Second Revision No. 8472-NFPA 70-2021 [Global Comment]

Relocate requirements for feeders, outside branch circuits and feeders, and services over 1000 Vac or 1500 Vdc from Articles 215, 225, and 230 into the new Article 235. See attached word document for deletions from Articles 215, 225, and 230, and the new requirements to be added to Article 235.

Supplemental Information

File Name	Description	Approved
NEC_CMP10_SR8472_Global.docx	For staff use	
CMP-10_Global_SR-8472_Chapter_2_for_ballot.pdf	For ballot	

Submitter Information Verification

Committee: NEC-P10

Submittal Date: Wed Oct 27 10:25:46 EDT 2021

Committee Statement

Committee Statement: This action will combine all the requirements under the purview of CMP-10 for feeders, outside branch circuits and feeders, and services over 1000 Vac or 1500 Vdc into the new Article 235. This action is to correlate with the actions taken by CMP-2 on PC-285 which created the new Article 235.

The corresponding sections from Articles 215, 225, and 230 will be deleted as the requirements have been relocated to the new Article 235.

The edition year ANSI/NETA ATS was removed so that it is automatically the latest edition as outlined in 90.1(C) pursuant to PC-853.

CMP-10 is requesting the correlating committee review the changes in scope of Articles 225 and 230. The scope change to Article 215 is addressed by SR-8369.

Response Message: SR-8472-NFPA 70-2021

Public Comment No. 848-NFPA 70-2021 [Section No. 225.1]

Public Comment No. 853-NFPA 70-2021 [Section No. 225.56(B)]

Public Comment No. 1423-NFPA 70-2021 [Global Input]

Global SR-8472 [CMP-10]

215.1 Scope.
This article covers the installation requirements, overcurrent protection requirements, minimum size, and ampacity of conductors for feeders not more than 1000 volts ac or 1500 volts dc, nominal.

Informational Note: See Part III of Article 235 for feeders over 1000 volts ac or 1500 volts dc.

~~*Exception: This article does not apply to feeders for electrolytic cells as covered in 668.3(C)(1) and (C)(4).*~~

215.2 Minimum Rating and Size.

(A) General.
Feeder conductors shall have an ampacity not less than the larger of 215.2(A)(1) or (A)(~~1~~2)~~(b)~~ and shall comply with 110.14(C).

(1) Continuous and Noncontinuous Loads.
Where a feeder supplies continuous loads or any combination of continuous and noncontinuous loads, the minimum feeder conductor size shall have an ampacity not less than the noncontinuous load plus 125 percent of the continuous load.

Exception No. 1: If the assembly, including the overcurrent devices protecting the feeder(s), is listed for operation at 100 percent of its rating, the ampacity of the feeder conductors shall be permitted to be not less than the sum of the continuous load plus the noncontinuous load.

Exception No. 2: Where a portion of a feeder is connected at both its supply and load ends to separately installed pressure connections as covered in 110.14(C)(2), it shall be permitted to have an ampacity not less than the sum of the continuous load plus the noncontinuous load. No portion of a feeder installed under this exception shall extend into an enclosure containing either the feeder supply or the feeder load terminations, as covered in 110.14(C)(1).

Exception No. 3: Grounded conductors that are not connected to an overcurrent device shall be permitted to be sized at 100 percent of the continuous and noncontinuous load.

(2) Ampacity Adjustment or Correction Factors.
The minimum feeder conductor size shall have an ampacity not less than the maximum load to be served after the application of any adjustment or correction factors in accordance with 310.14.

Informational Note No. 1: See Examples D1 through D11 in Informative Annex D.

Informational Note No. 2: Conductors for feeders, as defined in Article 100, sized to prevent a voltage drop exceeding 3 percent at the farthest outlet of power, heating, and lighting loads, or combinations of such loads, and where the maximum total voltage drop on both feeders and branch circuits to the farthest outlet does not exceed 5 percent, will provide reasonable efficiency of operation.

Informational Note No. 3: See 210.19~~(B)~~, Informational Note ~~No. 3,~~ for voltage drop for branch circuits.

(B) Grounded Conductor.
The size of the feeder circuit grounded conductor shall not be smaller than the equipment grounding conductor size required by 250.122, except that 250.122(F) shall not apply where grounded conductors are run in parallel.
Additional minimum sizes shall be as specified in 215.2(C) under the conditions stipulated.

(C) Ampacity Relative to Service Conductors.
The feeder conductor ampacity shall not be less than that of the service conductors where the feeder conductors carry the total load supplied by service conductors with an ampacity of 55 amperes or less.

~~**(A) Feeders Not More Than 1000 Volts.**~~

~~**(B) Feeders over 1000 Volts.**~~
~~The ampacity of conductors shall be in accordance with 310.14 and 315.60 as applicable. Where installed, the size of the feeder-circuit grounded conductor shall not be smaller than that required by 250.122, except that 250.122(F) shall not apply where grounded conductors are run in parallel. Feeder conductors over 1000 volts shall be sized in accordance with 215.2(B)(1), (B)(2), or (B)(3).~~

~~**(1) Feeders Supplying Transformers.**~~
~~The ampacity of feeder conductors shall not be less than the sum of the nameplate ratings of the transformers supplied when only transformers are supplied.~~

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

~~**(3) Supervised Installations.**~~
~~For supervised installations, feeder conductor sizing shall be permitted to be determined by qualified persons under engineering supervision in accordance with 310.14(B) or 315.60(B). Supervised installations are defined as those portions of a facility where all of the following conditions are met:~~

~~(1) Conditions of design and installation are provided under engineering supervision.~~

~~(2) Qualified persons with documented training and experience in over 1000-volt systems provide maintenance, monitoring, and servicing of the system.~~

225.1 Scope.
This article covers requirements for outside branch circuits and feeders not more than 1000 volts ac or 1500 volts dc, nominal, run on or between buildings, structures, or poles on the premises; and electrical equipment and wiring for the supply of utilization equipment that is located on or attached to the outside of buildings, structures, or poles.

Informational Note: ~~See ANSI/IEEE C2-2017, *National Electrical Safety Code*, for additional information on wiring over 1000 volts.~~See Part IV of Article 235 for outside branch circuits and feeders over 1000 volts ac or 1500 volts dc.

225.6 Conductor Size and Support.

(A) Overhead Spans.

Open individual conductors shall not be smaller than ~~the following:~~ 10 AWG copper or 8 AWG aluminum for spans up to 15 m (50 ft) in length, and 8 AWG copper or 6 AWG aluminum for a longer span unless supported by a messenger wire.

~~(1) For 1000 volts, nominal, or less, 10 AWG copper or 8 AWG aluminum for spans up to 15 m (50 ft) in length, and 8 AWG copper or 6 AWG aluminum for a longer span unless supported by a messenger wire~~

~~(2) For over 1000 volts, nominal, 6 AWG copper or 4 AWG aluminum where open individual conductors, and 8 AWG copper or 6 AWG aluminum where in cable~~

(B) Festoon Lighting.

Overhead conductors for festoon lighting shall not be smaller than 12 AWG unless the conductors are supported by messenger wires. In all spans exceeding 12 m (40 ft), the conductors shall be supported by messenger wire. The messenger wire shall be supported by strain insulators. Conductors or messenger wires shall not be attached to any fire escape, downspout, or plumbing equipment.

225.10 Wiring on Buildings (or Other Structures).

The installation of outside wiring on surfaces of buildings (or other structures) shall be permitted for circuits not exceeding 1000 volts, nominal, as the following:

(1) Auxiliary gutters

(2) Busways

(3) Cable trays

(4) Cablebus

(5) Electrical metallic tubing (EMT)

(6) Flexible metal conduit (FMC)

(7) Intermediate metal conduit (IMC)

(8) Liquidtight flexible metal conduit (LFMC)

(9) Liquidtight flexible nonmetallic conduit (LFNC)

(10) Messenger-supported wiring

(11) Open wiring on insulators

(12) Reinforced thermosetting resin conduit (RTRC)

(13) Rigid metal conduit (RMC)

(14) Rigid polyvinyl chloride conduit (PVC)

(15) Type MC cable

(16) Type MI cable

(17) Type SE cable

(18) Type TC-ER cable

(19) Type UF cable

(20) Wireways

~~Circuits of over 1000 volts, nominal, shall be installed as provided in 300.37.~~

225.14 Open-Conductor Spacings.
Conductors ~~of 1000 volts, nominal, or less,~~ shall comply with the spacings provided in Table 230.51(C).

~~**(A) 1000 Volts, Nominal, or Less.**~~
~~Conductors of 1000 volts, nominal, or less, shall comply with the spacings provided in Table 230.51(C).~~

~~**(B) Over 1000 Volts, Nominal.**~~
~~Conductors of over 1000 volts, nominal, shall comply with the spacings provided in 110.36 and 490.24.~~

(A) Separation from Other Circuits.
Open conductors shall be separated from open conductors of other circuits or systems by not less than 100 mm (4 in.).

(B) Conductors on Poles.
Conductors on poles shall have a separation of not less than 300 mm (1 ft) where not placed on racks or brackets. Conductors supported on poles shall provide a horizontal climbing space not less than the following:

(1) Power conductors below communications conductors — 750 mm (30 in.)

(2) Power conductors alone or above communications conductors:

a. 300 volts or less — 600 mm (24 in.)

b. Over 300 volts — 750 mm (30 in.)

(3) Communications conductors below power conductors — same as power conductors
(4) Communications conductors alone — no requirement

~~**Part III. Over 1000 Volts.**~~
~~**225.50 Sizing of Conductors.**~~
~~The sizing of conductors over 1000 volts shall be in accordance with 210.19(E) for branch circuits and 215.2(B) for feeders.~~
~~**225.51 Isolating Switches.**~~
~~Where oil switches or air, oil, vacuum, or sulfur hexafluoride circuit breakers constitute a building disconnecting means, an isolating switch with visible break contacts and meeting the requirements of 230.204(B), (C), and (D) shall be installed on the supply side of the disconnecting means and all associated equipment.~~
~~*Exception: The isolating switch shall not be required where the disconnecting means is mounted on removable truck panels or switchgear units that cannot be opened unless the circuit is disconnected and that, when removed from the normal operating position, automatically disconnect the circuit breaker or switch from all energized parts.*~~
~~**225.52 Disconnecting Means.**~~
~~**(A) Location.**~~
~~A building or structure disconnecting means shall be located in accordance with 225.31(B), or, if not readily accessible, it shall be operable by mechanical linkage from a readily~~

accessible point. For multibuilding industrial installations under single management, it shall be permitted to be electrically operated by a readily accessible, remote-control device in a separate building or structure.

(B) Type.

