improving on the PI by specifying the subsection designations of the referenced text.

Part IV is changed to Part III.

Response Message: FR-7775-NFPA 70-2020

[Public Input No. 4137-NFPA 70-2020 \[Section No. 314.70\(C\)\]](#)

Ballot Results

✔ **This item has passed ballot**

12 Eligible Voters

0 Not Returned

11 Affirmative All

1 Affirmative with Comments

0 Negative with Comments

0 Abstention

Affirmative All

Belisle, Rodney D.

Colvin, Carmon A.

Hartwell, Frederic P.

Hollander, Richard

Miller, Kevin R.

Osborne, Robert D.

Parker, Ryan

Ridgeway, Ronnie H.

Schultheis, Timothy James

Sullivan, Paul B.

Sumbera, Darrell M.

Affirmative with Comment

Sasso, Nick

Affirmative.

**First Revision No. 7889-NFPA 70-2020 [Section No. 404.1]****404.1 Scope.**

This article covers all switches, switching devices, and circuit breakers used as switches operating at 1000 volts and below, unless specifically referenced elsewhere in this *Code* for higher voltages.

This article does not cover wireless control equipment to which circuit conductors are not connected.

Submitter Information Verification

Committee: NEC-P09

Submittal Date: Thu Dec 10 15:05:24 EST 2020

Committee Statement

Committee Statement: In regards to PI-3280, the scope of Article 404 covers all switches, switching devices, and circuit breakers used as switches. The addition of the term "wall-mounted control devices" would be incorrect.

A wireless control device that initiates the switching function but does not connect to circuit conductors to operate, is not a "switching device", and therefore is not under the purview of Article 404.

Battery powered wireless control devices do not connect to circuit conductors.

CMP-9 realizes scope is under the purview of the Correlating Committee. CMP-9 requests the CC refer the FR to CMP-2 for information.

Response Message: FR-7889-NFPA 70-2020

[Public Input No. 3280-NFPA 70-2020 \[Section No. 404.1\]](#)

[Public Input No. 2299-NFPA 70-2020 \[Section No. 404.1\]](#)

Ballot Results

✔ **This item has passed ballot**

12 Eligible Voters

0 Not Returned

11 Affirmative All

1 Affirmative with Comments

0 Negative with Comments

0 Abstention

Affirmative All

Belisle, Rodney D.

Colvin, Carmon A.

Hartwell, Frederic P.

Hollander, Richard

Miller, Kevin R.

Osborne, Robert D.

Parker, Ryan

Ridgeway, Ronnie H.

Schultheis, Timothy James

Sullivan, Paul B.

Sumbera, Darrell M.

Affirmative with Comment

Sasso, Nick

Affirmative.



First Revision No. 7883-NFPA 70-2020 [Section No. 404.2(C)]

(C) Switches Controlling Lighting Loads.

The grounded circuit conductor for the controlled lighting circuit shall be installed at the location where switches control lighting loads that are supplied by a grounded general-purpose branch circuit serving bathrooms, hallways, stairways, and habitable rooms or occupiable spaces as defined in the applicable building code. Where multiple switch locations control the same lighting load such that the entire floor area of the room or space is visible from the single or combined switch locations, the grounded circuit conductor shall only be required at one location. A grounded conductor shall not be required to be installed at lighting switch locations under any of the following conditions:

- (1) Where conductors enter the box enclosing the switch through a raceway, provided that the raceway is large enough for all contained conductors, including a grounded conductor
- (1) ~~Where the box enclosing the switch is accessible for the installation of an additional or replacement cable without removing finish materials~~
- (2) Where snap switches with integral enclosures comply with 300.15(E)
- (3) Where lighting in the area is controlled by automatic means
- (4) Where a switch controls a receptacle load

The grounded conductor shall be extended to any switch location as necessary and shall be connected to switching devices that require line-to-neutral voltage to operate the electronics of the switch in the standby mode and shall meet the requirements of 404.22.

Exception: The connection requirement shall ~~become effective on January 1, 2020. It shall not apply to replacement or retrofit switches installed in locations prior to local adoption of 404.2(C) and where the grounded conductor cannot be extended without removing finish materials. The number of electronic control switches on a branch circuit shall not exceed five, and the number connected to any feeder on the load side of a system or main bonding jumper shall not exceed 25. For the purpose of this exception, a neutral busbar, in compliance with 200.2(B) and to which a main or system bonding jumper is connected shall not be limited as to the number of electronic lighting control switches connected.~~

Informational Note: The provision for a ~~(future)~~ grounded conductor is to complete a circuit path for electronic lighting control devices.

Submitter Information Verification

Committee: NEC-P09

Submittal Date: Thu Dec 10 12:47:47 EST 2020

Committee Statement

Committee Statement: CMP-9 is not removing the occupancy limitation because that represents the principal application of the rule.

CMP-9 removed the allowance that the grounded conductor would not be required to be installed at a lighting switch location where the box enclosing the switch is accessible for the installation of an additional or replacement cable without removing finish materials. Although the box may be accessible, the ease of installation of the grounded conductor after the initial installation is likely to be exceedingly more difficult than during the initial installation.

CMP-9 deletes the delayed implementation date in the exception and the word "future" in the Informational Note.

Response Message: FR-7883-NFPA 70-2020

Public Input No. [2234-NFPA 70-2020 \[Section No. 404.2\(C\)\]](#)

Ballot Results

✔ This item has passed ballot

12 Eligible Voters

0 Not Returned

11 Affirmative All

1 Affirmative with Comments

0 Negative with Comments

0 Abstention

Affirmative All

Belisle, Rodney D.

Colvin, Carmon A.

Hartwell, Frederic P.

Hollander, Richard

Miller, Kevin R.

Osborne, Robert D.

Parker, Ryan

Ridgeway, Ronnie H.

Schultheis, Timothy James

Sullivan, Paul B.

Sumbera, Darrell M.

Affirmative with Comment

Sasso, Nick

Affirmative.

**First Revision No. 7863-NFPA 70-2020 [Section No. 404.11]****404.11** Circuit Breakers as Switches.

A hand-operable circuit breaker equipped with a lever or handle, or a power-operated circuit breaker capable of being opened by hand in the event of a power failure, shall be permitted to serve as a switch if it has the required number of poles.

Informational Note: See ~~the provisions contained in~~ 240.81 and 240.83.

Submitter Information Verification

Committee: NEC-P09

Submittal Date: Wed Dec 09 21:26:20 EST 2020

Committee Statement

Committee Statement: The term "provisions contained in" in the informational note to 404.11 is unnecessary. The changes comply with 2020 NEC Style Manual 4.1.3.

Response Message: FR-7863-NFPA 70-2020

[Public Input No. 1069-NFPA 70-2020 \[Section No. 404.11\]](#)

Ballot Results

✓ **This item has passed ballot**

12 Eligible Voters

0 Not Returned

11 Affirmative All

1 Affirmative with Comments

0 Negative with Comments

0 Abstention

Affirmative All

Belisle, Rodney D.

Colvin, Carmon A.

Hartwell, Frederic P.

Hollander, Richard

Miller, Kevin R.

Osborne, Robert D.

Parker, Ryan

Ridgeway, Ronnie H.

Schultheis, Timothy James

Sullivan, Paul B.

Sumbera, Darrell M.

Affirmative with Comment

Sasso, Nick

Affirmative.



First Revision No. 7881-NFPA 70-2020 [Section No. 404.14]

404.14 Rating and Use of Switches.

Switches shall be listed and ~~used within~~ marked with their ratings. Switches of the types covered in 404.14(A) through (E) shall be limited to the control of loads as specified accordingly. Switches used to control cord-and-plug-connected loads shall be limited as covered in 404.14(G).

Informational Note No. 1: ~~For See 600.6 for switches for signs and outline lighting, see 600.6 .~~

Informational Note No. 2: ~~For See 430.83 , 430.109 , and 430.110 for switches controlling motors, see 430.83 , 430.109 , and 430.110 .~~

(A) Alternating-Current General-Use Snap Switch.

This form of switch shall only be used on ac circuits and used for controlling the following:

- (1) Resistive and inductive loads not exceeding the ampere rating of the switch at the voltage applied
- (2) Tungsten-filament lamp loads not exceeding the ampere rating of the switch at 120 volts
- (3) Electric discharge lamp loads not exceeding the marked ampere and voltage rating of the switch
- (4) Motor loads not exceeding 80 percent of the ampere rating of the switch at its rated voltage
- (5) Electronic ballasts, self-ballasted lamps, compact fluorescent lamps, and LED lamp loads with their associated drivers, not exceeding 20 amperes and not exceeding the ampere rating of the switch at the voltage applied

(B) Alternating-Current or Direct-Current General-Use Snap Switch.

This form of switch shall be permitted on either ac or dc circuits and used only for controlling the following:

- (1) Resistive loads not exceeding the ampere rating of the switch at the voltage applied.
- (2) Inductive loads not exceeding 50 percent of the ampere rating of the switch at the applied voltage. Switches rated in horsepower are suitable for controlling motor loads within their rating at the voltage applied.
- (3) Tungsten-filament lamp loads not exceeding the ampere rating of the switch at the applied voltage if T-rated.
- (4) Electronic ballasts, self-ballasted lamps, compact fluorescent lamps, and LED lamp loads with their associated drivers, not exceeding the ampere rating of the switch at the voltage applied.

(C) CO/ALR Snap Switches.

Snap switches directly connected to aluminum conductors and rated 20 amperes or less shall be marked CO/ALR.

(D) Snap Switches with Push-in Terminals.

Push-in terminals of snap switches rated 15 amperes shall only be connected directly to 14 AWG solid copper conductors. For use with conductors other than 14 AWG solid copper, the snap switch shall be listed and marked for the specific use.

(E) Alternating-Current General-Use Snap Switches Rated for 347 Volts.

This form of switch shall not be rated less than 15 amperes at a voltage of 347 volts ac, and they shall not be readily interchangeable in box mounting with switches covered in 404.14(A) and (B). These switches shall be used only for controlling any of the following:

- (1) Noninductive loads other than tungsten-filament lamps not exceeding the ampere and voltage ratings of the switch.
- (2) Inductive loads not exceeding the ampere and voltage ratings of the switch. Where particular load characteristics or limitations are specified as a condition of the listing, those restrictions shall be observed regardless of the ampere rating of the load.
- (3) Electronic ballasts, self-ballasted lamps, compact fluorescent lamps, and LED lamp loads with their associated drivers, not exceeding 20 amperes and not exceeding the ampere rating of the switch at the voltage applied.

(F) Dimmer and Electronic Control Switches.

General-use dimmer switches shall be used only to control permanently installed incandescent luminaires unless listed for the control of other loads and installed accordingly. Other electronic control switches, such as timing switches and occupancy sensors, shall be used to control permanently connected loads. They shall be marked by their manufacturer with their current and voltage ratings and used for loads that do not exceed their ampere rating at the voltage applied.

(G) Cord- and- Plug-Connected Loads.

Where a snap switch or control device is used to control cord-and-plug-connected equipment on a general-purpose branch circuit, each snap switch or control device controlling receptacle outlets or cord connectors that are supplied by permanently connected cord pendants shall be rated at not less than the rating of the maximum permitted ampere rating or setting of the overcurrent device protecting the receptacles or cord connectors, as provided in 210.21(B).

Informational Note: See 210.50(A) and 400.10(A)(1) for equivalency to a receptacle outlet of a cord connector that is supplied by a permanently connected cord pendant.

Exception: Where a snap switch or control device is used to control not more than one receptacle on a branch circuit, the switch or control device shall be permitted to be rated at not less than the rating of the receptacle.

Submitter Information Verification

Committee: NEC-P09

Submittal Date: Thu Dec 10 12:25:11 EST 2020

Committee Statement

Committee Statement: The UL standard and associated guide information under category code WJQR for snap switches with push in terminals permits only 14 AWG solid copper conductors to be used at this time.

"Screwless terminal connectors of the conductor push-in type (also known as "push-in terminals") are restricted to 15 A branch circuits and are intended for connection with 14 AWG solid copper wire only. They are not intended for use with aluminum or copper-clad aluminum wire, 14 AWG stranded copper wire, or 12 AWG solid or stranded copper wire."

The change to this section is to highlight this limitation for switches that may have push-in terminals provided. The introduction of 14 AWG copper-clad aluminum into the NEC for branch circuit wiring needs this limitation to ensure push-in terminals on wiring devices are being installed in accordance with their listing. Nothing in the proposed language mandates that the push-in terminals must be used.