Each building or structure disconnect shall simultaneously disconnect all ungrounded supply conductors it controls and shall have a fault-closing rating not less than the available fault current at its supply terminals.

Exception: Where the individual disconnecting means consists of fused cutouts, the simultaneous disconnection of all ungrounded supply conductors shall not be required if there is a means to disconnect the load before opening the cutouts. A permanent legible sign shall be installed adjacent to the fused cutouts and shall read DISCONNECT LOAD BEFORE OPENING CUTOUTS.

Where fused switches or separately mounted fuses are installed, the fuse characteristics shall be permitted to contribute to the fault-closing rating of the disconnecting means.

(C) Locking.

Disconnecting means shall be lockable open in accordance with 110.25.

Exception: Where an individual disconnecting means consists of fused cutouts, a suitable enclosure capable of being locked and sized to contain all cutout fuse holders shall be installed at a convenient location to the fused cutouts.

(D) Indicating.

Disconnecting means shall clearly indicate whether they are in the open "off" or closed "on" position.

(E) Uniform Position.

Where disconnecting means handles are operated vertically, the "up" position of the handle shall be the "on" position.

Exception: A switching device having more than one "on" position, such as a double throw switch, shall not be required to comply with this requirement.

(F) Identification.

Where a building or structure has any combination of feeders, branch circuits, or services passing through or supplying it, a permanent plaque or directory shall be installed at each feeder and branch-circuit disconnect location that denotes all other services, feeders, or branch circuits supplying that building or structure or passing through that building or structure and the area served by each.

225.56 Inspections and Tests.

(A) Pre-Energization and Operating Tests.

The complete electrical system design, including settings for protective, switching, and control circuits, shall be prepared in advance and made available on request to the authority having jurisdiction and shall be performance tested when first installed on-site. Each protective, switching, and control circuit shall be adjusted in accordance with the system design and tested by actual operation using current injection or equivalent methods as necessary to ensure that each and every such circuit operates correctly to the satisfaction of the authority having jurisdiction.

(1) Instrument Transformers.

All instrument transformers shall be tested to verify correct polarity and burden.

(2) Protective Relays.

Each protective relay shall be demonstrated to operate by injecting current or voltage, or both, at the associated instrument transformer output terminal and observing that the associated switching and signaling functions occur correctly and in proper time and sequence to accomplish the protective function intended.

(3) Switching Circuits.

Each switching circuit shall be observed to operate the associated equipment being switched.

(4) Control and Signal Circuits.

Each control or signal circuit shall be observed to perform its proper control function or produce a correct signal output.

(5) Metering Circuits.

All metering circuits shall be verified to operate correctly from voltage and current sources in a similar manner to protective relay circuits.

(6) Acceptance Tests.

Complete acceptance tests shall be performed, after the substation installation is completed, on all assemblies, equipment, conductors, and control and protective systems, as applicable, to verify the integrity of all the systems.

(7) Relays and Metering Utilizing Phase Differences.

All relays and metering that use phase differences for operation shall be verified by measuring phase angles at the relay under actual load conditions after operation commences.

(B) Test Report.

A test report covering the results of the tests required in 225.56(A) shall be delivered to the authority having jurisdiction prior to energization.

Informational Note: See ANSI/NETA ATS-2013, *Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems*, for an example of acceptance specifications.

225.60 Clearances over Roadways, Walkways, Rail, Water, and Open Land.

(A) 22 kV or Less to Ground.

The clearances over roadways, walkways, rail, water, and open land for conductors and live parts up to 22 kV or less to ground shall be not less than the values shown in Table 225.60(A).

Table 225.60(A) Clearances over Roadways, Walkways, Rail, Water, and Open Land

Location	Clearance	
	m	ft
Open land subject to vehicles, cultivation, or grazing	5.6	18.5
Roadways, driveways, parking lots, and alleys	5.6	18.5
Walkways	4.1	13.5
Rails	8.1	26.5
Spaces and ways for pedestrians and restricted traffic	4.4	14.5
Water areas not suitable for boating	5.2	17.0

(B) More Than 22 kV to Ground.

Clearances for the categories shown in Table 225.60(A) shall be increased by 10 mm (0.4 in.) per kV, or major fraction thereof, more than 22 kV.

(C) Special Cases.

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

Informational Note: See ANSI/IEEE C2-2017, *National Electrical Safety Code*, for additional information.

225.61 Clearances over Buildings and Other Structures.

(A) 22 kV or Less to Ground.

The clearances over buildings and other structures for conductors and live parts up to 22 kV or less to ground shall be not less than the values shown in Table 225.61(A).

Table 225.61(A) Clearances over Buildings and Other Structures

Clearance from Conductors or Live Parts from:	Horizontal		Vertical	
	m	ft	m	ft
Building walls, projections, and windows	2.3	7.5	—	—
Balconies, catwalks, and similar areas accessible to people	2.3	7.5	4.1	13.5
Over or under roofs or projections not readily accessible to people	—	—	3.8	12.5
Over roofs accessible to vehicles but not trucks	—	—	4.1	13.5
Over roofs accessible to trucks	—	—	5.6	18.5
Other structures	2.3	7.5	—	—

(B) More Than 22 kV to Ground.

Clearances for the categories shown in Table 225.61(A) shall be increased by 10 mm (0.4 in.) per kV , or major fraction thereof, more than 22 kV.

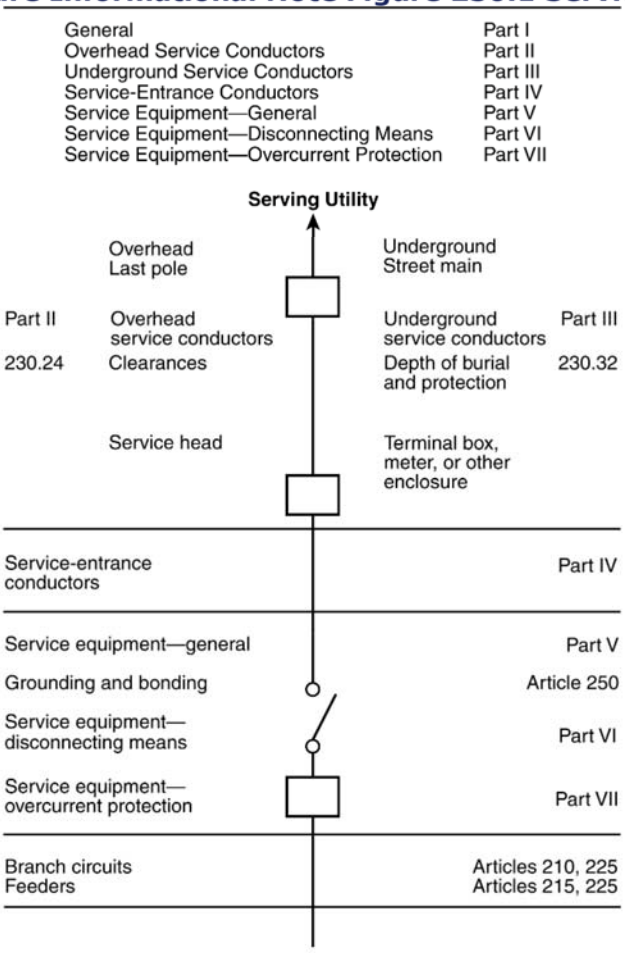
Informational Note: See ANSI/IEEE C2-2017, *National Electrical Safety Code*, for additional information.

230.1 Scope.

This article covers service conductors and equipment for control and protection of services not more than 1000 volts ac or 1500 volts dc, nominal and their installation requirements.

Informational Note No. 1: See Informational Note Figure 230.1.

Figure Informational Note Figure 230.1 Services.



Informational Note No. 2: See Part V of Article 235 for services over 1000 volts ac or 1500 volts dc, nominal.

Part III. Feeders

235.201 General.

Part III covers the installation requirements, overcurrent protection requirements, minimum size, and ampacity of conductors for feeders over 1000 volts ac or 1500 volts dc, nominal.

235.202 Minimum Rating and Size.

The ampacity of conductors shall be in accordance with 310.14 and 315.60 as applicable. Where installed, the size of the feeder-circuit grounded conductor shall not be smaller than that required by 250.122, except that 250.122(F) shall not apply where grounded conductors are run in parallel. Feeder conductors over 1000 volts shall be sized in accordance with 235.202(A), (B), or (C).

(A) Feeders Supplying Transformers.

The ampacity of feeder conductors shall not be less than the sum of the nameplate ratings of the transformers supplied when only transformers are supplied.

(B) Feeders Supplying Transformers and Utilization Equipment.

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

(C) Supervised Installations.

For supervised installations, feeder conductor sizing shall be permitted to be determined by qualified persons under engineering supervision in accordance with 310.14(B) or 315.60(B). Supervised installations are defined as those portions of a facility where all of the following conditions are met:

(1) Conditions of design and installation are provided under engineering supervision.

(2) Qualified persons with documented training and experience in over 1000-volt systems provide maintenance, monitoring, and servicing of the system.

235.203 Overcurrent Protection.

Feeders shall be protected against overcurrent in accordance with Part IX of Article 240.

235.205 Diagrams of Feeders.

If required by the authority having jurisdiction, a diagram showing feeder details shall be provided prior to the installation of the feeders. Such a diagram shall show the area in square feet of the building or other structure supplied by each feeder, the total calculated load before applying demand factors, the demand factors used, the calculated load after applying demand factors, and the size and type of conductors to be used.

235.206 Feeder Equipment Grounding Conductor.

Where a feeder supplies branch circuits in which equipment grounding conductors are required, the feeder shall include or provide an equipment grounding conductor, to which the equipment grounding conductors of the branch circuits shall be connected. Where the feeder supplies a separate building or structure, the requirements of 250.32 shall apply.

235.212 Identification for Feeders.

(A) Grounded Conductor.
The grounded conductor of a feeder, if insulated, shall be identified in accordance with 200.6.

(B) Equipment Grounding Conductor.
The equipment grounding conductor shall be identified in accordance with 250.119.

(C) Identification of Ungrounded Conductors.
Ungrounded conductors shall be identified in accordance with 235.212(C)(1) or (C)(2), as applicable.

(1) Feeders Supplied from More Than One Nominal Voltage System.
Where the premises wiring system has feeders supplied from more than one nominal voltage system, each ungrounded conductor of a feeder shall be identified by phase or line and system at all termination, connection, and splice points in compliance with 235.212(C)(1)(a) and (C)(1)(b).

(a) *Means of Identification.* The means of identification shall be permitted to be by separate color coding, marking tape, tagging, or other approved means.

(b) *Posting of Identification Means.* The method utilized for conductors originating within each feeder panelboard or similar feeder distribution equipment shall be documented in a manner that is readily available or shall be permanently posted at each feeder panelboard or similar feeder distribution equipment.

(2) Feeders Supplied from Direct-Current Systems.
Where a feeder is supplied from a dc system operating at more than 1500 volts, each ungrounded conductor of 4 AWG or larger shall be identified by polarity at all termination, connection, and splice points by marking tape, tagging, or other approved means; each ungrounded conductor of 6 AWG or smaller shall be identified by polarity at all termination, connection, and splice points in compliance with 235.212(C)(2)(a) and (C)(2)(b). The identification methods utilized for conductors originating within each feeder panelboard or similar feeder distribution equipment shall be documented in a manner that is readily available or shall be permanently posted at each feeder panelboard or similar feeder distribution equipment.

(a) *Positive Polarity, Sizes 6 AWG or Smaller.* Where the positive polarity of a dc system does not serve as the connection for the grounded conductor, each positive ungrounded conductor shall be identified by one of the following means:

(1) A continuous red outer finish

(2) A continuous red stripe durably marked along the conductor's entire length on insulation of a color other than green, white, gray, or black

(3) Imprinted plus signs (+) or the word POSITIVE or POS durably marked on insulation of a color other than green, white, gray, or black, and repeated at intervals not exceeding 610 mm (24 in.) in accordance with 310.8(B)

(4) An approved permanent marking means such as sleeving or shrink-tubing that is suitable for the conductor size, at all termination, connection, and splice points, with imprinted plus signs (+) or the word POSITIVE or POS durably marked on insulation of a color other than green, white, gray, or black

(b) *Negative Polarity, Sizes 6 AWG or Smaller.* Where the negative polarity of a dc system does not serve as the connection for the grounded conductor, each negative ungrounded conductor shall be identified by one of the following means:

(1) A continuous black outer finish

(2) A continuous black stripe durably marked along the conductor's entire length on insulation of a color other than green, white, gray, or red

(3) Imprinted minus signs (−) or the word NEGATIVE or NEG durably marked on insulation of a color other than green, white, gray, or red, and repeated at intervals not exceeding 610 mm (24 in.) in accordance with 310.8(B)

(4) An approved permanent marking means such as sleeving or shrink-tubing that is suitable for the conductor size, at all termination, connection, and splice points, with imprinted minus signs (−) or the word NEGATIVE or NEG durably marked on insulation of a color other than green, white, gray, or red

Part IV. Outside Branch Circuits and Feeders

235.301 General.

Part IV covers requirements for outside branch circuits and feeders over 1000 volts ac or 1500 volts dc, nominal, that are run on or between buildings, structures, or poles on the premises; and electrical equipment and wiring for the supply of utilization equipment that is located on or attached to the outside of buildings, structures, or poles. Outside branch circuits and feeders over 1000 volts ac or 1500 volts dc, nominal, shall comply with the applicable requirements in Parts I and II of Article 225 and with Part IV of this article, which supplements or modifies those requirements.

235.306 Conductor Size and Support.

For overhead spans, open individual conductors shall not be smaller than 6 AWG copper or 4 AWG aluminum where open individual conductors and 8 AWG copper or 6 AWG aluminum where in cable.

235.310 Wiring on Buildings (or Other Structures).

The installation of outside wiring on surfaces of buildings (or other structures) shall be installed as provided in 305.3.

235.314 Open-Conductor Spacings.

Conductors shall comply with the spacings provided in 110.36 and 495.24.

235.339 Rating of Disconnect.

The feeder or branch-circuit disconnecting means shall have a rating of not less than the calculated load to be supplied, determined in accordance with Parts I and II of Article 220 for branch circuits, Part III or IV of Article 220 for feeders, or Part V of Article 220 for farm loads.

235.350 Sizing of Conductors.

The sizing of conductors over 1000 volts shall be in accordance with 235.19(A) for branch circuits and 235.19(B) for feeders.

235.351 Isolating Switches.

Where oil switches or air, oil, vacuum, or sulfur hexafluoride circuit breakers constitute a building disconnecting means, an isolating switch with visible break contacts and meeting

the requirements of 235.404(B), (C), and (D) shall be installed on the supply side of the disconnecting means and all associated equipment.

Exception: The isolating switch shall not be required where the disconnecting means is mounted on removable truck panels or switchgear units that cannot be opened unless the circuit is disconnected and that, when removed from the normal operating position, automatically disconnect the circuit breaker or switch from all energized parts.

235.352 Disconnecting Means.

(A) Location.
A building or structure disconnecting means shall be located in accordance with 225.31(B), or, if not readily accessible, it shall be operable by mechanical linkage from a readily accessible point. For multibuilding industrial installations under single management, it shall be permitted to be electrically operated by a readily accessible, remote-control device in a separate building or structure.

(B) Type.
Each building or structure disconnect shall simultaneously disconnect all ungrounded supply conductors it controls and shall have a fault-closing rating not less than the available fault current at its supply terminals.

Exception: Where the individual disconnecting means consists of fused cutouts, the simultaneous disconnection of all ungrounded supply conductors shall not be required if there is a means to disconnect the load before opening the cutouts. A permanent legible sign shall be installed adjacent to the fused cutouts and shall read DISCONNECT LOAD BEFORE OPENING CUTOUTS.

Where fused switches or separately mounted fuses are installed, the fuse characteristics shall be permitted to contribute to the fault-closing rating of the disconnecting means.

(C) Locking.
Disconnecting means shall be lockable open in accordance with 110.25.

Exception: Where an individual disconnecting means consists of fused cutouts, a suitable enclosure capable of being locked and sized to contain all cutout fuse holders shall be installed at a convenient location to the fused cutouts.

(D) Indicating.
Disconnecting means shall clearly indicate whether they are in the open "off" or closed "on" position.

(E) Uniform Position.
Where disconnecting means handles are operated vertically, the "up" position of the handle shall be the "on" position.

Exception: A switching device having more than one "on" position, such as a double throw switch, shall not be required to comply with this requirement.

(F) Identification.
Where a building or structure has any combination of feeders, branch circuits, or services passing through or supplying it, a permanent plaque or directory shall be installed at each feeder and branch-circuit disconnect location that denotes all other services, feeders, or

branch circuits supplying that building or structure or passing through that building or structure and the area served by each.

235.356 Inspections and Tests.

(A) Pre-Energization and Operating Tests.
The complete electrical system design, including settings for protective, switching, and control circuits, shall be prepared in advance and made available on request to the authority having jurisdiction and shall be performance tested when first installed on-site. Each protective, switching, and control circuit shall be adjusted in accordance with the system design and tested by actual operation using current injection or equivalent methods as necessary to ensure that each and every such circuit operates correctly to the satisfaction of the authority having jurisdiction.

(1) Instrument Transformers.
All instrument transformers shall be tested to verify correct polarity and burden.

(2) Protective Relays.
Each protective relay shall be demonstrated to operate by injecting current or voltage, or both, at the associated instrument transformer output terminal and observing that the associated switching and signaling functions occur correctly and in proper time and sequence to accomplish the protective function intended.

(3) Switching Circuits.
Each switching circuit shall be observed to operate the associated equipment being switched.

(4) Control and Signal Circuits.
Each control or signal circuit shall be observed to perform its proper control function or produce a correct signal output.

(5) Metering Circuits.
All metering circuits shall be verified to operate correctly from voltage and current sources in a similar manner to protective relay circuits.

(6) Acceptance Tests.
Complete acceptance tests shall be performed, after the substation installation is completed, on all assemblies, equipment, conductors, and control and protective systems, as applicable, to verify the integrity of all the systems.

(7) Relays and Metering Utilizing Phase Differences.
All relays and metering that use phase differences for operation shall be verified by measuring phase angles at the relay under actual load conditions after operation commences.

(B) Test Report.
A test report covering the results of the tests required in 235.356(A) shall be delivered to the authority having jurisdiction prior to energization.

Informational Note: See ANSI/NETA ATS, *Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems*, for an example of acceptance specifications.

235.360 Clearances over Roadways, Walkways, Rail, Water, and Open Land.

(A) 22 kV or Less to Ground.
The clearances over roadways, walkways, rail, water, and open land for conductors and live parts up to 22 kV or less to ground shall be not less than the values shown in Table 235.360(A).

Table 235.360(A) Clearances over Roadways, Walkways, Rail, Water, and Open Land

Location	Clearance	
	m	ft
Open land subject to vehicles, cultivation, or grazing	5.6	18.5
Roadways, driveways, parking lots, and alleys	5.6	18.5
Walkways	4.1	13.5
Rails	8.1	26.5
Spaces and ways for pedestrians and restricted traffic	4.4	14.5
Water areas not suitable for boating	5.2	17.0

(B) More Than 22 kV to Ground.
Clearances for the categories shown in Table 235.360(A) shall be increased by 10 mm (0.4 in.) per kV, or major fraction thereof, more than 22 kV.

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

Informational Note: See ANSI/IEEE C2-2017, *National Electrical Safety Code*, for additional information.

235.361 Clearances over Buildings and Other Structures.

(A) 22 kV or Less to Ground.
The clearances over buildings and other structures for conductors and live parts up to 22 kV or less to ground shall be not less than the values shown in Table 235.361(A) .

Table 235.361(A) Clearances over Buildings and Other Structures

Clearance from Conductors or Live Parts from:	Horizontal		Vertical	
	m	ft	m	ft
Building walls, projections, and windows	2.3	7.5	—	—
Balconies, catwalks, and similar areas accessible to people	2.3	7.5	4.1	13.5
Over or under roofs or projections not readily accessible to people	—	—	3.8	12.5
Over roofs accessible to vehicles but not trucks	—	—	4.1	13.5
Over roofs accessible to trucks	—	—	5.6	18.5
Other structures	2.3	7.5	—	—

(B) More Than 22 kV to Ground.

Clearances for the categories shown in Table 235.361(A) shall be increased by 10 mm (0.4 in.) per kV , or major fraction thereof, more than 22 kV.

Informational Note: See ANSI/IEEE C2-2017, *National Electrical Safety Code*, for additional information.

Part V. Services

235.401 General.

Part V covers requirements for service conductors and equipment used on circuits over 1000 volts ac and 1500 volts dc, nominal, shall comply with all of the applicable requirements in Parts I through VII of Article 230 and with Part V of this article, which supplements or modifies those requirements. In no case shall the provisions of Part V apply to equipment on the supply side of the service point.

235.402 Service-Entrance Conductors.

Service-entrance conductors to buildings or enclosures shall be installed to conform to 235.402(A) and (B).

(A) Conductor Size.

Service-entrance conductors shall not be smaller than 6 AWG unless in multiconductor cable. Multiconductor cable shall not be smaller than 8 AWG.

(B) Wiring Methods.

Service-entrance conductors shall be installed by one of the wiring methods covered in 305.3 and 305.15.