The marking addition ensures that the AHJ will be provided with the intended rating for use. The panel finds it necessary to write this requirement into NEC although it may already be present in other applicable standards.

Response Message: FR-7881-NFPA 70-2020

[Public Input No. 2782-NFPA 70-2020 \[Section No. 404.14 \[Excluding any Sub-Sections\]\]](#)

[Public Input No. 3256-NFPA 70-2020 \[Section No. 404.14\]](#)

Ballot Results

✔ This item has passed ballot

12 Eligible Voters

0 Not Returned

11 Affirmative All

1 Affirmative with Comments

0 Negative with Comments

0 Abstention

Affirmative All

Belisle, Rodney D.

Colvin, Carmon A.

Hartwell, Frederic P.

Hollander, Richard

Miller, Kevin R.

Osborne, Robert D.

Parker, Ryan

Ridgeway, Ronnie H.

Schultheis, Timothy James

Sullivan, Paul B.

Sumbera, Darrell M.

Affirmative with Comment

Sasso, Nick

Affirmative.



First Revision No. 7859-NFPA 70-2020 [New Section after 404.14(F)]

404.16 Reconditioned Equipment.

(A) Lighting, Dimmer, and Electronic Control Switches.

Lighting, dimmer, and electronic control switches shall not be permitted to be reconditioned.

(B) Snap Switches.

Snap switches of any type shall not be permitted to be reconditioned.

(C) Knife Switches, Switches with Butt Contacts, and Bolted Pressure Contact Switches.

Knife switches, switches with butt contacts, and bolted pressure contact switches shall be permitted to be reconditioned. The reconditioning process shall use design qualified parts verified under applicable standards and shall be performed in accordance with any instructions provided by the manufacturer. If equipment has been damaged by fire, products of combustion, corrosive influences, or water, it shall be specifically evaluated by its manufacturer or a qualified testing laboratory prior to being returned to service. Reconditioned switches shall be listed or field labeled as reconditioned and marked in accordance with 110.21(A)(2).

Submitter Information Verification

Committee: NEC-P09

Submittal Date: Wed Dec 09 21:12:40 EST 2020

Committee Statement

Committee Statement: Lighting dimmer and electronic control switches are constructed using specialized materials, parts and techniques that are specified by the original equipment manufacturer. If these factors are not properly considered during reconditioning, important safety features may not function properly. Additionally, if proper materials, parts, or equipment are not used, the integrity of reconditioned devices may not be assured, and reliability or function may be compromised This change will clearly address reconditioning of these devices.

Snap switches are inexpensive and easy to replace and should not be reconditioned.

Knife switches, switches with butt contacts, and bolted pressure contact switches are open type and could be repaired or parts replaced if available

CMP-9 moves the requirement to 404.16 rather than 404.24 as this is more appropriate, adds corrosive influences to the list and makes reference to 110.21(A)(2).

Response Message: FR-7859-NFPA 70-2020

Public Input No. 3047-NFPA 70-2020 [New Section after 404.22]

Public Input No. 4134-NFPA 70-2020 [New Section after 404.14(F)]

Ballot Results

✓ **This item has passed ballot**

12 Eligible Voters

0 Not Returned

10 Affirmative All

1 Affirmative with Comments

1 Negative with Comments

0 Abstention

Affirmative All

Belisle, Rodney D.

Colvin, Carmon A.
Hartwell, Frederic P.
Hollander, Richard
Miller, Kevin R.
Parker, Ryan
Ridgeway, Ronnie H.
Schultheis, Timothy James
Sullivan, Paul B.
Sumbera, Darrell M.

Affirmative with Comment

Osborne, Robert D.

Identifying which types of switches can and can not be reconditioned is a good step for the Code and safety. With many lists, it is hard to make them complete; however, one common type of switch that is missing from this requirement is "molded case switches". Similar to molded case circuit breakers, molded case switches are sealed, not user serviceable, have intricate mechanisms, and may also have an instantaneous overcurrent tripping function. Similar to actions taken by CMP 10 in Article 240, CMP 9 should consider adding "molded case switches" to the new Section 404.16, as a type of product that "shall not be reconditioned".

Negative with Comment

Sasso, Nick

IMO, it is MORE THAN OBVIOUS that some of this equipment should not be reconditioned. We are just opening up Pandora's box such that now it becomes necessary to list every possible thing in order to disallow reconditioning something. Where the code remains silent, certain qualified persons will most likely assume that since the equipment ISN'T specifically mentioned, then it's Ok to recondition it - IF IT SUITS THEIR PURPOSE. The code already lists equipment that can be reconditioned. There is a trap here. Let's not fall into it. I might be able to approve most of the language in (C) but the rest of it should be stricken.

**First Revision No. 8035-NFPA 70-2020 [Section No. 404.22]****404.22 Electronic Control Switches.**

Electronic control switches shall be listed. Electronic control switches shall not introduce current on the equipment grounding conductor during normal operation. ~~The requirement to not introduce current on the equipment grounding conductor shall take effect on January 1, 2020.~~

Exception: Electronic control switches that introduce current on the equipment grounding conductor shall be permitted for applications covered by 404.2(C), Exception. Electronic control switches that introduce current on the equipment grounding conductor shall be listed and marked for use in replacement or retrofit applications only.

Submitter Information Verification

Committee: NEC-P09

Submittal Date: Tue Dec 15 08:47:46 EST 2020

Committee Statement

Committee Statement: CMP-9 removes the effective date of January 1, 2020 as it has passed.

Response Message: FR-8035-NFPA 70-2020

Ballot Results

✓ **This item has passed ballot**

12 Eligible Voters

0 Not Returned

11 Affirmative All

1 Affirmative with Comments

0 Negative with Comments

0 Abstention

Affirmative All

Belisle, Rodney D.

Colvin, Carmon A.

Hartwell, Frederic P.

Hollander, Richard

Miller, Kevin R.

Osborne, Robert D.

Parker, Ryan

Ridgeway, Ronnie H.

Schultheis, Timothy James

Sullivan, Paul B.

Sumbera, Darrell M.

Affirmative with Comment

Sasso, Nick

Affirmative.

**First Revision No. 7861-NFPA 70-2020 [New Section after 404.28]****404.30 Switch Enclosures with Doors.**

Switch mechanisms mounted within enclosures with doors that, when opened, expose uninsulated live parts shall be constructed so that either a tool is required to open the door or other approved means to restrict interior access by unqualified persons are provided.

Submitter Information Verification

Committee: NEC-P09

Submittal Date: Wed Dec 09 21:16:31 EST 2020

Committee Statement

Committee Statement: Switches of this type may allow access to live parts with the door open that the user may contact. This change will restrict access to qualified persons.

Response Message: FR-7861-NFPA 70-2020

[Public Input No. 4109-NFPA 70-2020 \[New Section after 404.28\]](#)

[Public Input No. 4057-NFPA 70-2020 \[Section No. 404.8\(A\)\]](#)

Ballot Results

✓ **This item has passed ballot**

12 Eligible Voters

0 Not Returned

10 Affirmative All

2 Affirmative with Comments

0 Negative with Comments

0 Abstention

Affirmative All

Belisle, Rodney D.

Colvin, Carmon A.

Hollander, Richard

Miller, Kevin R.

Osborne, Robert D.

Parker, Ryan

Ridgeway, Ronnie H.

Schultheis, Timothy James

Sullivan, Paul B.

Sumbera, Darrell M.

Affirmative with Comment

Hartwell, Frederic P.

Note that there is a grammatical error in that the final verb should be singular ("... unqualified persons is provided"). This will need to be addressed in a public comment. The "approved means" may require specificity. I helped provoke this discussion by calling for a tool to open. This is a time-honored approach that uses what is commonly referred to in the trade as a "defeater". One week after the submittal deadline I installed a Cutler-Hammer disconnect for an air-conditioning

condenser at my house, that did not require a tool to open. However, I believe it fully complied with the objectives of what I had proposed in the PI, and with this FR. By this statement I am inviting comment from the industry on this topic. Should specific text be thought necessary, I did craft the following language: "Switch mechanisms mounted within enclosures with doors shall be arranged so the door cannot be readily opened while energized. In that state the door shall require the use of a tool, or the simultaneous traction of two hands placed in different positions and acting against resistance in order to open." The panel went with allowing an approved method, but I wanted this text to also get public review in the event the simple concept of approval were felt to be too open-ended.

Sasso, Nick

Affirmative.

**First Revision No. 7890-NFPA 70-2020 [Section No. 408.2]****408.2- Other Articles.**

~~Switches, circuit breakers, and overcurrent devices used on switchboards, switchgear, and panelboards and their enclosures shall comply with this article and also with the requirements of Articles 240 , 250 , 312 , 404 , and other articles that apply. Switchboards, switchgear, and panelboards in hazardous (classified) locations shall comply with the applicable provisions of Articles 500 through 517 .~~

Submitter Information Verification**Committee:** NEC-P09**Submittal Date:** Thu Dec 10 15:15:57 EST 2020**Committee Statement**

Committee Statement: The information in 408.2 is redundant and applies because of section 90.3. There is no need to reference here.

Response Message: FR-7890-NFPA 70-2020[Public Input No. 3878-NFPA 70-2020 \[Section No. 408.2\]](#)**Ballot Results**

✔ **This item has passed ballot**

12 Eligible Voters

0 Not Returned

11 Affirmative All

1 Affirmative with Comments

0 Negative with Comments

0 Abstention

Affirmative All

Belisle, Rodney D.

Colvin, Carmon A.

Hartwell, Frederic P.

Hollander, Richard

Miller, Kevin R.

Osborne, Robert D.

Parker, Ryan

Ridgeway, Ronnie H.

Schultheis, Timothy James

Sullivan, Paul B.

Sumbera, Darrell M.

Affirmative with Comment

Sasso, Nick

Affirmative.



First Revision No. 7895-NFPA 70-2020 [Section No. 408.4]

408.4 ~~Field Identification~~ Descriptions Required.

(A) ~~Circuit Directory or Circuit Identification~~ Description .

Every circuit and circuit modification shall be legibly ~~identified as and permanently described as~~ to its clear, evident, and specific purpose or use. The ~~identification shall~~ description shall include an approved degree of detail that allows each circuit to be distinguished from all others. Spare positions that contain unused overcurrent devices or switches shall be described accordingly. The ~~identification description~~ shall be included in a circuit directory that is located on the face of , inside of, or in an approved location adjacent to the panel door in the case of a panelboard and at each switch or circuit breaker in a switchboard or switchgear. No circuit shall be described in a manner that depends on transient conditions of occupancy.

(B) Source of Supply.

All switchboards, switchgear, and panelboards supplied by a feeder(s) in other than one- or two-family dwellings shall be permanently marked to indicate each device or equipment where the power originates and its physical location . The label shall be permanently affixed, of sufficient durability to withstand the environment involved, and not handwritten.

Submitter Information Verification

Committee: NEC-P09

Submittal Date: Thu Dec 10 15:45:58 EST 2020

Committee Statement

Committee Statement: The removal of the word field is needed as it will assist the electrical plans examiner. The NEC is an enforcement document; this change will improve electrical Code enforcement at the plan review stage. There is no reason to limit the scope of this provision solely to "the field."

Identification is changed to description so as to not conflict with the defined term in Article 100.

The description should be marked in a permanent way to prevent fading over time. A specific language may not be appropriate in some areas. Legible handwriting is acceptable.

CMP-9 adds physical location for clarity. The location of where power originates is critical information for inspectors, service persons, and other individuals that may have need to locate the supply source. It is not always readily apparent where the location of the source is. For this reason, an identification of the location of the source should be provided in addition to the identification of the source itself.

In some circumstances the location of the supply source may be readily apparent, but it was determined that allowing for an exemption in these cases would lead to ambiguity and make the requirement too subjective. For this reason, the requirement is applied to all cases.

Response Message: FR-7895-NFPA 70-2020

[Public Input No. 1113-NFPA 70-2020 \[Section No. 408.4\(B\)\]](#)

[Public Input No. 2619-NFPA 70-2020 \[Section No. 408.4\(B\)\]](#)

[Public Input No. 2456-NFPA 70-2020 \[Section No. 408.4\(A\)\]](#)

[Public Input No. 590-NFPA 70-2020 \[Section No. 408.4\(A\)\]](#)

[Public Input No. 206-NFPA 70-2019 \[Section No. 408.4\]](#)

[Public Input No. 2725-NFPA 70-2020 \[Section No. 408.4\(A\)\]](#)

Ballot Results

✓ **This item has passed ballot**

12 Eligible Voters

0 Not Returned
11 Affirmative All
1 Affirmative with Comments
0 Negative with Comments
0 Abstention

Affirmative All

Belisle, Rodney D.
Colvin, Carmon A.
Hartwell, Frederic P.
Hollander, Richard
Miller, Kevin R.
Osborne, Robert D.
Parker, Ryan
Ridgeway, Ronnie H.
Schultheis, Timothy James
Sullivan, Paul B.
Sumbera, Darrell M.

Affirmative with Comment

Sasso, Nick

Affirmative. This is desperately needed as it will ASSIST THE ELECTRICAL PLANS EXAMINER AND THE ELECTRICAL INSPECTOR that has to also perform the plan reviews.



First Revision No. 7951-NFPA 70-2020 [Section No. 408.8]

408.8 Reconditioning of Equipment.

Reconditioning of equipment within the scope of this article shall be limited as described in 408.8(A) and (B). The reconditioning process shall use design qualified parts verified under applicable standards and be performed in accordance with any instructions provided by the manufacturer. If equipment has been damaged by fire, products of combustion, or corrosive influences, or water, it shall be specifically evaluated by its manufacturer or a qualified testing laboratory prior to being returned to service. Reconditioned equipment shall be listed or field labeled as reconditioned switchboards and marked in accordance with 110.21(A)(2).

(A) Panelboards.

Panelboards shall not be permitted to be reconditioned. This shall not prevent the replacement of a panelboard within an enclosure. In the event the replacement has not been listed for the specific enclosure and the available fault current is greater than 10,000 amperes, the completed work shall be field labeled, and any previously applied listing marks on the cabinet that pertain to the panelboard shall be removed.

(B) Switchboards and Switchgear.

Switchboards and switchgear, or sections of switchboards or switchgear, shall be permitted to be reconditioned. Reconditioned switchboards and switchgear shall be listed or field labeled as reconditioned, and previously applied listing marks, if any, within the portions reconditioned shall be removed.

Submitter Information Verification

Committee: NEC-P09

Submission Date: Fri Dec 11 12:39:07 EST 2020

Committee Statement

Committee Statement: CMP-9 is rewording the provisions of 408.8 so as to avoid duplicating requirements in 110.21(A)(2). Other changes include adding "corrosive influences" to the list of items to consider in the parent language of 408.8, and adding "switchboards" to 408.8(B), since that was inadvertently overlooked during the 2020 Code Cycle.

Response Message: FR-7951-NFPA 70-2020

[Public Input No. 4513-NFPA 70-2020 \[Section No. 408.8\(A\)\]](#)

[Public Input No. 228-NFPA 70-2019 \[Section No. 408.8\(B\)\]](#)

[Public Input No. 2298-NFPA 70-2020 \[Section No. 408.8\(B\)\]](#)

[Public Input No. 4151-NFPA 70-2020 \[Section No. 408.8\(B\)\]](#)

Ballot Results

✔ **This item has passed ballot**

12 Eligible Voters

0 Not Returned

11 Affirmative All

1 Affirmative with Comments

0 Negative with Comments

0 Abstention

Affirmative All

Belisle, Rodney D.

Colvin, Carmon A.

Hartwell, Frederic P.

Hollander, Richard
Miller, Kevin R.
Osborne, Robert D.
Parker, Ryan
Ridgeway, Ronnie H.
Schultheis, Timothy James
Sullivan, Paul B.
Sumbera, Darrell M.

Affirmative with Comment

Sasso, Nick
Affirmative.

**First Revision No. 7891-NFPA 70-2020 [Section No. 408.36(D)]****(D) Back-Fed Devices.**

Plug-in-type overcurrent protection devices or plug-in type main lug assemblies that are backfed and used to terminate field-installed ungrounded supply conductors shall be secured in place by an additional fastener that requires other than a pull to release the device from the mounting means on the ~~panel~~ panelboard .

Submitter Information Verification

Committee: NEC-P09

Submittal Date: Thu Dec 10 15:21:48 EST 2020

Committee Statement

Committee Statement: CMP-9 changes the text as the the correct term is panelboard.

Response Message: FR-7891-NFPA 70-2020

Public Input No. 1068-NFPA 70-2020 [Section No. 408.36(D)]

Ballot Results

✔ **This item has passed ballot**

12 Eligible Voters

0 Not Returned

11 Affirmative All

1 Affirmative with Comments

0 Negative with Comments

0 Abstention

Affirmative All

Belisle, Rodney D.

Colvin, Carmon A.

Hartwell, Frederic P.

Hollander, Richard

Miller, Kevin R.

Osborne, Robert D.

Parker, Ryan

Ridgeway, Ronnie H.

Schultheis, Timothy James

Sullivan, Paul B.

Sumbera, Darrell M.

Affirmative with Comment

Sasso, Nick

Affirmative.

**First Revision No. 7950-NFPA 70-2020 [Section No. 408.38]****408.38** Enclosure.

Panelboards shall be mounted in cabinets, cutout boxes, or identified enclosures and shall be dead-front. Where the available fault current is greater than 10,000 amperes, the panelboard and enclosure combination shall be evaluated for the application.

Exception: Panelboards other than of the dead-front, externally operable type shall be permitted where accessible only to qualified persons.

Submitter Information Verification

Committee: NEC-P09

Submittal Date: Fri Dec 11 12:30:04 EST 2020

Committee Statement

Committee Statement: CMP-9 is also adding an evaluation requirement on systems with fault currents above 10,000 amperes to the general provisions in 408.38.

Response Message: FR-7950-NFPA 70-2020

Ballot Results

✓ **This item has passed ballot**

12 Eligible Voters

0 Not Returned

9 Affirmative All

3 Affirmative with Comments

0 Negative with Comments

0 Abstention

Affirmative All

Colvin, Carmon A.

Hartwell, Frederic P.

Hollander, Richard

Miller, Kevin R.

Osborne, Robert D.

Parker, Ryan

Ridgeway, Ronnie H.

Sullivan, Paul B.

Sumbera, Darrell M.

Affirmative with Comment

Belisle, Rodney D.

This is another location where the definition of Enclosed Panelboard would be beneficial.

Sasso, Nick

Affirmative.

Schultheis, Timothy James

During the first revision meeting it was discussed that all panelboards used where the available fault current is greater than 10,000 amps are evaluated with a specific enclosure. This will limit the ability to retrofit old panelboards in block walls or other types of construction where the enclosure cannot be removed or it is prohibitively expensive to do so. I believe we should work with the evaluating bodies to better address this problem because it is in the best interest to have newer, fully operational overcurrent devices installed in these applications, rather than limiting the retrofitting ability because of the enclosure. These locations are typically in a robust construction material such as concrete or block walls that will not allow failure of the enclosure walls during a fault event, which I believe is the main concern. The door and dead front assembly should be able to be evaluated easily since it normally comes with the retrofit panelboard.

**First Revision No. 7945-NFPA 70-2020 [Section No. 408.40]****408.40** Grounding of Panelboards.

Panelboard cabinets and panelboard frames, if of metal, shall be in physical contact with each other and shall be connected to an equipment grounding conductor. Where the panelboard is used with nonmetallic raceway or cable or where separate equipment grounding conductors are provided, a terminal bar for the equipment grounding conductors shall be secured inside the cabinet. The terminal bar shall be bonded to the cabinet and panelboard frame, if of metal; otherwise it shall be connected to the equipment grounding conductor that is run with the conductors feeding the panelboard.

Exception: Where an isolated equipment grounding conductor for a branch circuit or a feeder is provided as permitted by 250.146(D), the insulated equipment grounding conductor that is run with the circuit conductors shall be permitted to pass through the panelboard without being connected to the panelboard's equipment grounding terminal bar.

Equipment grounding conductors shall not be connected to a terminal bar provided for grounded conductors or neutral conductors unless the bar is identified for the purpose and is located where interconnection between equipment grounding conductors and grounded circuit conductors is permitted or required by Part II and Part VII of Article 250.

Submitter Information Verification

Committee: NEC-P09

Submittal Date: Fri Dec 11 11:03:30 EST 2020

Committee Statement

Committee Statement: The title complies with the Style Manual and adequately describes the code section. Equipment grounding conductors are covered in Part II of and Part VII of Article 250. The last sentence in 408.40 was revised as Section 4.1.4 of the 2020 NEC Style Manual prohibits reference to an entire article, other than Article 100.

Response Message: FR-7945-NFPA 70-2020

[Public Input No. 3881-NFPA 70-2020 \[Section No. 408.40\]](#)

[Public Input No. 1356-NFPA 70-2020 \[Section No. 408.40\]](#)

Ballot Results

✔ **This item has passed ballot**

12 Eligible Voters

0 Not Returned

11 Affirmative All

1 Affirmative with Comments

0 Negative with Comments

0 Abstention

Affirmative All

Belisle, Rodney D.

Colvin, Carmon A.

Hartwell, Frederic P.

Hollander, Richard

Miller, Kevin R.

Osborne, Robert D.

Parker, Ryan

Ridgeway, Ronnie H.

Schultheis, Timothy James

Sullivan, Paul B.

Sumbera, Darrell M.

Affirmative with Comment

Sasso, Nick

Affirmative.

**First Revision No. 7944-NFPA 70-2020 [Section No. 408.43]****408.43** Panelboard Orientation.

Panelboards shall not be installed in the face-up position or face-down position .

Submitter Information Verification

Committee: NEC-P09

Submittal Date: Fri Dec 11 10:56:33 EST 2020

Committee Statement

Committee Statement: This change in the 2020 NEC revision cycle addressing the installation of a panelboard in a face-up position is necessary. The mounting of an electrical panelboard in a face up position does not provide a safe working environment necessary for electrical safety of installers/maintainers when servicing the panelboard. The likelihood for contaminants accumulating on the overcurrent devices and panelboard bussing is increased significantly, creating a hazard. Can the working space requirements mandated by 110.26 be satisfied with a panelboard mounted in a face up position?

The face-down position criteria is added to 408.43 mainly due to working space concerns. Even with acceptable working space it would be very difficult for a qualified worker to safely work in this position. The only movement away from an arc blast or arc fault event might be left or right from the equipment due to the installer laying, kneeling, or standing on a concrete floor looking up. In some cases, the panelboard overcurrent protective devices would only be accessible utilizing a step ladder. This type of installation is unsafe and is addressed.

Panelboards in general applications should not be installed in a face up or face down position.

CMP-9 acknowledges that conditions within special occupancies such as those in Article 518 may warrant a modification to this general rule.

PI-1761 may accomplish this and is under the purview of CMP-15.

Response Message: FR-7944-NFPA 70-2020

[Public Input No. 1705-NFPA 70-2020 \[Section No. 408.43\]](#)

[Public Input No. 3452-NFPA 70-2020 \[Section No. 408.43\]](#)

[Public Input No. 4255-NFPA 70-2020 \[Section No. 408.43\]](#)

Ballot Results

✔ This item has passed ballot

12 Eligible Voters

0 Not Returned

10 Affirmative All

2 Affirmative with Comments

0 Negative with Comments

0 Abstention

Affirmative All

Belisle, Rodney D.

Colvin, Carmon A.

Hollander, Richard

Miller, Kevin R.

Osborne, Robert D.

Parker, Ryan

Ridgeway, Ronnie H.

Schultheis, Timothy James

Sullivan, Paul B.

Sumbera, Darrell M.

Affirmative with Comment

Hartwell, Frederic P.

This is the final text of the operational requirement for panelboard orientation. It expressly prohibits the allowance built into the erroneous ballot language at FR 7946. That said, this panel member believes that some relief should be granted, presumably with both size and horizontal workspace parameters, that will avoid an inevitable UL file review that will likely force a long-standing product category out of the market.

Sasso, Nick

Affirmative.

**First Revision No. 7896-NFPA 70-2020 [Section No. 408.53]****~~408.53 Component Parts.~~**

~~Switches, fuses, and fuseholders used on panelboards shall comply with the applicable requirements of Articles 240 and 404 .~~

Submitter Information Verification

Committee: NEC-P09

Submission Date: Thu Dec 10 15:56:32 EST 2020

Committee Statement

Committee Statement: 408.53 refers to entire Articles and is deleted to comply with the NEC Style Manual. It is also noted that reference to specific sections of other articles is unnecessary for usability of the code.

Response Message: FR-7896-NFPA 70-2020

Public Input No. 3885-NFPA 70-2020 [Section No. 408.53]

Ballot Results

✓ **This item has passed ballot**

12 Eligible Voters

0 Not Returned

11 Affirmative All

1 Affirmative with Comments

0 Negative with Comments

0 Abstention

Affirmative All

Belisle, Rodney D.