235.404 Isolating Switches.

(A) Where Required.

Where oil switches or air, oil, vacuum, or sulfur hexafluoride circuit breakers constitute the service disconnecting means, an isolating switch with visible break contacts shall be installed on the supply side of the disconnecting means and all associated service equipment.

Exception: An isolating switch shall not be required where the circuit breaker or switch is mounted on removable truck panels or switchgear units where both of the following conditions apply:

(1) Cannot be opened unless the circuit is disconnected

(2) Where all energized parts are automatically disconnected when the circuit breaker or switch is removed from the normal operating position

(B) Fuses as Isolating Switch.

Where fuses are of the type that can be operated as a disconnecting switch, a set of such fuses shall be permitted as the isolating switch.

(C) Accessible to Qualified Persons Only.

The isolating switch shall be accessible to qualified persons only.

(D) Connection to Ground.

Isolating switches shall be provided with a means for readily connecting the load side conductors to a grounding electrode system, equipment ground busbar, or grounded steel structure when disconnected from the source of supply.
A means for grounding the load side conductors to a grounding electrode system, equipment grounding busbar, or grounded structural steel shall not be required for any duplicate isolating switch installed and maintained by the electric supply company.

235.405 Disconnecting Means.

(A) Location.
The service disconnecting means shall be located in accordance with 230.70.
For either overhead or underground primary distribution systems on private property, the service disconnect shall be permitted to be located in a location that is not readily accessible, if the disconnecting means can be operated by mechanical linkage from a readily accessible point, or electronically in accordance with 235.405(C), where applicable.
(B) Type.

Each service disconnect shall simultaneously disconnect all ungrounded service conductors that it controls and shall have a fault-closing rating that is not less than the available fault current at its supply terminals.

Where fused switches or separately mounted fuses are installed, the fuse characteristics shall be permitted to contribute to the fault-closing rating of the disconnecting means.

(C) Remote Control.
For multibuilding, industrial installations under single management, the service disconnecting means shall be permitted to be located at a separate building or structure. In such cases, the service disconnecting means shall be permitted to be electrically operated by a readily accessible, remote-control device.

235.406 Overcurrent Devices as Disconnecting Means.
Where the circuit breaker or alternative for it, as specified in 235.408 for service overcurrent devices, meets the requirements specified in 235.405, it shall constitute the service disconnecting means.

235.408 Protection Requirements.
A short-circuit protective device shall be provided on the load side of, or as an integral part of, the service disconnect, and shall protect all ungrounded conductors that it supplies. The protective device shall be capable of detecting and interrupting all values of current, in excess of its trip setting or melting point, that can occur at its location. A fuse rated in continuous amperes not to exceed three times the ampacity of the conductor, or a circuit breaker with a trip setting of not more than six times the ampacity of the conductors, shall be considered as providing the required short-circuit protection.

Informational Note: See Table 315.60(C)(1) through Table 315.60(C)(20) for ampacities of conductors rated 2001 volts to 35,000 volts.
Overcurrent devices shall conform to 235.408(A) and (B).

(A) Equipment Type.
Equipment used to protect service-entrance conductors shall meet the requirements of Article 495, Part II.

(B) Enclosed Overcurrent Devices.

The restriction to 80 percent of the rating for an enclosed overcurrent device for continuous loads shall not apply to overcurrent devices installed in systems operating at over 1000 volts.

235.409 Surge Arresters.
Surge arresters installed in accordance with the requirements of Parts II and III of Article 242 shall be permitted on each ungrounded overhead service conductor.

Informational Note: Surge arresters may be referred to as lightning arresters in older documents.

235.410 Service Equipment — General.
Service equipment, including instrument transformers, shall conform to Part I of Article 495.

235.411 Switchgear.
Switchgear shall consist of a substantial metal structure and a sheet metal enclosure. Where installed over a combustible floor, suitable protection thereto shall be provided.

235.412 Over 35,000 Volts.
Where the voltage exceeds 35,000 volts between conductors that enter a building, they shall terminate in a switchgear compartment or a vault conforming to the requirements of 450.41 through 450.48.

Second Revision No. 8704-NFPA 70-2021 [Global Comment]

Delete requirements in 240.13(B), 240.62, and 240.88 and create a new 240.2 with all the requirements for reconditioned equipment as show in the attached word document. Additionally, delete header only for 240.13(A).

Supplemental Information

File Name	Description	Approved
NEC_CMP10_SR8704_420.2.docx	For staff use	
CMP-10_Global_SR-8704_Article_240_for_ballot.docx	For ballot	

Submitter Information Verification

Committee: NEC-P10

Submittal Date: Mon Nov 01 14:39:43 EDT 2021

Committee Statement

Committee Statement: Reconditioning provisions are relocated to 240.2 to comply with Correlating Committee recommendations in PC 896. A reference to 110.21 (A)(2) is added to include a reference to additional marking requirements.

Response to PC-1929: The new text is modified to comply with the style manual.

Response Message: SR-8704-NFPA 70-2021

Public Comment No. 1076-NFPA 70-2021 [Section No. 240.88 [Excluding any Sub-Sections]]

Public Comment No. 1929-NFPA 70-2021 [Section No. 240.62]

Public Comment No. 869-NFPA 70-2021 [Section No. 240.88]

Public Comment No. 866-NFPA 70-2021 [Section No. 240.13]

Global SR-8704 [CMP-10]

240.2 Reconditioned Equipment.

(A) Reconditioning Not Permitted.
The following equipment shall not be reconditioned:

(1) Equipment providing ground-fault protection of equipment

(2) Ground-fault circuit interrupters

(3) Low-voltage fuseholders and low-voltage nonrenewable fuses

(4) Molded-case circuit breakers

(5) Low-voltage power circuit breaker electronic trip units.

(B) Reconditioning Permitted.
The following equipment shall be permitted to be reconditioned:

(1) Low-voltage power circuit breakers

(2) Electromechanical protective relays and current transformers

Reconditioned equipment shall be listed as reconditioned and comply with 110.21(A)(2).

240.13 Ground-Fault Protection of Equipment.
Ground-fault protection of equipment shall be provided in accordance with 230.95 for solidly grounded wye electrical systems of more than 150 volts to ground but not exceeding 1000 volts phase-to-phase for each individual device used as a building or structure main disconnecting means rated 1000 amperes or more.
This section shall not apply to the disconnecting means for the following:

(1) Continuous industrial processes where a nonorderly shutdown will introduce additional or increased hazards

(2) Installations where ground-fault protection is provided by other requirements for services or feeders

(3) Fire pumps

~~**(A) General.**~~

~~**(B) Reconditioned Equipment.**~~
~~Equipment providing ground-fault protection of equipment shall not be permitted to be reconditioned.~~

~~**240.62 Reconditioned Equipment.**~~
~~Low-voltage fuseholders and low-voltage nonrenewable fuses shall not be permitted to be reconditioned.~~

~~**240.88 Reconditioned Equipment.**~~
~~Reconditioned equipment shall be listed as *reconditioned* and the original listing mark removed.~~

~~**(A) Molded Case Circuit Breakers.**~~

~~Molded-case circuit breakers shall not be permitted to be reconditioned.~~

~~(B) Low-Voltage Power Circuit Breakers.~~

~~Low-voltage power circuit breakers shall be permitted to be reconditioned. Low-voltage power circuit breaker electronic trip units shall not be permitted to be reconditioned.~~

~~(C) Components.~~

~~The use of reconditioned trip units, protective relays, and current transformers shall comply with the following:~~

~~(1) Low-voltage power circuit breaker electronic trip units shall not be permitted to be reconditioned.~~

~~(2) Electromechanical protective relays and current transformers shall be permitted to be reconditioned.~~

Second Revision No. 8705-NFPA 70-2021 [Global Comment]

Delete 242.41 and 242.7, and create a new 242.2 with the requirements for reconditioned equipment as in the attached word document.

Supplemental Information

File Name	Description	Approved
NEC_CMP10_SR8705_242.2.docx	For staff use	
CMP-10_Global_SR-8705_Article_242_for_ballot.docx	For ballot	

Submitter Information Verification

Committee: NEC-P10

Submittal Date: Mon Nov 01 15:13:37 EDT 2021

Committee Statement

Committee Statement: Reconditioning provisions are relocated to 242.2 to comply with Correlating Committee recommendations in PC 896.

Sections 242.7 and 242.41 are relocated to 242.2. The text “shall not be permitted to be” is revised.

Response Message: SR-8705-NFPA 70-2021

Public Comment No. 1733-NFPA 70-2021 [Section No. 242.7]

Public Comment No. 1734-NFPA 70-2021 [Section No. 242.41]

Global SR-8705 [CMP-10]

242.2 Reconditioned Equipment.

SPDs and surge arresters shall not be reconditioned.

~~**242.7 Reconditioned Equipment.**~~

~~SPDs shall not be permitted to be reconditioned.~~

~~**242.41 Reconditioned Equipment.**~~

~~Surge arresters shall not be permitted to be reconditioned.~~

Second Revision No. 8722-NFPA 70-2021 [Detail]

230.85

(E) Marking.

(1) Marking Text. The disconnecting means shall marked as follows:

(1) Service disconnect

EMERGENCY DISCONNECT,
SERVICE DISCONNECT

(1) Meter disconnects installed in accordance with 230.82(3) and marked as follows:

EMERGENCY DISCONNECT,
METER DISCONNECT,
NOT SERVICE EQUIPMENT

(1) Other listed disconnect switches or circuit breakers on the supply side of each service disconnect that are marked suitable for use as service equipment and marked as follows:

EMERGENCY DISCONNECT,
NOT SERVICE EQUIPMENT

(2) Marking Location and Size. Markings shall comply with 110.21(B) and both of the following:

(1) The marking or labels shall be located on the outside front of the disconnect enclosure with red background and white text.

(2) The letters shall be at least 13 mm (1/2 in.) high.

Submitter Information Verification

Committee: NEC-P10

Submittal Date: Fri Dec 03 16:27:15 EST 2021

Committee Statement

Committee Statement: This editorial second revision is developed by NFPA staff for compliance with Section 2.1.5 of the NEC Style Manual regarding arrangement of content in subdivisions and lists for clarity.

Response Message: SR-8722-NFPA 70-2021

Second Revision No. 8442-NFPA 70-2021 [Definition: Overcurrent Protective Device, Branch-Circuit. ...]

Overcurrent Protective Device, Branch-Circuit. (Branch-Circuit Overcurrent Protective Device)

A device capable of providing protection for service, feeder, and branch circuits and equipment over the full range of overcurrents between its rated current and its interrupting rating. ~~Such devices are provided with interrupting ratings appropriate for the intended use but no less than 5000 amperes.~~ (CMP-10)

Submitter Information Verification

Committee: NEC-P10

Submittal Date: Tue Oct 26 15:59:37 EDT 2021

Committee Statement

Committee Statement: The term branch-circuit is not removed in the title to correlate with product standards. The second sentence is removed because it contained a requirement.