Colvin, Carmon A.

Hartwell, Frederic P.

Hollander, Richard

Miller, Kevin R.

Osborne, Robert D.

Parker, Ryan

Ridgeway, Ronnie H.

Schultheis, Timothy James

Sullivan, Paul B.

Sumbera, Darrell M.

Affirmative with Comment

Sasso, Nick

Affirmative.

**First Revision No. 7782-NFPA 70-2020 [Section No. 450.1]****450.1 Scope.**

This article covers the installation of all transformers. other than the following:

Exception No. 1: Current transformers.

Exception No. 2: Dry-type transformers that constitute a component part of other apparatus and comply with the requirements for such apparatus.

Exception No. 3: Transformers that are an integral part of an X-ray, high-frequency, or electrostatic-coating apparatus.

Exception No. 4: Transformers used with Class 2 and Class 3 circuits that comply with Article 725.

Exception No. 5: Transformers for sign and outline lighting that comply with Article 600.

Exception No. 6: Transformers for electric-discharge lighting that comply with Article 410.

Exception No. 7: Transformers used for power-limited fire alarm circuits that comply with Part III of Article 760.

Exception No. 8: Transformers used for research, development, or testing, where effective arrangements are provided to safeguard persons from contacting energized parts.

- (1) Current transformers.
- (2) Dry-type transformers that constitute a component part of other apparatus and comply with the requirements for such apparatus.
- (3) Transformers that are an integral part of an X-ray, high-frequency, or electrostatic-coating apparatus.
- (4) Transformers used with Class 2 and Class 3 circuits that comply with Article 725.
- (5) Transformers for sign and outline lighting that comply with Article 600.
- (6) Transformers for electric-discharge lighting that comply with Article 410.
- (7) Transformers used for power-limited fire alarm circuits that comply with Part III of Article 760.
- (8) Transformers used for research, development, or testing, where effective arrangements are provided to safeguard persons from contacting energized parts.

~~This article covers the installation of transformers dedicated to supplying power to a fire pump installation as modified by Article 695.~~

~~This article also covers the installation of transformers in hazardous (classified) locations as modified by Articles 501 through 504.~~

Submitter Information Verification

Committee: NEC-P09

Submittal Date: Tue Dec 08 15:26:47 EST 2020

Committee Statement

Committee Statement: The section is rewritten to meet the requirements of the Style Manual. The last two sentences of the section were removed based on the application of 90.3.

CMP-9 understands that the scope is within the purview of the Correlating Committee and recommends that the CC take this action.

Response Message: FR-7782-NFPA 70-2020

[Public Input No. 2993-NFPA 70-2020 \[Section No. 450.1\]](#)

[Public Input No. 4317-NFPA 70-2020 \[Section No. 450.1\]](#)

Ballot Results

✓ This item has passed ballot

12 Eligible Voters

0 Not Returned

11 Affirmative All

1 Affirmative with Comments

0 Negative with Comments

0 Abstention

Affirmative All

Belisle, Rodney D.

Colvin, Carmon A.

Hartwell, Frederic P.

Hollander, Richard

Miller, Kevin R.

Osborne, Robert D.

Parker, Ryan

Ridgeway, Ronnie H.

Schultheis, Timothy James

Sullivan, Paul B.

Sumbera, Darrell M.

Affirmative with Comment

Sasso, Nick

Affirmative.



First Revision No. 7833-NFPA 70-2020 [Section No. 450.3(B)]

(B) Transformers 1000 Volts, Nominal, or Less.

Overcurrent protection shall be provided in accordance with Table 450.3(B) unless the transformer is installed as a motor control circuit transformer in accordance with 430.72(C)(1) through (C)(5).

Exception: Where the transformer is installed as a motor control circuit transformer in accordance with 430.72(C)(1) through (C)(5).

Table 450.3(A) Maximum Rating or Setting of Overcurrent Protection for Transformers Over 1000 Volts (as a Percentage of Transformer-Rated Current)

<u>Location Limitations</u>	<u>Transformer Rated Impedance</u>	<u>Primary Protection over 1000 Volts</u>		<u>Secondary Protection² (See Note 2.)</u>		
		<u>Over 1000 Volts</u>		<u>Over 1000 Volts</u>	<u>1000 Volts or Less</u>	
		<u>Circuit Breaker⁴ (See Note 4.)</u>	<u>Fuse Rating</u>	<u>Circuit Breaker⁴ (See Note 4.)</u>	<u>Fuse Rating</u>	<u>Circuit Breaker or Fuse Rating</u>
Any location	Not more than 6%	600% ¹ (See Note 1.)	300% ¹ (See Note 1.)	300% ¹ (See Note 1.)	250% ¹ (See Note 1.)	125% ¹ (See Note 1.)
	More than 6% and not more than 10%	400% ¹ (See Note 1.)	300% ¹ (See Note 1.)	250% ¹ (See Note 1.)	225% ¹ (See Note 1.)	125% ¹ (See Note 1.)
Supervised locations only ³ (See Note 3.)	Any	300% ¹ (See Note 1.)	250% ¹ (See Note 1.)	Not required	Not required	Not required
	Not more than 6%	600%	300%	300% ⁵ (See Note 5.)	250% ⁵ (See Note 5.)	250% ⁵ (See Note 5.)
	More than 6% and not more than 10%	400%	300%	250% ⁵ (See Note 5.)	225% ⁵ (See Note 5.)	250% ⁵ (See Note 5.)

Notes:

1. ¹ Where the required fuse rating or circuit breaker setting does not correspond to a standard rating or setting, a higher rating or setting that does not exceed the following shall be permitted:

a. (1) The next higher standard rating or setting for fuses and circuit breakers 1000 volts and below, or

b. (2) The next higher commercially available rating or setting for fuses and circuit breakers above 1000 volts.

2. ² Where secondary overcurrent protection is required, the secondary overcurrent device shall be permitted to consist of not more than six circuit breakers or six sets of fuses grouped in one location. Where multiple overcurrent devices are utilized, the total of all the device ratings shall not exceed the allowed value of a single overcurrent device. If both circuit breakers and fuses are used as the overcurrent device, the total of the device ratings shall not exceed that allowed for fuses.

3. ³ A supervised location is a location where conditions of maintenance and supervision ensure that only qualified persons monitor and service the transformer installation.

4. ⁴ Electronically actuated fuses that may be set to open at a specific current shall be set in accordance with settings for circuit breakers.

5. ⁵ A transformer equipped with a coordinated thermal overload protection by the manufacturer shall be permitted to have separate secondary protection omitted.

Table 450.3(B) Maximum Rating or Setting of Overcurrent Protection for Transformers 1000 Volts and Less (as a Percentage of Transformer-Rated Current)

<u>Protection Method</u>	<u>Primary Protection</u>			<u>Secondary Protection² (See Note 2.)</u>	
	<u>Currents of 9 Amperes or More</u>	<u>Currents Less Than 9 Amperes</u>	<u>Currents Less Than 2 Amperes</u>	<u>Currents of 9 Amperes or More</u>	<u>Currents Less Than 9 Amperes</u>
Primary only protection	125% ¹ (See Note 1.)	167%	300%	Not required	Not required

<u>Protection Method</u>	<u>Primary Protection</u>			<u>Secondary Protection² (See Note 2.)</u>	
	<u>Currents of 9 Amperes or More</u>	<u>Currents Less Than 9 Amperes</u>	<u>Currents Less Than 2 Amperes</u>	<u>Currents of 9 Amperes or More</u>	<u>Currents Less Than 9 Amperes</u>
Primary and secondary protection	250% ³ (See Note 3.)	250% ³ (See Note 3.)	250% ³ (See Note 3.)	125% ¹ (See Note 1.)	167%

Notes:

4. ¹ Where 125 percent of this current does not correspond to a standard rating of a fuse or nonadjustable circuit breaker, a higher rating that does not exceed the next higher standard rating shall be permitted.

2. ² Where secondary overcurrent protection is required, the secondary overcurrent device shall be permitted to consist of not more than six circuit breakers or six sets of fuses grouped in one location. Where multiple overcurrent devices are utilized, the total of all the device ratings shall not exceed the allowed value of a single overcurrent device.

3. ³ A transformer equipped with coordinated thermal overload protection by the manufacturer and arranged to interrupt the primary current shall be permitted to have primary overcurrent protection rated or set at a current value that is not more than six times the rated current of the transformer for transformers having not more than 6 percent impedance and not more than four times the rated current of the transformer for transformers having more than 6 percent but not more than 10 percent impedance.

Submitter Information Verification

Committee: NEC-P09

Submittal Date: Wed Dec 09 15:47:19 EST 2020

Committee Statement

Committee Statement: The exception is rewritten to meet new Style Manual requirements as positive text.

Response Message: FR-7833-NFPA 70-2020

Ballot Results

✔ This item has passed ballot

12 Eligible Voters

0 Not Returned

11 Affirmative All

1 Affirmative with Comments

0 Negative with Comments

0 Abstention

Affirmative All

Belisle, Rodney D.

Colvin, Carmon A.

Hartwell, Frederic P.

Hollander, Richard

Miller, Kevin R.

Osborne, Robert D.

Parker, Ryan

Ridgeway, Ronnie H.

Schultheis, Timothy James

Sullivan, Paul B.

Sumbera, Darrell M.

Affirmative with Comment

Sasso, Nick

Affirmative.

**First Revision No. 7837-NFPA 70-2020 [Section No. 450.3(C)]****(C) Voltage (Potential) Transformers.**

Voltage (potential) transformers installed indoors or enclosed shall be protected with primary fuses.

Informational Note: For See 408.52 for protection of instrument circuits, including voltage transformers, ~~see 408.52~~.

Submitter Information Verification

Committee: NEC-P09

Submittal Date: Wed Dec 09 16:06:28 EST 2020

Committee Statement

Committee Statement: The Informational Note is rewritten to meet new Style Manual requirements.

Response Message: FR-7837-NFPA 70-2020

Ballot Results

✔ **This item has passed ballot**

12 Eligible Voters

0 Not Returned

11 Affirmative All

1 Affirmative with Comments

0 Negative with Comments

0 Abstention

Affirmative All

Belisle, Rodney D.

Colvin, Carmon A.

Hartwell, Frederic P.

Hollander, Richard

Miller, Kevin R.

Osborne, Robert D.

Parker, Ryan

Ridgeway, Ronnie H.

Schultheis, Timothy James

Sullivan, Paul B.

Sumbera, Darrell M.

Affirmative with Comment

Sasso, Nick

Affirmative.

**First Revision No. 7787-NFPA 70-2020 [Section No. 450.3 [Excluding any Sub-Sections]]**

Overcurrent protection of transformers shall comply with 450.3(A), (B), or (C). As used in this section, the word *transformer* shall mean a transformer or polyphase bank of two or more single-phase transformers operating as a unit.

Informational Note No. 1: See 240.4, 240.21, 240.100, and 240.101 for overcurrent protection of conductors.

Informational Note No. 2: Nonlinear loads can increase heat in a transformer without operating its overcurrent protective device. See IEEE 3002.8, *Recommended Practice for Conducting Harmonic Studies and Analysis of Industrial and Commercial Power Systems*, for additional information.

Submitter Information Verification

Committee: NEC-P09

Submittal Date: Tue Dec 08 16:20:59 EST 2020

Committee Statement

Committee Statement: Informational Note 2 is revised to include reference to IEEE standard.

Response Message: FR-7787-NFPA 70-2020

[Public Input No. 3266-NFPA 70-2020 \[Section No. 450.3 \[Excluding any Sub-Sections\]\]](#)

Ballot Results

✔ This item has passed ballot

12 Eligible Voters

0 Not Returned

11 Affirmative All

1 Affirmative with Comments

0 Negative with Comments

0 Abstention

Affirmative All

Belisle, Rodney D.

Colvin, Carmon A.

Hartwell, Frederic P.

Hollander, Richard

Miller, Kevin R.

Osborne, Robert D.

Parker, Ryan

Ridgeway, Ronnie H.

Schultheis, Timothy James

Sullivan, Paul B.

Sumbera, Darrell M.

Affirmative with Comment

Sasso, Nick

Affirmative.

**First Revision No. 7838-NFPA 70-2020 [Section No. 450.4(B)]**

(B) Transformer Field-Connected as an Autotransformer.

A transformer field-connected as an autotransformer shall be identified for use at elevated voltage.

Informational Note: For See 210.9 and 215.11 for information on permitted uses of autotransformers, ~~see 210.9 and 215.11.~~

Submitter Information Verification

Committee: NEC-P09

Submittal Date: Wed Dec 09 16:10:54 EST 2020

Committee Statement

Committee Statement: The Informational Note is rewritten to meet new Style Manual requirements.

Response Message: FR-7838-NFPA 70-2020

Ballot Results

✓ **This item has passed ballot**

12 Eligible Voters

0 Not Returned

11 Affirmative All

1 Affirmative with Comments

0 Negative with Comments

0 Abstention

Affirmative All

Belisle, Rodney D.

Colvin, Carmon A.

Hartwell, Frederic P.

Hollander, Richard

Miller, Kevin R.

Osborne, Robert D.

Parker, Ryan

Ridgeway, Ronnie H.

Schultheis, Timothy James

Sullivan, Paul B.

Sumbera, Darrell M.

Affirmative with Comment

Sasso, Nick

Affirmative.

**First Revision No. 7788-NFPA 70-2020 [Section No. 450.6(C)]****(C) Grounding.**

Where the secondary tie system is grounded, each transformer secondary supplying the tie system shall be grounded in accordance with ~~the requirements of~~ 250.30 for separately derived systems.

Submitter Information Verification

Committee: NEC-P09

Submittal Date: Tue Dec 08 16:35:39 EST 2020

Committee Statement

Committee Statement: Changes were made to improve the clarity of the requirement.

Response Message: FR-7788-NFPA 70-2020

Public Input No. 4070-NFPA 70-2020 [Section No. 450.6(C)]

Ballot Results

✓ **This item has passed ballot**

12 Eligible Voters

0 Not Returned

11 Affirmative All

1 Affirmative with Comments

0 Negative with Comments

0 Abstention

Affirmative All

Belisle, Rodney D.

Colvin, Carmon A.

Hartwell, Frederic P.

Hollander, Richard

Miller, Kevin R.

Osborne, Robert D.

Parker, Ryan

Ridgeway, Ronnie H.

Schultheis, Timothy James

Sullivan, Paul B.

Sumbera, Darrell M.

Affirmative with Comment

Sasso, Nick

Affirmative.

**First Revision No. 7839-NFPA 70-2020 [Section No. 450.9]****450.9 Ventilation.**

The ventilation shall dispose of the transformer full-load heat losses without creating a temperature rise that is in excess of the transformer rating.

Informational Note No. 1: See IEEE C57.12.00-2015, *General Requirements for Liquid-Immersed Distribution, Power, and Regulating Transformers*, and IEEE C57.12.01-2015 2020 , *General Requirements for Dry-Type Distribution and Power Transformers*, for additional information .

Informational Note No. 2: ~~Additional losses occur in some transformers where nonsinusoidal currents are present, resulting in increased heat in the transformer above its rating.~~ See IEEE C57.110-2008 2018 , *Recommended Practice for Establishing Liquid-Filled and Dry-Type Power and Distribution Transformer Capability When Supplying Nonsinusoidal Load Currents*, ~~where transformers for more information where transformers are utilized used with nonlinear loads that have nonsinusoidal currents that can result in additional losses and transformer heating .~~

Transformers with ventilating openings shall be installed so that the ventilating openings are not blocked by walls or other obstructions. The required clearances shall be clearly marked on the transformer. Transformer top surfaces that are horizontal and readily accessible shall be marked to prohibit storage.

Submitter Information Verification

Committee: NEC-P09

Submission Date: Wed Dec 09 16:14:35 EST 2020

Committee Statement

Committee Statement: The Informational Notes are rewritten to meet new Style Manual requirements. CMP-9 also updated the issue date of IEEE C57.12.01 to 2020 and IEEE C57.110 to 2018.

Response Message: FR-7839-NFPA 70-2020

Ballot Results

✔ This item has passed ballot

12 Eligible Voters

0 Not Returned

11 Affirmative All

1 Affirmative with Comments

0 Negative with Comments

0 Abstention

Affirmative All

Belisle, Rodney D.

Colvin, Carmon A.

Hartwell, Frederic P.

Hollander, Richard

Miller, Kevin R.

Osborne, Robert D.

Parker, Ryan

Ridgeway, Ronnie H.

Schultheis, Timothy James

Sullivan, Paul B.

Sumbera, Darrell M.

Affirmative with Comment

Sasso, Nick

Affirmative.

**First Revision No. 7790-NFPA 70-2020 [Section No. 450.10]****450.10** Grounding and Bonding .**(A)** Dry-Type Transformer Enclosures.

Where separate equipment grounding conductors and supply-side bonding jumpers are installed, a terminal bar for all grounding and bonding conductor connections shall be secured inside the transformer enclosure. The terminal bar shall be bonded to the enclosure in accordance with 250.12 and shall not be installed on or over any vented portion of the enclosure.

Exception: Where a dry-type transformer is equipped with wire-type connections (leads), the grounding and bonding connections shall be permitted to be connected together using any of the methods in 250.8 and shall be bonded to the enclosure if of metal.

(B) Other Metal Parts.

Exposed non-current-carrying metal parts of transformer installations, including fences, guards, and so forth, shall be grounded and bonded under the conditions and in the manner specified for electrical equipment and other exposed metal parts in Parts V, VI, and VII of Article 250.

Submitter Information Verification

Committee: NEC-P09

Submittal Date: Tue Dec 08 17:15:18 EST 2020

Committee Statement

Committee Statement: Word changes meet the NEC Style Manual and creates clarity as both grounding and bonding are addressed in this section.

Response Message: FR-7790-NFPA 70-2020

[Public Input No. 1363-NFPA 70-2020 \[Section No. 450.10\]](#)

Ballot Results

✔ **This item has passed ballot**

12 Eligible Voters

0 Not Returned

11 Affirmative All

1 Affirmative with Comments

0 Negative with Comments

0 Abstention

Affirmative All

Belisle, Rodney D.

Colvin, Carmon A.

Hartwell, Frederic P.

Hollander, Richard

Miller, Kevin R.

Osborne, Robert D.

Parker, Ryan

Ridgeway, Ronnie H.

Schultheis, Timothy James

Sullivan, Paul B.

Sumbera, Darrell M.

Affirmative with Comment

Sasso, Nick

Affirmative. "Where separate equipment grounding conductors and supply-side bonding jumpers are installed, a terminal bar for all grounding and bonding conductor connections shall be secured inside the transformer enclosure. The terminal bar shall be bonded to the enclosure in accordance with 250.12 and shall not be installed on or over any vented portion of the enclosure." This is important language that was approved by CMP-9. This language is necessary to ensure a safe installation and LESS PROBLEMS FOR THE ELECTRICAL INSPECTOR IN THE FIELD. This is exactly the reason that Public Input No. 382-NFPA 70-2020 [Section No. 404.12] should have been a First Revision. Inspectors need to have one common point where they can view and check all grounding and bonding connections. This is especially true for services, when the inspector must examine inside the switch (SUSE). There is usually a hodgepodge of lugs untidily scattered about the switch enclosure. It is also not uncommon to find a single lug, containing two or more conductors (an obvious violation). As an inspector it would save me time, and also make for a safer installation if it was required that all equipment grounding conductors and bonding jumpers could be routed to a single point. It's cleaner, and safer. And we wouldn't have to spend so much time trying to "decipher" what is actually going on within the switch enclosure. The Panel comment for PI 382 is erroneous, incorrect, and disingenuous. This requirement is NOT covered elsewhere in the code as the public is being led to believe. All that I asked for is to add a ground bar terminal. It can be added to a switch enclosure rather easily. An example of what a ground bar is, can be found here: https://www.amazon.com/Square-Schneider-Electric-PK12GTACP-Terminal/dp/B00002NB4P/ref=sr_1_2?dchild=1&keywords=ground+bar&qid=1616685377&sr=8-2 All I know is that someone started talking about "product standards" (which had nothing to do with my PI) and derailed the entire conversation. Nobody was proposing to alter the manufacture of the switch enclosure, only to add a ground bar, and only if necessary. This has nothing to do with manufacturers' product standards or how the equipment is built. PI 382 should have passed. It is indicative of the fact that the Panel members seem to give very little weight to what the ELECTRICAL INSPECTOR IS STATING. In the case of this particular PI, the gentlemen from Arizona also substantiated in support of my PI, that "we see this condition all the time," hence making the panel fully aware that THIS WAS AND STILL IS A PROBLEM for the electrical inspector in the field. I hope that CMP-9 will start to listen to the electrical inspectors more as time moves forward. If not, then I don't think that the panel can succeed with NFPA's mission.

**First Revision No. 7979-NFPA 70-2020 [Section No. 450.21]****450.21 Dry-Type Transformers Installed Indoors.****(A) Not Over 112½ kVA.**

Dry-type transformers installed indoors and rated 112½ kVA or less shall have a separation of at least 300 mm (12 in.) from combustible material unless separated from the combustible material by a fire-resistant, heat-insulated barrier.

Exception: This rule shall not apply to transformers rated for 1000 volts, nominal, or less that are completely enclosed, except for ventilating openings.

(B) Over 112½ kVA.

Individual dry-type transformers of more than 112½ kVA rating shall be installed in a transformer room of fire-resistant construction having a minimum fire rating of 1 hour.

Exception No. 1: Transformers with Class 155 or higher insulation systems and separated from combustible material by a fire-resistant, heat-insulating barrier or by not less than 1.83 m (6 ft) horizontally and 3.7 m (12 ft) vertically shall not be required to be installed in a transformer room .

Exception No. 2: Transformers with Class 155 or higher insulation systems and completely enclosed except for ventilating openings shall not be required to be installed in a transformer room .

Informational Note: See ASTM E119-18a, *Standard Test Methods for Fire Tests of Building Construction and Materials*, for additional information on fire-resistance ratings .

(C) Over 35,000 Volts.

Dry-type transformers rated over 35,000 volts shall be installed in a vault complying with Part III of this article.

Submitter Information Verification

Committee: NEC-P09

Submittal Date: Mon Dec 14 08:22:49 EST 2020

Committee Statement

Committee Statement: The exceptions are rewritten to meet new Style Manual requirements. The Informational note is rewritten to meet new Style Manual requirements.

Response Message: FR-7979-NFPA 70-2020

Ballot Results

✔ **This item has passed ballot**

12 Eligible Voters

0 Not Returned

10 Affirmative All

2 Affirmative with Comments

0 Negative with Comments

0 Abstention

Affirmative All

Belisle, Rodney D.

Colvin, Carmon A.

Hartwell, Frederic P.

Hollander, Richard

Miller, Kevin R.

Osborne, Robert D.

Parker, Ryan

Ridgeway, Ronnie H.

Sullivan, Paul B.

Sumbera, Darrell M.

Affirmative with Comment

Sasso, Nick

Affirmative.

Schultheis, Timothy James

depending on the outcome of FR7941, 450.21 may need revised.



First Revision No. 7840-NFPA 70-2020 [Section No. 450.23(B)]

(B) Outdoor Installations.

Less-flammable liquid-filled transformers shall be permitted to be installed outdoors, attached to, adjacent to, or on the roof of buildings, if installed in accordance with (1) or (2), either of the following:

- (1) For Type I and Type II buildings, the installation shall comply with all the restrictions provided for in the listing of the liquid.

Informational Note No. 1: ~~Installations See 450.27 for information about installations adjacent to combustible material, fire escapes, or door and window openings that can require additional safeguards such as those listed in 450.27.~~

Informational Note No. 2: Such restrictions can include, but are not limited to: , maximum pressure of the tank, use of a pressure relief valve, appropriate fuse types, and proper sizing of overcurrent protection.

- (2) In accordance with 450.27.

Informational Note No. 3: ~~As used in this section, Type I and Type II buildings refers to Type I and Type II building construction as defined in See NFPA 220-2018 2021, Standard on Types of Building Construction. Combustible materials refers to those materials not classified as noncombustible or limited-combustible as defined in NFPA 220 -2018, Standard on Types of Building Construction, for definitions of Type I and Type II building construction.~~

Informational Note No. 4: See Article 100 for definition of ~~Listed in Article 100~~.

Submitter Information Verification

Committee: NEC-P09

Submittal Date: Wed Dec 09 16:24:45 EST 2020

Committee Statement

Committee Statement: The Informational Notes are rewritten to meet new Style Manual requirements.