CMP-10 is requesting that the correlating committee review the use of the term “Branch-Circuit Overcurrent Protective Device” and the use of the term “overcurrent protection device” and “supplemental overcurrent device”.

See SR-8440 relocating the requirement to 240.16.

Response Message: SR-8442-NFPA 70-2021

Public Comment No. 891-NFPA 70-2021 [Definition: Overcurrent Protective Device, Branch-Circuit. ...]

Public Comment No. 1496-NFPA 70-2021 [Definition: Overcurrent Protective Device, Branch-Circuit. ...]

Second Revision No. 8447-NFPA 70-2021 [Definition: Supervised Industrial Installation.]

Industrial Installation, Supervised. (Supervised Industrial Installation) ~~.~~

~~For the purposes of Part VIII of Article 240, the~~ The industrial portions of a facility where all of the following conditions are met:

(1) Conditions of maintenance and engineering supervision ensure that only qualified persons monitor and service the system.

(2) The premises wiring system has 2500 kVA or greater of load used in industrial process(es), manufacturing activities, or both, as calculated in accordance with Article 220.

(3) The premises has at least one service or feeder that is more than 150 volts to ground and more than 300 volts phase-to-phase.

This definition excludes installations in buildings used by the industrial facility for offices, warehouses, garages, machine shops, and recreational facilities that are not an integral part of the industrial plant, substation, or control center. (240) (CMP-10)

Submitter Information Verification

Committee: NEC-P10

Submittal Date: Tue Oct 26 16:08:19 EDT 2021

Committee Statement

Committee Statement: The first sentence was revised to comply with the NEC Style Manual. The title was changed to enhance usability of the Code.

CMP-10 requests editorial to relocate this term so it appears alphabetically.

Response Message: SR-8447-NFPA 70-2021

Public Comment No. 1524-NFPA 70-2021 [Definition: Supervised Industrial Installation.]

Second Revision No. 8449-NFPA 70-2021 [Definitions (100): Service-Ent... to Service-Ent...]

~~**Service-Entrance Conductors, Overhead System.**~~

~~The service conductors between the terminals of the service equipment and a point usually outside the building, clear of building walls, where joined by tap or splice to the service drop or overhead service conductors. (CMP-10)~~

Service-Entrance Conductors~~, Underground System~~ .

The service conductors between the terminals of the service equipment ~~and the point of connection to the~~ to the service drop, overhead service conductors, service lateral, or underground service conductors. (CMP-10)

Informational Note: Where service equipment is located outside the building walls, there ~~may~~ could be no service-entrance conductors or they ~~may~~ might be entirely outside the building.

Submitter Information Verification

Committee: NEC-P10

Submittal Date: Tue Oct 26 16:15:59 EDT 2021

Committee Statement

Committee Statement: The definitions of Service-entrance Conductor, Overhead and Service-conductor, Underground are combined and simplified for clarity and usability.

Response Message: SR-8449-NFPA 70-2021

Public Comment No. 885-NFPA 70-2021 [Global Input]

Second Revision No. 8215-NFPA 70-2021 [Section No. 215.1]

Global SR-8472

215.1 Scope.

This article covers the installation requirements, overcurrent protection requirements, minimum size, and ampacity of conductors for feeders not more than 1000 volts ac or 1500 volts dc, nominal.

Informational Note: See Part III of Article 235 for feeders over 1000 volts ac or 1500 volts dc.

~~*Exception: This article does not apply to feeders for electrolytic cells as covered in 668.3(C)(1) and (C)(4).*~~

Submitter Information Verification

Committee: NEC-P10

Submittal Date: Mon Oct 25 10:34:06 EDT 2021

Committee Statement

Committee Statement: The Exception is not necessary based on 90.3 and the Manual of style in paragraph 4.1.1.

Response Message: SR-8215-NFPA 70-2021

Public Comment No. 844-NFPA 70-2021 [Section No. 215.1]

Second Revision No. 8216-NFPA 70-2021 [Section No. 215.15]

215.15 Barriers.

Barriers shall be placed such that no uninsulated, ungrounded busbar or terminal is exposed to inadvertent contact by persons or maintenance equipment while servicing load terminations in panelboards, switchboards, switchgear, or motor control centers supplied by feeder taps in 240.21(B) or transformer secondary conductors in 240.21(C)~~with~~ when the disconnecting device, to which the tap conductors are terminated, is in the open position.

Submitter Information Verification

Committee: NEC-P10

Submittal Date: Mon Oct 25 10:45:37 EDT 2021

Committee Statement

Committee Statement: Editorial changes are made to improve clarity and useability.

Response Message: SR-8216-NFPA 70-2021

Public Comment No. 1270-NFPA 70-2021 [Section No. 215.15]

Second Revision No. 8382-NFPA 70-2021 [Section No. 215.18(B)]

(B) Location.

~~An~~ The SPD shall be installed in or adjacent to ~~the~~ distribution equipment ~~containing~~ , connected to the load side of the feeder, that contains branch circuit overcurrent protective device(s) that supply the location~~s~~ specified in 215.18(A).

~~*Exception: An SPD shall not be required in distribution equipment that is supplied by a feeder originating in the distribution equipment containing an SPD as required in 215.18(A) and (B).*~~

Informational Note: Surge protection is most effective when closest to the branch circuit. Surges can be generated from multiple sources including, but not limited to, lightning, the electric utility, or utilization equipment.

Submitter Information Verification

Committee: NEC-P10

Submittal Date: Tue Oct 26 12:25:48 EDT 2021

Committee Statement

Committee Statement: The text is revised to indicate that the SPD is intended to protect the branch circuits and should not be installed remotely from the distribution equipment supplying branch circuits in the locations specified in 215.18(A). The current exception in 230.67 achieves the goals of this exception by not requiring the SPD at the service when surge protection is provided at each next level distribution equipment downstream towards the load. The requirements of 215.18(A) require SPD for distribution panels that serve the locations in 215.18(A), and subpanels within these spaces would not require additional SPD. This change is made to correlate with SR-8379 created as a result of PC-1346 and PC-1459.

Response Message: SR-8382-NFPA 70-2021

Second Revision No. 8218-NFPA 70-2021 [Section No. 215.18(E)]

(E) Ratings.

SPDs shall have a nominal discharge current rating (In) of not less than 10kA.

~~Informational Note: Lead lengths of conductors to the SPD should be kept as short as possible to reduce let-through voltages.~~

Submitter Information Verification

Committee: NEC-P10

Submittal Date: Mon Oct 25 10:52:32 EDT 2021

Committee Statement

Committee Statement: The informational note is deleted because it repeats information already covered in 242.24.

Response Message: SR-8218-NFPA 70-2021

Public Comment No. 1717-NFPA 70-2021 [Section No. 215.18]

Second Revision No. 8698-NFPA 70-2021 [Section No. 225.3]

225.3 Other Articles.

Application of other articles, including additional requirements to specific cases of equipment and conductors, is shown in Table 225.3.

Table 225.3 Other Articles

Equipment/Conductors	Article
Branch circuits	210
Class 1 power-limited circuits and Class 1 power-limited remote-control and signaling circuits	724
~~Class 1,~~ Class 2~~,~~ and Class 3 remote-control, signaling, and power-limited circuits	725
Conductors for general wiring	310
Electrically driven or controlled irrigation machines	675
Electric signs and outline lighting	600
Feeders	215
Fire alarm systems	760
Fixed outdoor electric deicing and snow-melting equipment	426
Grounding and bonding	250
Hazardous (classified) locations	500
Hazardous (classified) locations — specific	510
Marinas and boatyards	555
Medium-voltage conductors and cable	311
Messenger-supported wiring	396
Mobile homes, manufactured homes, and mobile home parks	550
Open wiring on insulators	398
Over 1000 volts, general	~~490~~ 495
Overcurrent protection	240
Overcurrent protection for systems rated over 1000 volts ac, 1500 volts dc	245
Services	230
Services, feeders, and branch circuits over 1000 volts ac, 1500 volts dc	235
Solar photovoltaic systems	690
Swimming pools, fountains, and similar installations	680
Use and identification of grounded conductors	200

Submitter Information Verification

Committee: NEC-P10

Submittal Date: Mon Nov 01 11:08:50 EDT 2021

Committee Statement

Committee Table 225.3 is modified to align with changes relocating over 1000 Vac or 1500 Vdc

Statement:	requirements throughout the code to Articles 235 and 245. This also includes changing reference to Article 490 to 495 due to article renumbering.
Response Message:	SR-8698-NFPA 70-2021

Second Revision No. 8275-NFPA 70-2021 [Section No. 225.41(B)]

(B) Identification of Other ~~Emergency~~ Isolation Disconnects.

Where ~~emergency disconnects are installed for other systems that are~~ equipment for isolation of other energy source systems is not located adjacent to the emergency disconnect required by this section, a plaque or directory identifying the location of all ~~emergency disconnects~~ equipment for isolation of other energy sources shall be located adjacent to the disconnecting means required by this section.

Informational Note: See 445.19 , 480.7 , 705.20 , and 706.15 for examples of other energy source system isolation means.

Submitter Information Verification

Committee: NEC-P10

Submittal Date: Mon Oct 25 13:46:42 EDT 2021

Committee Statement

Committee Statement: Revisions have been made to align the language in 225.41(B) with the revision made in 230.85(D). See SR#.

Response Message: SR-8275-NFPA 70-2021

Second Revision No. 8379-NFPA 70-2021 [Section No. 225.42(B)]

(B) Location.

~~An~~ The SPD shall be installed in or adjacent to the distribution equipment ~~containing~~ that is connected to the load side of the feeder and contains branch circuit overcurrent protective device(s) that supply the location specified in 225.42(A).

~~*Exception: An SPD shall not be required in distribution equipment that is supplied by a feeder originating in the distribution equipment containing an SPD as required in 225.42(A) and (B).*~~

Informational Note: Surge protection is most effective when closest to the branch circuit. Surges can be generated from multiple sources including, but not limited to, lightning, the electric utility, or utilization equipment.

Submitter Information Verification

Committee: NEC-P10

Submittal Date: Tue Oct 26 12:19:14 EDT 2021

Committee Statement

Committee Statement: The text is revised to indicate that the SPD is intended to protect the branch circuits and should not be installed remotely from the distribution equipment supplying branch circuits in the locations specified in 225.42(A). The current exception in 230.67 achieves the goals of this exception by not requiring the SPD at the service when surge protection is provided at each next level distribution equipment downstream towards the load. The requirements of 225.42(A) require SPD for distribution panels that serve the locations in 225.42(A), and subpanels within these spaces would not require additional SPD.