Response Message: FR-7840-NFPA 70-2020

Ballot Results

✓ **This item has passed ballot**

12 Eligible Voters

0 Not Returned

11 Affirmative All

1 Affirmative with Comments

0 Negative with Comments

0 Abstention

Affirmative All

Belisle, Rodney D.

Colvin, Carmon A.

Hartwell, Frederic P.

Hollander, Richard

Miller, Kevin R.

Osborne, Robert D.

Parker, Ryan

Ridgeway, Ronnie H.

Schultheis, Timothy James

Sullivan, Paul B.

Sumbera, Darrell M.

Affirmative with Comment

Sasso, Nick

Affirmative.

**First Revision No. 7843-NFPA 70-2020 [Section No. 450.27]****450.27 Oil-Insulated Transformers Installed Outdoors.**

Combustible material, combustible buildings, and parts of buildings, fire escapes, and door and window openings shall be safeguarded from fires originating in oil-insulated transformers installed on roofs, attached to or adjacent to a building or combustible material.

In cases where the transformer installation presents a fire hazard, one or more of the following safeguards shall be applied according to the degree of hazard involved:

- (1) Space separations
- (2) Fire-resistant barriers
- (3) Automatic fire suppression systems
- (4) Enclosures that confine the oil of a ruptured transformer tank

Oil enclosures shall be permitted to consist of fire-resistant dikes, curbed areas or basins, or trenches filled with coarse, crushed stone. Oil enclosures shall be provided with trapped drains where the exposure and the quantity of oil involved are such that removal of oil is important.

Informational Note: For See ANSI/IEEE C2-2017, *National Electrical Safety Code*, for additional information on transformers installed on poles or structures or underground, see ANSI/IEEE C2-2017, *National Electrical Safety Code*.

Submitter Information Verification

Committee: NEC-P09

Submittal Date: Wed Dec 09 16:43:04 EST 2020

Committee Statement

Committee Statement: The Informational Notes are rewritten to meet new Style Manual requirements.

Response Message: FR-7843-NFPA 70-2020

Ballot Results

✔ **This item has passed ballot**

12 Eligible Voters

0 Not Returned

11 Affirmative All

1 Affirmative with Comments

0 Negative with Comments

0 Abstention

Affirmative All

Belisle, Rodney D.

Colvin, Carmon A.

Hartwell, Frederic P.

Hollander, Richard

Miller, Kevin R.

Osborne, Robert D.

Parker, Ryan

Ridgeway, Ronnie H.

Schultheis, Timothy James

Sullivan, Paul B.

Sumbera, Darrell M.

Affirmative with Comment

Sasso, Nick

Affirmative.

**First Revision No. 7844-NFPA 70-2020 [Section No. 450.42]****450.42 Walls, Roofs, and Floors.**

The walls and roofs of vaults shall be constructed of materials that have approved structural strength for the conditions with a minimum fire resistance of 3 hours. The floors of vaults in contact with the earth shall be of concrete that is not less than 100 mm (4 in.) thick, but, where the vault is constructed with a vacant space or other stories below it, the floor shall have approved structural strength for the load imposed thereon and a minimum fire resistance of 3 hours. For the purposes of this section, studs and wallboard construction shall not be permitted.

Exception: Where transformers are protected with automatic sprinkler, water spray, carbon dioxide, or halon, construction of 1-hour rating shall be permitted.

Informational Note No. 1: ~~For See additional information, see~~ ASTM E119-18a 20, Standard Test Methods for Fire Tests of Building Construction and Materials, for additional information.

Informational Note No. 2: A typical 3-hour construction is 150 mm (6 in.) thick reinforced concrete.

Submitter Information Verification

Committee: NEC-P09

Submission Date: Wed Dec 09 16:47:39 EST 2020

Committee Statement

Committee Statement: The Informational Note is rewritten to meet new Style Manual requirements. CMP-9 updates the ASTM E119 date and title.

Response Message: FR-7844-NFPA 70-2020

Ballot Results

✓ **This item has passed ballot**

12 Eligible Voters

0 Not Returned

11 Affirmative All

1 Affirmative with Comments

0 Negative with Comments

0 Abstention

Affirmative All

Belisle, Rodney D.

Colvin, Carmon A.

Hartwell, Frederic P.

Hollander, Richard

Miller, Kevin R.

Osborne, Robert D.

Parker, Ryan

Ridgeway, Ronnie H.

Schultheis, Timothy James

Sullivan, Paul B.

Sumner, Darrell M.

Affirmative with Comment

Sasso, Nick

Affirmative.

**First Revision No. 7846-NFPA 70-2020 [Section No. 450.43(A)]****(A) Type of Door.**

Each doorway leading into a vault from the building interior shall be provided with a tight-fitting door that has a minimum fire rating of 3 hours. The authority having jurisdiction shall be permitted to require such a door for an exterior wall opening where conditions warrant.

Exception: Where transformers are protected with automatic sprinkler, water spray, carbon dioxide, or halon, construction of 1-hour rating shall be permitted.

Informational Note: ~~For additional information, see~~ See NFPA 80-2016 2019 , *Standard for Fire Doors and Other Opening Protectives*, for additional information .

Submitter Information Verification

Committee: NEC-P09

Submission Date: Wed Dec 09 16:53:11 EST 2020

Committee Statement

Committee Statement: The Informational Note is rewritten to meet new Style Manual requirements.

Response Message: FR-7846-NFPA 70-2020

Ballot Results

✓ **This item has passed ballot**

12 Eligible Voters

0 Not Returned

11 Affirmative All

1 Affirmative with Comments

0 Negative with Comments

0 Abstention

Affirmative All

Belisle, Rodney D.

Colvin, Carmon A.

Hartwell, Frederic P.

Hollander, Richard

Miller, Kevin R.

Osborne, Robert D.

Parker, Ryan

Ridgeway, Ronnie H.

Schultheis, Timothy James

Sullivan, Paul B.

Sumner, Darrell M.

Affirmative with Comment

Sasso, Nick

Affirmative.

**First Revision No. 7791-NFPA 70-2020 [Section No. 450.43(C)]****(C) Locks Accessibility .**

Doors shall be equipped with locks, and doors shall be kept locked, with access being allowed only to qualified persons. Personnel doors shall ~~open~~ be capable of opening not less than 90 degrees in the direction of egress and be equipped with listed fire exit hardware.

Submitter Information Verification

Committee: NEC-P09

Submittal Date: Tue Dec 08 17:27:26 EST 2020

Committee Statement

Committee Statement: CMP-9 changes the 450.43(C) title from "Locks" to "Accessibility" since the section addressed more than locks.

The revised wording ensures vault doorways open wide enough to provide proper access and egress to provide safety.

Response Message: FR-7791-NFPA 70-2020

[Public Input No. 3570-NFPA 70-2020 \[Section No. 450.43\(C\)\]](#)

Ballot Results

✓ **This item has passed ballot**

12 Eligible Voters

0 Not Returned

11 Affirmative All

1 Affirmative with Comments

0 Negative with Comments

0 Abstention

Affirmative All

Belisle, Rodney D.

Colvin, Carmon A.

Hartwell, Frederic P.

Hollander, Richard

Miller, Kevin R.

Osborne, Robert D.

Parker, Ryan

Ridgeway, Ronnie H.

Schultheis, Timothy James

Sullivan, Paul B.

Sumbera, Darrell M.

Affirmative with Comment

Sasso, Nick

Affirmative.

**First Revision No. 7848-NFPA 70-2020 [Section No. 450.45(E)]****(E) Dampers.**

All ventilation openings to the indoors shall be provided with automatic closing fire dampers that operate in response to a vault fire. Such dampers shall possess a standard fire rating of not less than 1½ hours.

Informational Note: See ANSI/UL 555-2016 2020 , *Standard for Fire Dampers*, for additional information on fire dampers .

Submitter Information Verification

Committee: NEC-P09

Submittal Date: Wed Dec 09 16:59:27 EST 2020

Committee Statement

Committee Statement: The Informational Note is rewritten to meet new Style Manual requirements. CMP-9 updates the date of ANSI/UL 555.

Response Message: FR-7848-NFPA 70-2020

Ballot Results

✓ **This item has passed ballot**

12 Eligible Voters

0 Not Returned

11 Affirmative All

1 Affirmative with Comments

0 Negative with Comments

0 Abstention

Affirmative All

Belisle, Rodney D.

Colvin, Carmon A.

Hartwell, Frederic P.

Hollander, Richard

Miller, Kevin R.

Osborne, Robert D.

Parker, Ryan

Ridgeway, Ronnie H.

Schultheis, Timothy James

Sullivan, Paul B.

Sumbera, Darrell M.

Affirmative with Comment

Sasso, Nick

Affirmative.

**First Revision No. 8141-NFPA 70-2020 [Section No. 490.1]****490.1 Scope.**

This article covers the general requirements for equipment operating at more than 1000 volts, nominal.

Informational Note No. 1: See NFPA 70E-2018 2021 , *Standard for Electrical Safety in the Workplace*, for electrical safety requirements for employee workplaces.

Informational Note No. 2: ~~For further information on hazard signs and labels, see~~ See ANSI Z535.4-2011, *Product Signs and Safety Labels*, for further information on hazard signs and labels .

Informational Note No. 3: ~~For information regarding power distribution apparatus, see~~ See IEEE 3001.5-2013, *Recommended Practice for the Application of Power Distribution Apparatus in Industrial and Commercial Power Systems*, for information regarding power distribution apparatus .

Submitter Information Verification

Committee: NEC-P09

Submittal Date: Wed Dec 16 10:56:43 EST 2020

Committee Statement

Committee Statement: Informational notes in Article 490 are revised to comply with Clause 3.1.3.1 of the NEC Style Manual.

Response Message: FR-8141-NFPA 70-2020

Ballot Results

✓ **This item has passed ballot**

12 Eligible Voters

0 Not Returned

11 Affirmative All

1 Affirmative with Comments

0 Negative with Comments

0 Abstention

Affirmative All

Belisle, Rodney D.

Colvin, Carmon A.

Hartwell, Frederic P.

Hollander, Richard

Miller, Kevin R.

Osborne, Robert D.

Parker, Ryan

Ridgeway, Ronnie H.

Schultheis, Timothy James

Sullivan, Paul B.

Sumner, Darrell M.

Affirmative with Comment

Sasso, Nick

Affirmative.

**First Revision No. 7960-NFPA 70-2020 [Section No. 490.3(A)]****(A) Oil-Filled Equipment.**

Installation of electrical equipment, ~~other than transformers covered in Article 450~~, containing more than 38 L (10 gal) of flammable oil per unit shall meet the requirements of Parts II and III of Article 450.

Submitter Information Verification

Committee: NEC-P09

Submission Date: Fri Dec 11 13:30:29 EST 2020

Committee Statement

Committee Statement: In accordance with Clause 4.1.4 of the NEC Style Manual, the reference to the entire Article 450 is removed. There is no need in referencing "transformers" in a Section that references other oil filled equipment. The revised text improves clarity.

Response Message: FR-7960-NFPA 70-2020

[Public Input No. 4358-NFPA 70-2020 \[Section No. 490.3\(A\)\]](#)

Ballot Results

✔ **This item has passed ballot**

12 Eligible Voters

0 Not Returned

11 Affirmative All

1 Affirmative with Comments

0 Negative with Comments

0 Abstention

Affirmative All

Belisle, Rodney D.

Colvin, Carmon A.

Hartwell, Frederic P.

Hollander, Richard

Miller, Kevin R.

Osborne, Robert D.

Parker, Ryan

Ridgeway, Ronnie H.

Schultheis, Timothy James

Sullivan, Paul B.

Sumbera, Darrell M.

Affirmative with Comment

Sasso, Nick

Affirmative.



First Revision No. 7961-NFPA 70-2020 [Section No. 490.24]

490.24 Minimum Space Separation.

In field-fabricated installations, the minimum air separation between bare live conductors and between such conductors and adjacent grounded surfaces shall not be less than the values given in Table 490.24(a). These values shall not apply to interior portions or exterior terminals of equipment designed, manufactured, and tested in accordance with accepted national standards.