Response Message: SR-8379-NFPA 70-2021

Public Comment No. 1346-NFPA 70-2021 [Section No. 225.42(B)]

Public Comment No. 1459-NFPA 70-2021 [Section No. 225.42(B)]

Second Revision No. 8236-NFPA 70-2021 [Section No. 230.7]

230.7 Other Conductors.

~~Conductors~~ Circuit conductors other than service conductors, shall not be installed in the same ~~service~~ raceway, ~~service~~ cable, ~~handholes~~ handhole enclosure , or underground ~~boxes in which~~ box as the service conductors ~~are installed~~ .

Exception No. 1: Grounding electrode conductors or supply side bonding jumpers or conductors shall be permitted within service raceways.

Exception No. 2: Load management control conductors having overcurrent protection shall be permitted within service raceways.

Submitter Information Verification

Committee: NEC-P10

Submittal Date: Mon Oct 25 11:45:41 EDT 2021

Committee Statement

Committee Statement: It is important to clarify that grounding electrode conductors and supply side bonding jumpers are permitted in the same raceway or enclosure as service conductors. Revisions are made to enhance clarity and consistency in code language.

Response Message: SR-8236-NFPA 70-2021

Public Comment No. 1309-NFPA 70-2021 [Section No. 230.7]

Second Revision No. 8238-NFPA 70-2021 [Section No. 230.31(C)]

(C) Grounded Conductors.

The grounded conductor shall not be ~~less~~ smaller than the minimum size required by 250.24(D).

Submitter Information Verification

Committee: NEC-P10
Submittal Date: Mon Oct 25 11:53:49 EDT 2021

Committee Statement

Committee Statement: Editorial changes are made to improve clarity and useability.
Response Message: SR-8238-NFPA 70-2021

Public Comment No. 267-NFPA 70-2021 [Section No. 230.31(C)]

Second Revision No. 8241-NFPA 70-2021 [Section No. 230.43]

230.43 Wiring Methods for 1000 Volts, Nominal, or Less.

Service-entrance conductors shall be installed in accordance with the applicable requirements of this *Code* covering the type of wiring method used and shall be limited to the following methods:

(1) Open wiring on insulators

(2) Type IGS cable

(3) Rigid metal conduit (RMC)

(4) Intermediate metal conduit (IMC)

(5) Electrical metallic tubing (EMT)

(6) Electrical nonmetallic tubing

(7) Service-entrance cables

(8) Wireways

(9) Busways

(10) Auxiliary gutters

(11) Rigid polyvinyl chloride conduit (PVC)

(12) Cablebus

(13) Type MC cable

(14) Mineral-insulated, metal-sheathed cable, Type MI

(15) Flexible metal conduit (FMC) not over 1.8 m (6 ft) long or liquidtight flexible metal conduit (LFMC) not over 1.8 m (6 ft) long between a raceway, or between a raceway and service equipment, with a supply-side bonding jumper routed with the flexible metal conduit (FMC) or the liquidtight flexible metal conduit (LFMC) according to 250.102(A), (B), (C), and (E)

(16) Liquidtight flexible nonmetallic conduit (LFNC)

(17) High density polyethylene conduit (HDPE)

(18) Nonmetallic underground conduit with conductors (NUCC)

(19) Reinforced thermosetting resin conduit (RTRC)

(20) Type TC-ER cable where identified for use as service entrance conductors

(21) Flexible bus systems

Submitter Information Verification

Committee: NEC-P10

Submittal Date: Mon Oct 25 11:57:27 EDT 2021

Committee Statement

Committee Statement: The addition of Flexible Bus Systems recognizes the wiring method for use in services as found in permitted uses in NEC 371.10 and listed in accordance with 371.6. The

panel recommends that the correlating committee confirm that the ballot passes for the new Article 371.

Response Message: SR-8241-NFPA 70-2021

Public Comment No. 1808-NFPA 70-2021 [Section No. 230.43]

Second Revision No. 8244-NFPA 70-2021 [Section No. 230.67(B)]

(B) Location.

The SPD shall be an integral part of the service equipment or shall be located immediately adjacent thereto.

Exception: The SPD shall not be required to be located ~~in~~ at the service equipment as required in 230.67(B) if located at each next level distribution equipment downstream toward the load.

Submitter Information Verification

Committee: NEC-P10

Submittal Date: Mon Oct 25 12:06:13 EDT 2021

Committee Statement

Committee Statement: Editorial change was made to improve clarity and useability.

Response Message: SR-8244-NFPA 70-2021

Public Comment No. 1363-NFPA 70-2021 [Section No. 230.67(B)]

Second Revision No. 8249-NFPA 70-2021 [Section No. 230.71(B)]

(B) Two to Six Service Disconnecting Means.

Two to six service disconnects shall be permitted for each service permitted by 230.2 or for each set of service-entrance conductors permitted by 230.40, Exception No. 1, 3, 4, or 5. The two to six service disconnecting means shall be permitted to consist of a combination of any of the following:

(1) Separate enclosures with a main service disconnecting means in each enclosure

(2) Panelboards with a main service disconnecting means in each panelboard enclosure

(3) Switchboard(s) where there is only one service disconnect in each separate vertical section~~. Barriers shall be~~ with barriers provided between each vertical section to maintain the inadvertent contact protection required in 230.62 based on access from the adjacent section(s)

(4) Service disconnects in switchgear, transfer switches, or metering centers where each disconnect is located in a separate compartment

(5) Metering centers with a main service disconnecting means in each metering center

(6) Motor control center(s) where there is only one service disconnect in a motor control center unit and a maximum of two service disconnects provided in a single motor control center~~. Barriers shall be~~ with barriers provided between each motor control center unit or compartment containing a service disconnect to maintain the inadvertent contact protection required in 230.62 based on access from adjacent motor control center unit(s) or compartment(s)

Exception to (2), (3), (4), (5), and (6): Existing service equipment, installed in compliance with previous editions of this Code that permitted multiple service disconnecting means in a single enclosure, section, or compartment, shall be permitted to contain a maximum of six service disconnecting means.

Informational Note No. 1: See UL 67, *Standard for Panelboards*, for information on metering centers.

Informational Note No. 2: Examples of separate enclosures with a main service disconnecting means in each enclosure include but are not limited to motor control centers, fused disconnects, and circuit breaker enclosures.

Informational Note No. 3: Transfer switches ~~may have~~ are provided with one service disconnect or ~~may have~~ multiple service disconnects ~~for multiple services. Transfer switches with multiple disconnects will have a separate compartment for each service disconnect~~ in separate compartments .

Submitter Information Verification

Committee: NEC-P10

Submittal Date: Mon Oct 25 12:16:04 EDT 2021

Committee Statement

Committee Statement: Text revisions have been completed to comply with the style manual of Section 3.3.5.3. The informational note has also been modified to comply with the style manual.

Response Message: SR-8249-NFPA 70-2021

Public Comment No. 1938-NFPA 70-2021 [Section No. 230.71(B)]

Second Revision No. 8253-NFPA 70-2021 [Section No. 230.82]

230.82 Equipment Connected to the Supply Side of Service Disconnect.

Only the following equipment shall be permitted to be connected to the supply side of the service disconnecting means:

(1) Cable limiters.

(2) Meters and meter sockets nominally rated not in excess of 1000 volts, if all metal housings and service enclosures are grounded in accordance with Part VII and bonded in accordance with Part V of Article 250.

(3) Meter disconnect switches nominally rated not in excess of 1000 volts that have a short-circuit current rating equal to or greater than the available fault current, if all metal housings and service enclosures are grounded in accordance with Part VII and bonded in accordance with Part V of Article 250. A meter disconnect switch shall be capable of interrupting the load served. A meter disconnect shall be legibly field marked on its exterior in a manner suitable for the environment as follows:

METER DISCONNECT

NOT SERVICE EQUIPMENT

(4) Instrument transformers (current and voltage), impedance shunts, load management devices, surge arresters, and Type 1 surge-protective devices.

(5) Conductors used to supply ~~load~~ energy management ~~devices~~ systems , circuits for standby power systems, fire pump equipment, and fire and sprinkler alarms, if provided with service equipment and installed in accordance with requirements for service-entrance conductors.

(6) Solar photovoltaic systems, fuel cell systems, wind electric systems, energy storage systems, or interconnected electric power production sources, if provided with a disconnecting means listed as suitable for use as service equipment, and overcurrent protection as specified in Part VII of Article 230.

(7) Control circuits for power-operable service disconnecting means, if suitable overcurrent protection and disconnecting means are provided.

(8) Ground-fault protection systems or Type 2 surge-protective devices, where installed as part of listed equipment, if suitable overcurrent protection and disconnecting means are provided.

(9) Connections used only to supply listed communications equipment under the exclusive control of the serving electric utility, if suitable overcurrent protection and disconnecting means are provided. For installations of equipment by the serving electric utility, a disconnecting means is not required if the supply is installed as part of a meter socket, such that access can only be gained with the meter removed.

(10) Emergency disconnects in accordance with 230.85(B)(2) and (B)(3), if all metal housings and enclosures are grounded in accordance with Part VII and bonded in accordance with Part V of Article 250.

(11) Meter-mounted transfer switches nominally rated not in excess of 1000 volts that have a short-circuit current rating equal to or greater than the available fault current. A meter-mounted transfer switch shall be listed and be capable of transferring the load served. A meter-mounted transfer switch shall be marked on its exterior with both of the following:

a. Meter-mounted transfer switch

b. Not service equipment

(12) Control power circuits for protective relays where installed as part of listed equipment, if overcurrent protection and disconnecting means are provided.

Submitter Information Verification

Committee: NEC-P10

Submittal Date: Mon Oct 25 12:24:25 EDT 2021

Committee Statement

Committee Statement:	The term energy management system is used to maintain consistency and clarity throughout the code.
Response Message:	SR-8253-NFPA 70-2021

Public Comment No. 1406-NFPA 70-2021 [Section No. 230.82]

Second Revision No. 8262-NFPA 70-2021 [Section No. 230.85(B)]

(B) Disconnects.

Each disconnect shall be one of the following:

(1) Service disconnect

(2) A meter disconnect integral to the meter mounting equipment not marked as suitable only for use as service equipment installed in accordance with 230.82

(3) Other listed disconnect switch or circuit breaker that is marked suitable for use as service equipment, but not marked as suitable only for use as service equipment, installed on the supply side of each service disconnect

Informational Note 1: Conductors between the emergency disconnect and the service disconnect in 230.85(2) and 230.85(3) are service conductors.