Table 490.24(a) Minimum Clearance of Live Parts

<u>Nominal Voltage Rating (kV)</u>	<u>Impulse Withstand, Basic Impulse Level B.I.L. (kV)</u>		<u>Minimum Clearance of Live Parts</u>							
			<u>Phase-to-Phase</u>				<u>Phase-to-Ground</u>			
			<u>Indoors</u>		<u>Outdoors</u>		<u>Indoors</u>		<u>Outdoors</u>	
	<u>Indoors</u>	<u>Outdoors</u>	<u>mm</u>	<u>in.</u>	<u>mm</u>	<u>in.</u>	<u>mm</u>	<u>in.</u>	<u>mm</u>	<u>in.</u>
2.4–4.16	60	95	115	4.5	180	7	80	3.0	155	6
7.2	75	95	140	5.5	180	7	105	4.0	155	6
13.8	95	110	195	7.5	305	12	130	5.0	180	7
14.4	110	110	230	9.0	305	12	170	6.5	180	7
23	125	150	270	10.5	385	15	190	7.5	255	10
34.5	150	150	320	12.5	385	15	245	9.5	255	10
	200	200	460	18.0	460	18	335	13.0	335	13
46	—	200	—	—	460	18	—	—	335	13
	—	250	—	—	535	21	—	—	435	17
69	—	250	—	—	535	21	—	—	435	17
	—	350	—	—	790	31	—	—	635	25
115	—	550	—	—	1350	53	—	—	1070	42
138	—	550	—	—	1350	53	—	—	1070	42
	—	650	—	—	1605	63	—	—	1270	50
161	—	650	—	—	1605	63	—	—	1270	50
	—	750	—	—	1830	72	—	—	1475	58
230	—	750	—	—	1830	72	—	—	1475	58
	—	900	—	—	2265	89	—	—	1805	71
	—	1050	—	—	2670	105	—	—	2110	83

Note: The values given are the minimum clearance for rigid parts and bare conductors under favorable service conditions. They shall be increased for conductor movement or under unfavorable service conditions or wherever space limitations permit. The selection of the associated impulse withstand voltage for a particular system voltage is determined by the characteristics of the overvoltage (surge) protective equipment.

Submitter Information Verification

Committee: NEC-P09

Submittal Date: Fri Dec 11 13:34:07 EST 2020

Committee Statement

Committee Statement: Article 242 (new to the 2020 Code) covers “surge equipment”; however, the title of the Article is “Overvoltage Protection”, as that is a more generic term. This revision aligns this text with the title of Article 242, and also includes the term “surge” as this has historically been used to describe this equipment.

The use of the generic term “overvoltage protection” allows for a broader application of products that provide this protection.

Response Message: FR-7961-NFPA 70-2020

[Public Input No. 3209-NFPA 70-2020 \[Section No. 490.24\]](#)

Ballot Results

✔ This item has passed ballot

12 Eligible Voters

0 Not Returned

11 Affirmative All

1 Affirmative with Comments

0 Negative with Comments

0 Abstention

Affirmative All

Belisle, Rodney D.

Colvin, Carmon A.

Hartwell, Frederic P.

Hollander, Richard

Miller, Kevin R.

Osborne, Robert D.

Parker, Ryan

Ridgeway, Ronnie H.

Schultheis, Timothy James

Sullivan, Paul B.

Sumbera, Darrell M.

Affirmative with Comment

Sasso, Nick

Affirmative.

**First Revision No. 7963-NFPA 70-2020 [Section No. 490.36]****~~490.36~~ Grounding.**

~~Frames of switchgear and control assemblies shall be connected to an equipment grounding conductor or, where permitted, the grounded conductor.~~

Submitter Information Verification

Committee: NEC-P09

Submission Date: Fri Dec 11 13:39:26 EST 2020

Committee Statement

Committee Statement: Requirements in sections 490.36 and 490.37 address different equipment, but have the same requirement. Since "Equipment", as defined in Article 100 is a generic term, it covers all items identified in both sections. Rather than repeat the same requirement twice, they are combined into a single section, and a reference to the section in Article 250 that covers equipment grounding is added.

Response Message: FR-7963-NFPA 70-2020

[Public Input No. 1367-NFPA 70-2020 \[Section No. 490.36\]](#)

Ballot Results

✓ **This item has passed ballot**

12 Eligible Voters

0 Not Returned

11 Affirmative All

1 Affirmative with Comments

0 Negative with Comments

0 Abstention

Affirmative All

Belisle, Rodney D.

Colvin, Carmon A.

Hartwell, Frederic P.

Hollander, Richard

Miller, Kevin R.

Osborne, Robert D.

Parker, Ryan

Ridgeway, Ronnie H.

Schultheis, Timothy James

Sullivan, Paul B.

Sumbera, Darrell M.

Affirmative with Comment

Sasso, Nick

Affirmative.

**First Revision No. 7964-NFPA 70-2020 [Section No. 490.37]****490.37** Equipment Grounding of Devices Connections .

The metal cases or frames, or both, such as those of instruments, relays, meters, and instrument and control transformers, located in or on switchgear or control assemblies, and the frames of switchgear and control assemblies shall be connected to an equipment grounding conductor or, where permitted, the grounded conductor, in accordance with 250.190 .

Submitter Information Verification**Committee:** NEC-P09**Submittal Date:** Fri Dec 11 13:41:43 EST 2020**Committee Statement**

Committee Statement: Requirements in sections 490.36 and 490.37 address different equipment, but have the same requirement. Since "Equipment", as defined in Article 100 is a generic term, it covers all items identified in both sections. Rather than repeat the same requirement twice, they are combined into a single section, and a reference to the section in Article 250 that covers equipment grounding is added.

Response Message: FR-7964-NFPA 70-2020

Ballot Results

✓ **This item has passed ballot**

12 Eligible Voters

0 Not Returned

11 Affirmative All

1 Affirmative with Comments

0 Negative with Comments

0 Abstention

Affirmative All

Belisle, Rodney D.

Colvin, Carmon A.

Hartwell, Frederic P.

Hollander, Richard

Miller, Kevin R.

Osborne, Robert D.

Parker, Ryan

Ridgeway, Ronnie H.

Schultheis, Timothy James

Sullivan, Paul B.

Sumbera, Darrell M.

Affirmative with Comment

Sasso, Nick

Affirmative.

**First Revision No. 7965-NFPA 70-2020 [Section No. 490.48(A)]****(A) Design and Documentation.**

Substations shall be designed by a qualified licensed professional engineer. Where components or the entirety of the substation ~~are~~ is listed by a qualified electrical testing laboratory, documentation of internal design features subject to the listing investigation shall not be required. The design shall address but not be limited to the following topics, and the documentation of this design shall be made available to the authority having jurisdiction:

- (1) Clearances and exits
- (2) Electrical enclosures
- (3) Securing and support of electrical equipment
- (4) Fire protection
- (5) Safety ground connection provisions
- (6) Guarding live parts
- (7) Transformers and voltage regulation equipment
- (8) Conductor insulation, electrical and mechanical protection, isolation, and terminations
- (9) Application, arrangement, and disconnection of circuit breakers, switches, and fuses
- (10) Provisions for oil- filled equipment
- (11) Switchgear
- (12) ~~Surge arresters~~ Overvoltage (surge) protection equipment

Submitter Information Verification

Committee: NEC-P09

Submittal Date: Fri Dec 11 13:47:22 EST 2020

Committee Statement

Committee Statement: Article 242 (new to the 2020 Code) covers “surge equipment”; however, the title of the Article is “Overvoltage Protection”, as that is a more generic term. This revision aligns this text with the title of Article 242, and also includes the term “surge” as this has historically been used to describe this equipment.

The use of the generic term “overvoltage protection” allows for a broader application of products that provide this protection.

Response Message: FR-7965-NFPA 70-2020

[Public Input No. 3210-NFPA 70-2020 \[Section No. 490.48\(A\)\]](#)

Ballot Results

✓ **This item has passed ballot**

12 Eligible Voters

0 Not Returned

11 Affirmative All

1 Affirmative with Comments

0 Negative with Comments

0 Abstention

Affirmative All

Belisle, Rodney D.

Colvin, Carmon A.
Hartwell, Frederic P.
Hollander, Richard
Miller, Kevin R.
Osborne, Robert D.
Parker, Ryan
Ridgeway, Ronnie H.
Schultheis, Timothy James
Sullivan, Paul B.
Sumbera, Darrell M.

Affirmative with Comment

Sasso, Nick
Affirmative.

**First Revision No. 7966-NFPA 70-2020 [Section No. 490.49]****490.49** Reconditioned Switchgear.

Switchgear, or sections of switchgear, within the scope of this article shall be permitted to be reconditioned. The reconditioning process shall use design qualified parts verified under applicable standards and be performed in accordance with any instructions provided by the manufacturer. Reconditioned switchgear shall be listed or field labeled as reconditioned, ~~and previously applied listing marks, if any, within the portions reconditioned shall be removed~~ [see 110.21(A)(2)]. If equipment has been damaged by fire, products of combustion, or water, it shall be specifically evaluated by its manufacturer or a qualified testing laboratory prior to being returned to service.

Submitter Information Verification**Committee:** NEC-P09**Submittal Date:** Fri Dec 11 13:51:38 EST 2020**Committee Statement****Committee Statement:** CMP-9 eliminates the statement to remove previously installed labels, as this is a general requirement contained in Chapter 1.**Response Message:** FR-7966-NFPA 70-2020Public Input No. 4517-NFPA 70-2020 [Section No. 490.49]**Ballot Results**✔ **This item has passed ballot**

12 Eligible Voters

0 Not Returned

10 Affirmative All

2 Affirmative with Comments

0 Negative with Comments

0 Abstention

Affirmative All

Belisle, Rodney D.

Colvin, Carmon A.

Hartwell, Frederic P.

Hollander, Richard

Miller, Kevin R.

Osborne, Robert D.

Parker, Ryan

Ridgeway, Ronnie H.

Sullivan, Paul B.

Sumbera, Darrell M.

Affirmative with Comment

Sasso, Nick

Affirmative.

Schultheis, Timothy James

"Corrosive influences" should be added as was done in other sections during the first draft meetings. "If equipment has been damaged by fire, products of combustion, corrosive influences, or water, it shall be specifically evaluated by its manufacturer or a qualified testing laboratory prior to being returned to service"

**First Revision No. 7967-NFPA 70-2020 [Section No. 490.51(B)]****(B) Other Requirements** Grounding and Bonding .

~~The requirements of this part shall be additional to, or amendatory of, those prescribed in Articles 100 through 725 of this Code .~~ Special attention shall be paid to Grounding and bonding shall be in accordance with Part X of Article 250.

Submitter Information Verification**Committee:** NEC-P09**Submittal Date:** Fri Dec 11 13:59:28 EST 2020**Committee Statement**

Committee Statement: Section 4.1.4 of the 2020 NEC® Style Manual prohibits references to an entire articles, with the exception of Article 100. The intent here is to point to the bonding and grounding parts that would apply in Article 250, which is Part X since this is "high voltage equipment", and requirements for portable equipment appear in Part X.

Response Message: FR-7967-NFPA 70-2020

Public Input No. 4361-NFPA 70-2020 [Section No. 490.51(B)]

Ballot Results

✔ **This item has passed ballot**

12 Eligible Voters

0 Not Returned

11 Affirmative All

1 Affirmative with Comments

0 Negative with Comments

0 Abstention

Affirmative All

Belisle, Rodney D.

Colvin, Carmon A.

Hartwell, Frederic P.

Hollander, Richard

Miller, Kevin R.

Osborne, Robert D.

Parker, Ryan

Ridgeway, Ronnie H.

Schultheis, Timothy James

Sullivan, Paul B.

Sumbera, Darrell M.

Affirmative with Comment

Sasso, Nick

Affirmative.

**First Revision No. 7968-NFPA 70-2020 [Section No. 490.56]****490.66** High-Voltage Portable Cable for Main Power Supply.

Flexible high-voltage cable supplying power to portable or mobile equipment shall comply with the grounding and bonding requirements in Parts V, VI, and X of Article 250 and the flexible cable requirements in Part III of Article 400, Part III.

Submitter Information Verification

Committee: NEC-P09

Submittal Date: Fri Dec 11 14:04:00 EST 2020

Committee Statement

Committee Statement: Section 4.1.4 of the 2020 NEC® Style Manual prohibits references to an entire articles, with the exception of Article 100. The intent here is to point to the bonding and grounding parts that would apply in Article 250, which are Parts V, VI, and X since this is "high voltage equipment". The structure of this section is reordered for consistency, with "Part" occurring prior to "Article".

Response Message: FR-7968-NFPA 70-2020

[Public Input No. 4367-NFPA 70-2020 \[Section No. 490.56\]](#)

Ballot Results

✔ **This item has passed ballot**

12 Eligible Voters

0 Not Returned

11 Affirmative All

1 Affirmative with Comments

0 Negative with Comments

0 Abstention

Affirmative All

Belisle, Rodney D.

Colvin, Carmon A.

Hartwell, Frederic P.

Hollander, Richard

Miller, Kevin R.

Osborne, Robert D.

Parker, Ryan

Ridgeway, Ronnie H.

Schultheis, Timothy James

Sullivan, Paul B.

Sumbera, Darrell M.

Affirmative with Comment

Sasso, Nick

Affirmative.

**First Revision No. 7971-NFPA 70-2020 [Section No. 490.71]****490.71 Electrical Supply System.**

~~Electrode-type boilers~~ **Boilers** shall be supplied only from a 3-phase, 4-wire solidly grounded wye system, or from isolating transformers arranged to provide such a system. Control circuit voltages shall not exceed 150 volts, shall be supplied from a grounded system, and shall have the controls in the ungrounded conductor.

Submitter Information Verification

Committee: NEC-P09

Submittal Date: Fri Dec 11 15:22:42 EST 2020

Committee Statement

Committee Statement: The use of larger resistance type boilers is becoming more prevalent as users move to de-carbonization and away from fossil fuels for heating. Other standards are referencing the NEC for evaluation and resistance type boilers operating over 1000V are not addressed in Article 490. Part V already addresses "Electrode-Type Boilers", and rather than create a new "Part VI" that has identical requirements, Part V is revised to refer to "Boilers" more generically. The existing requirements for "Electrode-Type Boilers" would apply equally to other types of Boilers, including "Resistance-Type Boilers". Changes are made throughout Part V to refer generically to "Boilers".

Response Message: FR-7971-NFPA 70-2020

Ballot Results

✔ **This item has passed ballot**

12 Eligible Voters

0 Not Returned

11 Affirmative All

1 Affirmative with Comments

0 Negative with Comments

0 Abstention

Affirmative All

Belisle, Rodney D.

Colvin, Carmon A.

Hartwell, Frederic P.

Hollander, Richard

Miller, Kevin R.

Osborne, Robert D.

Parker, Ryan

Ridgeway, Ronnie H.

Schultheis, Timothy James

Sullivan, Paul B.

Sumbera, Darrell M.

Affirmative with Comment

Sasso, Nick

Affirmative.

**First Revision No. 7972-NFPA 70-2020 [Section No. 490.72(E)]****(E) Grounded Neutral Conductor.**

The grounded neutral conductor shall be as follows:

- (1) Connected to the pressure vessel containing ~~the electrodes~~ the heating elements
- (2) Insulated for not less than 1000 volts
- (3) Have not less than the ampacity of the largest ungrounded branch-circuit conductor
- (4) Installed with the ungrounded conductors in the same raceway, cable, or cable tray, or, where installed as open conductors, in close proximity to the ungrounded conductors
- (5) Not used for any other circuit

Submitter Information Verification

Committee: NEC-P09

Submittal Date: Fri Dec 11 15:25:38 EST 2020

Committee Statement

Committee Statement: The use of larger resistance type boilers is becoming more prevalent as users move to de-carbonization and away from fossil fuels for heating. Other standards are referencing the NEC for evaluation and resistance type boilers operating over 1000V are not addressed in Article 490. Part V already addresses "Electrode-Type Boilers", and rather than create a new "Part VI" that has identical requirements, Part V is revised to refer to "Boilers" more generically. The existing requirements for "Electrode-Type Boilers" would apply equally to other types of Boilers, including "Resistance-Type Boilers". Changes are made throughout Part V to refer generically to "Boilers".

Response Message: FR-7972-NFPA 70-2020

Ballot Results

✔ This item has passed ballot

12 Eligible Voters

0 Not Returned

11 Affirmative All

1 Affirmative with Comments

0 Negative with Comments

0 Abstention

Affirmative All

Belisle, Rodney D.

Colvin, Carmon A.

Hartwell, Frederic P.

Hollander, Richard

Miller, Kevin R.

Osborne, Robert D.

Parker, Ryan

Ridgeway, Ronnie H.

Schultheis, Timothy James

Sullivan, Paul B.

Sumbera, Darrell M.

Affirmative with Comment

Sasso, Nick

Affirmative.

**First Revision No. 7973-NFPA 70-2020 [Section No. 490.73]****490.73 Pressure and Temperature Limit Control.**

Each boiler shall be equipped with a means to limit the maximum temperature, pressure, or both, by directly or indirectly interrupting all current flow through the ~~electrodes~~ heating elements . Such means shall be in addition to the temperature, pressure, or both, regulating systems and pressure relief or safety valves.

Submitter Information Verification

Committee: NEC-P09

Submittal Date: Fri Dec 11 15:27:42 EST 2020

Committee Statement

Committee Statement: The use of larger resistance type boilers is becoming more prevalent as users move to de-carbonization and away from fossil fuels for heating. Other standards are referencing the NEC for evaluation and resistance type boilers operating over 1000V are not addressed in Article 490. Part V already addresses "Electrode-Type Boilers", and rather than create a new "Part VI" that has identical requirements, Part V is revised to refer to "Boilers" more generically. The existing requirements for "Electrode-Type Boilers" would apply equally to other types of Boilers, including "Resistance-Type Boilers". Changes are made throughout Part V to refer generically to "Boilers".

Response Message: FR-7973-NFPA 70-2020

Ballot Results

✔ **This item has passed ballot**

12 Eligible Voters

0 Not Returned

11 Affirmative All

1 Affirmative with Comments

0 Negative with Comments

0 Abstention

Affirmative All

Belisle, Rodney D.

Colvin, Carmon A.

Hartwell, Frederic P.

Hollander, Richard

Miller, Kevin R.

Osborne, Robert D.

Parker, Ryan

Ridgeway, Ronnie H.

Schultheis, Timothy James

Sullivan, Paul B.

Sumbera, Darrell M.

Affirmative with Comment

Sasso, Nick

Affirmative.



First Revision No. 7700-NFPA 70-2020 [Part I.]

Part I. Scope and Installation General

Submitter Information Verification

Committee: NEC-P09

Submission Date: Mon Dec 07 14:51:25 EST 2020

Committee Statement

Committee Statement: CMP-9 is revising the title of Part 1 to comply with the new Style Manual, Sec. 2.4.2.1

Response Message: FR-7700-NFPA 70-2020

Public Input No. 4365-NFPA 70-2020 [Part I.]

Ballot Results

✔ **This item has passed ballot**

12 Eligible Voters

0 Not Returned

11 Affirmative All

1 Affirmative with Comments

0 Negative with Comments

0 Abstention

Affirmative All

Belisle, Rodney D.

Colvin, Carmon A.

Hartwell, Frederic P.

Hollander, Richard

Miller, Kevin R.

Osborne, Robert D.

Parker, Ryan

Ridgeway, Ronnie H.

Schultheis, Timothy James

Sullivan, Paul B.

Sumbera, Darrell M.

Affirmative with Comment

Sasso, Nick

Affirmative.



First Revision No. 7715-NFPA 70-2020 [Part I.]

Part I. Scope and General

Submitter Information Verification

Committee: NEC-P09

Submission Date: Mon Dec 07 16:59:02 EST 2020

Committee Statement

Committee Statement: CMP-9 is revising the title of Part I to comply with the new Style Manual, Sec. 2.4.2.1.

Response Message: FR-7715-NFPA 70-2020

[Public Input No. 4366-NFPA 70-2020 \[Part I.\]](#)

Ballot Results

✔ This item has passed ballot

12 Eligible Voters

0 Not Returned

11 Affirmative All

1 Affirmative with Comments

0 Negative with Comments

0 Abstention

Affirmative All

Belisle, Rodney D.

Colvin, Carmon A.

Hartwell, Frederic P.

Hollander, Richard

Miller, Kevin R.

Osborne, Robert D.

Parker, Ryan

Ridgeway, Ronnie H.

Schultheis, Timothy James

Sullivan, Paul B.

Sumbera, Darrell M.

Affirmative with Comment

Sasso, Nick

Affirmative.

**First Revision No. 7784-NFPA 70-2020 [Part I.]****Part I. General Provisions****Submitter Information Verification****Committee:** NEC-P09**Submission Date:** Tue Dec 08 15:35:10 EST 2020**Committee Statement****Committee Statement:**

CMP-9 Edits title to Part I for clarity to meet Style Manual requirements.

Response Message: FR-7784-NFPA 70-2020[Public Input No. 977-NFPA 70-2020 \[Part I.\]](#)[Public Input No. 4373-NFPA 70-2020 \[Part I.\]](#)**Ballot Results****✓ This item has passed ballot**

12 Eligible Voters

0 Not Returned

11 Affirmative All

1 Affirmative with Comments

0 Negative with Comments

0 Abstention

Affirmative All

Belisle, Rodney D.

Colvin, Carmon A.

Hartwell, Frederic P.

Hollander, Richard

Miller, Kevin R.

Osborne, Robert D.

Parker, Ryan

Ridgeway, Ronnie H.

Schultheis, Timothy James

Sullivan, Paul B.

Sumbera, Darrell M.

Affirmative with Comment

Sasso, Nick

Affirmative.



First Revision No. 7862-NFPA 70-2020 [Part I.]

Part I. Installation General

Submitter Information Verification

Committee: NEC-P09

Submission Date: Wed Dec 09 21:22:21 EST 2020

Committee Statement

Committee Statement: Per the style manual, where an article has multiple parts, Part I, shall be titled "General."

Response Message: FR-7862-NFPA 70-2020

Public Input No. 4371-NFPA 70-2020 [Part I.]

Ballot Results

✔ This item has passed ballot

12 Eligible Voters

0 Not Returned

11 Affirmative All

1 Affirmative with Comments

0 Negative with Comments

0 Abstention

Affirmative All

Belisle, Rodney D.

Colvin, Carmon A.

Hartwell, Frederic P.

Hollander, Richard

Miller, Kevin R.

Osborne, Robert D.

Parker, Ryan

Ridgeway, Ronnie H.

Schultheis, Timothy James

Sullivan, Paul B.

Sumbera, Darrell M.

Affirmative with Comment

Sasso, Nick

Affirmative.

**First Revision No. 7796-NFPA 70-2020 [Part II.]****Part II. Specific Provisions Applicable to Different Types of Transformers Installation****Submitter Information Verification****Committee:** NEC-P09**Submission Date:** Tue Dec 08 17:51:41 EST 2020**Committee Statement****Committee Statement:**

CMP-9 edits the title to Part II for clarity and to meet Style Manual requirements.

Response Message: FR-7796-NFPA 70-2020**Ballot Results****✔ This item has passed ballot**

12 Eligible Voters

0 Not Returned

11 Affirmative All

1 Affirmative with Comments

0 Negative with Comments

0 Abstention

Affirmative All

Belisle, Rodney D.

Colvin, Carmon A.

Hartwell, Frederic P.

Hollander, Richard

Miller, Kevin R.

Osborne, Robert D.

Parker, Ryan

Ridgeway, Ronnie H.

Schultheis, Timothy James

Sullivan, Paul B.

Sumbera, Darrell M.

Affirmative with Comment

Sasso, Nick

Affirmative.

**First Revision No. 7970-NFPA 70-2020 [Part V.]****Part V. ~~Electrode-Type~~ Boilers****Submitter Information Verification****Committee:** NEC-P09**Submittal Date:** Fri Dec 11 15:20:11 EST 2020**Committee Statement**

Committee Statement: The use of larger resistance type boilers is becoming more prevalent as users move to de-carbonization and away from fossil fuels for heating. Other standards are referencing the NEC for evaluation and resistance type boilers operating over 1000V are not addressed in Article 490. Part V already addresses "Electrode-Type Boilers", and rather than create a new "Part VI" that has identical requirements, Part V is revised to refer to "Boilers" more generically. The existing requirements for "Electrode-Type Boilers" would apply equally to other types of Boilers, including "Resistance-Type Boilers". Changes are made throughout Part V to refer generically to "Boilers".

Response Message: FR-7970-NFPA 70-2020

Public Input No. 2084-NFPA 70-2020 [New Article after 490]

Ballot Results

✓ **This item has passed ballot**

12 Eligible Voters

0 Not Returned

11 Affirmative All

1 Affirmative with Comments

0 Negative with Comments

0 Abstention

Affirmative All

Belisle, Rodney D.

Colvin, Carmon A.

Hartwell, Frederic P.

Hollander, Richard

Miller, Kevin R.

Osborne, Robert D.

Parker, Ryan

Ridgeway, Ronnie H.

Schultheis, Timothy James

Sullivan, Paul B.

Sumbera, Darrell M.

Affirmative with Comment

Sasso, Nick

Affirmative.