Informational Note 2: Equipment marked “Suitable only for use as service equipment” ~~is not appropriate for use as the emergency disconnect in 230.85(B)(3), because it would require the equipment to be modified after leaving the factory, by removing the factory~~ has a factory marking “Service Disconnect.” ~~and perhaps removing the factory installed bonding jumper, which may be nonremovable.~~

Submitter Information Verification

Committee: NEC-P10

Submittal Date: Mon Oct 25 12:40:28 EDT 2021

Committee Statement

Committee Statement: Informational Note 2 is revised to remove requirements. The note provides explanatory material related to the mandatory requirement is in 230.85(B)(3). All equipment listed and marked “suitable only for service” is marked “Service Disconnect.” The equipment could not be applied in accordance with 110.3(b).

Response Message: SR-8262-NFPA 70-2021

Public Comment No. 883-NFPA 70-2021 [Section No. 230.85]

Second Revision No. 8265-NFPA 70-2021 [Section No. 230.85(C)]

(C) Replacement.

Where service equipment is replaced, all of the requirements of this section shall apply.

Exception: Where only meter sockets, ~~or~~ service entrance conductors, or related raceways and fittings are replaced, the requirements of this section shall not apply.

Submitter Information Verification

Committee: NEC-P10

Submittal Date: Mon Oct 25 12:49:15 EDT 2021

Committee Statement

Committee Statement: Maintenance or repair such as replacing storm damaged service entrance conductors or raceways or fittings should not trigger the requirement for the addition of an emergency disconnect.

Response Message: SR-8265-NFPA 70-2021

Public Comment No. 1227-NFPA 70-2021 [Section No. 230.85(C)]

Second Revision No. 8268-NFPA 70-2021 [Section No. 230.85(D)]

(D) Identification of Other ~~Emergency~~ Isolation Disconnects.

Where ~~emergency disconnects are installed for other systems that are~~ equipment for isolation of other energy source systems is not located adjacent to the emergency disconnect required by this section, a plaque or directory identifying the location of all ~~emergency disconnects~~ equipment for isolation of other energy sources shall be located adjacent to the disconnecting means required by this section.

Informational Note: See 445.19 , 480.7 , 705.20 , and 706.15 for examples of other energy source system isolation means.

Submitter Information Verification

Committee: NEC-P10

Submittal Date: Mon Oct 25 12:52:23 EDT 2021

Committee Statement

Committee Statement: The language has been revised to address the identification for isolation means of other energy sources. An information note is also added to provide guidance of energy source isolation requirements.

Response Message: SR-8268-NFPA 70-2021

Public Comment No. 1137-NFPA 70-2021 [Section No. 230.85(D)]

Second Revision No. 8453-NFPA 70-2021 [Section No. 230.91]

230.91 Location.

The service overcurrent device shall be an integral part of the service disconnecting means or shall be located immediately adjacent thereto. Where fuses are used as the service overcurrent device, the disconnecting means shall be located ahead of the supply side of the fuses.

~~**(A)** General.~~

~~The service overcurrent device shall be an integral part of the service disconnecting means or shall be located immediately adjacent thereto. Where fuses are used as the service overcurrent device, the disconnecting means shall be located ahead of the supply side of the fuses.~~

~~**(A)** Separate Enclosure.~~

~~Services over 150 volts to ground and not over 1000 volts phase-to-phase that include fuses rated 1600 amperes or higher, or circuit breakers where the highest continuous current trip setting for which the actual overcurrent device installed in a circuit breaker is rated or can be adjusted is 1600 amperes or higher, the service disconnecting means and overcurrent device shall be located in a separate enclosure from feeder or branch circuit overcurrent devices.~~

Submitter Information Verification

Committee: NEC-P10

Submittal Date: Tue Oct 26 16:34:35 EDT 2021

Committee Statement

Committee Statement: The requirements in 230.91(B) are removed to align with the existing requirement for line side barriers in 230.62(C) and the lack of substantiation that the line side arc flash hazard is reduced. The line side barriers reduce the likelihood of an event initiating on the line side.

The heading to 230.91(A) was removed to comply with the NFPA Manual of Style.

Response Message: SR-8453-NFPA 70-2021

Public Comment No. 1555-NFPA 70-2021 [Section No. 230.91]

Public Comment No. 1681-NFPA 70-2021 [Section No. 230.91(B)]

Public Comment No. 1870-NFPA 70-2021 [Section No. 230.91(B)]

Second Revision No. 8703-NFPA 70-2021 [Section No. 230.95]

230.95 Ground-Fault Protection of Equipment.

Ground-fault protection of equipment shall be provided for solidly grounded wye electric services of more than 150 volts to ground but not exceeding 1000 volts phase-to-phase for each service disconnect rated ~~800~~ 1000 amperes or more. The grounded conductor for the solidly grounded wye system shall be connected directly to ground through a grounding electrode system, as specified in 250.50, without inserting any resistor or impedance device.

The rating of the service disconnect shall be considered to be the rating of the largest fuse that can be installed or the highest continuous current trip setting for which the actual overcurrent device installed in a circuit breaker is rated or can be adjusted.

Exception: The ground-fault protection provisions of this section shall not apply to a service disconnect for a continuous industrial process where a nonorderly shutdown will introduce additional or increased hazards.

(A) Setting.

The ground-fault protection system shall operate to cause the service disconnect to open all ungrounded conductors of the faulted circuit. The maximum setting of the ground-fault protection shall be 1200 amperes, and the maximum time delay shall be one second for ground-fault currents equal to or greater than 3000 amperes.

(B) Fuses.

If a switch and fuse combination is used, the fuses employed shall be capable of interrupting any current higher than the interrupting capacity of the switch during a time that the ground-fault protective system will not cause the switch to open.

(C) Performance Testing.

The ground-fault protection system shall be performance tested when first installed on site. This testing shall be conducted by a qualified person(s) using a test process of primary current injection, in accordance with instructions that shall be provided with the equipment. A written record of this testing shall be made and shall be available to the authority having jurisdiction.

Informational Note No. 1: Ground-fault protection that functions to open the service disconnect affords no protection from faults on the line side of the protective element. It serves only to limit damage to conductors and equipment on the load side in the event of an arcing ground fault on the load side of the protective element.

Informational Note No. 2: This added protective equipment at the service equipment ~~may~~ could make it necessary to review the overall wiring system for proper selective overcurrent protection coordination. Additional installations of ground-fault protective equipment ~~may~~ might be needed on feeders and branch circuits where maximum continuity of electric service is necessary.

Informational Note No. 3: Where ground-fault protection is provided for the service disconnect and interconnection is made with another supply system by a transfer device, means or devices ~~may~~ could be needed to ensure proper ground-fault sensing by the ground-fault protection equipment.

Informational Note No. 4: See 517.17(A) for information on where an additional step of ground-fault protection is required for hospitals and other buildings with critical areas or life support equipment.

Submitter Information Verification

Committee: NEC-P10

Submittal Date: Mon Nov 01 13:35:25 EDT 2021

Committee Statement

Committee Statement: No technical substantiation was provided to reduce the threshold for the requirement for GFPE on solidly grounded wye services of more than 150 volts to ground. No field evidence was provided.

Response Message: SR-8703-NFPA 70-2021

Public Comment No. 1871-NFPA 70-2021 [Section No. 230.95]

Second Revision No. 8281-NFPA 70-2021 [Section No. 240.3]

240.3 Other Articles.

Equipment shall be protected against overcurrent in accordance with the article in this *Code* that covers the type of equipment specified in Table 240.3.

Table 240.3 Other Articles

Equipment	Article
Air-conditioning and refrigerating equipment	440
Appliances	422
Assembly occupancies	518
Audio signal processing, amplification, and reproduction equipment	640
Branch circuits	210
Busways	368
Capacitors	460
Class 1 power-limited circuits and Class 1 power-limited remote-control and signaling circuits	724
~~Class 1,~~ Class 2~~,~~ and Class 3 remote-control, signaling, and power-limited circuits	725
Cranes and hoists	610
Electric signs and outline lighting	600
Electric welders	630
Electrolytic cells	668
Elevators, dumbwaiters, escalators, moving walks, wheelchair lifts, and stairway chairlifts	620
Emergency systems	700
Fire alarm systems	760
Fire pumps	695
Fixed electric heating equipment for pipelines and vessels	427
Fixed electric space-heating equipment	424
Fixed outdoor electric deicing and snow-melting equipment	426
Generators	445
Health care facilities	517
Induction and dielectric heating equipment	665
Industrial machinery	670
Luminaires, lampholders, and lamps	410
Motion picture and television studios and similar locations	530
Motors, motor circuits, and controllers	430
Phase converters	455
Pipe organs	650
Receptacles	406
Services	230
Solar photovoltaic systems	690
Switchboards, switchgear, and panelboards	408
Theaters, audience areas of motion picture and television studios, and similar locations	520
Transformers and transformer vaults	450
X-ray equipment	660

Submitter Information Verification

Committee: NEC-P10
Submittal Date: Mon Oct 25 14:09:00 EDT 2021

Committee Statement

Committee Statement: “Switchgear” is added to correlate with the scope of Article 408.
Response Message: SR-8281-NFPA 70-2021

Public Comment No. 1310-NFPA 70-2021 [Section No. 240.3]

Second Revision No. 8283-NFPA 70-2021 [Section No. 240.4(B)]

(B) Overcurrent Devices Rated 800 Amperes or Less.

The next higher standard overcurrent device rating (above the ampacity of the conductors being protected) shall be permitted to be used, provided all of the following conditions are met:

(1) The conductors being protected are not part of a branch circuit supplying more than one receptacle for cord-and-plug-connected portable loads.

(2) The ampacity of the conductors does not correspond with the standard ampere rating of a fuse or a circuit breaker without overload trip adjustments above its rating (but that shall be permitted to have other trip or rating adjustments).

(3) The next higher standard rating selected does not exceed 800 amperes.

~~Where~~ If the overcurrent protective device is an adjustable trip device~~,~~ installed in accordance with 240.4(B) (1), (B)(2), and (B)(3), it shall be permitted to be set to a value that does not exceed the next higher standard value above the ampacity of the conductors being protected as shown in Table 240.6(A) where restricted access in accordance with 240.6(C) is provided.

Submitter Information Verification

Committee: NEC-P10

Submittal Date: Mon Oct 25 14:13:00 EDT 2021

Committee Statement

Committee Statement: The last sentence is modified for compliance with the NEC style manual and to clarify that all of 240.4(B) applies.

Response Message: SR-8283-NFPA 70-2021

Public Comment No. 855-NFPA 70-2021 [Section No. 240.4(B)]

Public Comment No. 1311-NFPA 70-2021 [Section No. 240.4(B)]

Second Revision No. 8285-NFPA 70-2021 [Section No. 240.4(D)]

(D) Small Conductors.

Unless specifically permitted in 240.4(E) or (G), the overcurrent protection shall not exceed that required by 240.4 (D)(1) through (D)~~(7)~~ (8) after any correction factors for ambient temperature and number of conductors have been applied.

(1) 18 AWG Copper.

7 amperes, provided all the following conditions are met:

(1) Continuous loads do not exceed 5.6 amperes.

(2) Overcurrent protection is provided by one of the following:

a. Branch-circuit-rated circuit breakers listed and marked for use with 18 AWG copper conductor

b. Branch-circuit-rated fuses listed and marked for use with 18 AWG copper conductor

c. Class CC, Class CF, Class J, or Class T fuses

(2) 16 AWG Copper.

10 amperes, provided all the following conditions are met:

(1) Continuous loads do not exceed 8 amperes.

(2) Overcurrent protection is provided by one of the following:

a. Branch-circuit-rated circuit breakers listed and marked for use with 16 AWG copper conductor

b. Branch-circuit-rated fuses listed and marked for use with 16 AWG copper conductor

c. Class CC, Class CF, Class J, or Class T fuses

(3) 14 AWG Copper-Clad Aluminum.

10 amperes, provided all the following conditions are met:

(1) Continuous loads do not exceed 8 amperes

(2) Overcurrent protection is provided by one of the following:

a. Branch-circuit-rated circuit breakers are listed and marked for use with 14 AWG copper-clad aluminum conductor.

b. Branch-circuit-rated fuses are listed and marked for use with 14 AWG copper-clad aluminum conductor.

(4) 14 AWG Copper.

15 amperes

(5) 12 AWG Aluminum and Copper-Clad Aluminum.

15 amperes

(6) 12 AWG Copper.

20 amperes

(7) 10 AWG Aluminum and Copper-Clad Aluminum.

25 amperes

(8) 10 AWG Copper.

30 amperes

Supplemental Information

File Name	Description	Approved
NEC_CMP-10_SR_8285_240.4_D_.docx	For staff use	

Submitter Information Verification

Committee: NEC-P10

Submittal Date: Mon Oct 25 14:29:03 EDT 2021

Committee Statement

Committee Statement: A new list item (3) is added to address specific requirements for 14 AWG Copper-Clad Aluminum with a maximum overcurrent protection rating of 10 Amps to align with the other small conductors permitted in 240.4(D). The following sections were renumbered accordingly.

Response Message: SR-8285-NFPA 70-2021

Public Comment No. 1437-NFPA 70-2021 [Section No. 240.4(D)]

Second Revision No. 8394-NFPA 70-2021 [Section No. 240.6(C)]

(C) Local Restricted Access Adjustable-Trip Circuit Breakers.

A circuit breaker(s) that has restricted access to the adjusting means shall be permitted to have an ampere rating(s) that is equal to the adjusted current setting (long-time pickup setting). Restricted access shall be achieved by one of the following methods:

(1) Located behind removable and sealable covers over the adjusting means

(2) Located behind bolted equipment enclosure doors

(3) Located behind locked doors accessible only to qualified personnel

(4) Password protected, with password accessible only to qualified personnel

Informational Note: See NFPA 730 , *Guide for Premises Security* , and ANSI/TIA-5017, *Telecommunications Physical Network Security Standard* , for information regarding physical security.

Submitter Information Verification

Committee: NEC-P10

Submittal Date: Tue Oct 26 12:55:47 EDT 2021

Committee Statement

Committee Statement: The password protection indicated in 240.6(C)(4) is an integral feature of the circuit breaker. Other means of electronically locking are applicable to doors in (C)(3). An informational note is added to provide additional guidance regarding physical network.

Response Message: SR-8394-NFPA 70-2021

Public Comment No. 2112-NFPA 70-2021 [Section No. 240.6(C)]

Second Revision No. 8391-NFPA 70-2021 [Section No. 240.6(D)]

(D) Remotely Accessible Adjustable-Trip Circuit Breakers.

A circuit breaker(s) that ~~is remotely accessible and has password protected access to~~ can be adjusted remotely to modify the adjusting means shall be permitted to have an ampere rating(s) that is equal to the adjusted current setting (long-time pickup setting). Remote access shall be achieved by one of the following methods:

(1) Connected directly through a local nonnetworked interface.

(2) Connected through a networked interface complying with one of the following methods:

a. The circuit breaker and associated software for adjusting the settings are identified as being evaluated for cybersecurity.

b. A cybersecurity assessment of the network is completed. Documentation of the assessment and certification shall be made available to those authorized to inspect, operate, and maintain the system.

Informational Note No. 1: See ANSI/ISA 62443, *Cybersecurity Standards series*, UL 2900 *Cybersecurity Standard series*, or the NIST *Framework for Improving Critical Infrastructure Cybersecurity*, Version 1.1 for assessment requirements.

Informational Note No. 2: Examples of the commissioning certification used to demonstrate the system has been investigated for cybersecurity vulnerabilities could be one of the following:

(1) The ISA Security Compliance Institute (ISCI) conformity assessment program

(2) Certification of compliance by a nationally recognized test laboratory

(3) Manufacturer certification for the specific type and brand of system provided

Informational Note No. 3: Cybersecurity is a specialized field requiring constant, vigilant attention to security vulnerabilities that could arise due to software defects, system configuration changes, or user interactions. Installation of devices that can be secured is an important first step but not sufficient to guarantee a secure system.

Submitter Information Verification

Committee: NEC-P10

Submittal Date: Tue Oct 26 12:49:42 EDT 2021

Committee Statement

Committee Statement: Editorial changes are made to improve clarity and useability. “Remotely accessible” is a defined term that is removed for consistency. “Password protection” is removed because this section applies to circuit breakers which permit changes to the adjusting means, whether they are provided with or without password protection.

Complying with one of the methods in 240.6(D)(2) establishes a minimum baseline for cybersecurity protection. The proposed text “acceptable levels” contains unenforceable terms and violates the NEC Style Manual 3.2.1. An informational note is added to stress the importance of vulnerability due to cyber or physical attacks.

Response Message: SR-8391-NFPA 70-2021

Public Comment No. 2111-NFPA 70-2021 [Section No. 240.6(D)]

Public Comment No. 1486-NFPA 70-2021 [Section No. 240.6(D)]

Public Comment No. 1312-NFPA 70-2021 [Section No. 240.6(D)]

Second Revision No. 8295-NFPA 70-2021 [Section No. 240.7]

240.7 Listing Requirements.

The following shall be listed:

(1) Branch-circuit overcurrent protective devices ~~shall be listed.~~

(2) Relays and circuit breakers providing ground-fault protection of equipment

(3) Ground-fault circuit interrupter devices

Submitter Information Verification

Committee: NEC-P10

Submittal Date: Mon Oct 25 15:08:00 EDT 2021

Committee Statement

Committee Statement: Listing requirements for branch circuit overcurrent protective devices and relays and circuit breakers and ground-fault circuit interrupter devices are relocated to 240.7 for usability.

Ground-fault protection of equipment was included in this list as it was originally included in the first draft but inadvertently not included in the document as indicated in the first draft ballot report.

Response Message: SR-8295-NFPA 70-2021

Public Comment No. 1230-NFPA 70-2021 [Section No. 240.7]

Second Revision No. 8631-NFPA 70-2021 [Section No. 240.14]

~~**240.14** Ground-Fault Circuit-Interrupter Protection.~~

~~**(A)** Listing.~~

~~Ground-fault circuit interrupters shall be listed.~~

~~**(B)** Reconditioned Equipment.~~

~~Ground-fault circuit interrupters shall not be permitted to be reconditioned.~~

Submitter Information Verification

Committee: NEC-P10

Submittal Date: Fri Oct 29 11:57:42 EDT 2021

Committee Statement

Committee Statement: This section is deleted as the listing requirements are relocated to 240.7 (see SR-8295) and the reconditioned equipment requirement are relocated to 240.2 (see SR-8704).

Response Message: SR-8631-NFPA 70-2021

Public Comment No. 880-NFPA 70-2021 [Section No. 240.14]

Second Revision No. 8440-NFPA 70-2021 [New Section after 240.15(B)(4)]

240.16 Interrupting Ratings.

Branch-circuit overcurrent protective devices shall have an interrupting rating no less than 5000 amperes.

Submitter Information Verification

Committee: NEC-P10

Submittal Date: Tue Oct 26 15:55:31 EDT 2021

Committee Statement

Committee Statement: This requirement is relocated from the definition for “Overcurrent Protective Device, Branch-Circuit” to comply with the NEC Style Manual 2.2.2.2.

Response Message: SR-8440-NFPA 70-2021

Second Revision No. 8313-NFPA 70-2021 [Section No. 240.24]

240.24 Location in or on Premises.

(A) Accessibility.

Circuit breakers and switches containing fuses shall be readily accessible and installed so that the center of the grip of the operating handle of the switch or circuit breaker, when in its highest position, is not more than 2.0 m (6 ft 7 in.) above the floor or working platform, unless one of the following applies:

(1) For busways, as provided in 368.17(C).

(2) For supplementary overcurrent protection, as described in 240.10.

(3) For overcurrent protective devices, as described in 225.40 and 230.92.

(4) For overcurrent protective devices adjacent to utilization equipment that they supply, access shall be permitted to be by portable means.

Exception: The use of a tool shall be permitted to access overcurrent protective devices located within listed industrial control panels, within enclosures designed for hazardous (classified) locations or enclosures to protect against environmental conditions. An enclosure within the scope of this exception, and all overcurrent protective device(s) within such enclosures as judged with the enclosure open, shall comply with the accessibility provisions of 240.24(A).

(B) Occupancy.

Each occupant shall have ready access to all overcurrent devices protecting the conductors supplying that occupancy, unless otherwise permitted in 240.24(B)(1) and (B)(2).

(1) Service and Feeder Overcurrent Protective Devices.

Where electric service and electrical maintenance are provided by the building management and where these are under continuous building management supervision, the service overcurrent protective devices and feeder overcurrent protective devices supplying more than one occupancy shall be permitted to be accessible only to authorized management personnel in the following:

(1) Multiple-occupancy buildings

(2) Guest rooms or guest suites

(2) Branch-Circuit Overcurrent Protective Devices.

Where electric service and electrical maintenance are provided by the building management and where these are under continuous building management supervision, the branch-circuit overcurrent protective devices supplying any guest rooms, guest suites, or sleeping rooms in dormitory units without permanent provisions for cooking shall be permitted to be accessible only to authorized management personnel.

(C) Not Exposed to Physical Damage.

Overcurrent protective devices shall be located where they will not be exposed to physical damage.

Informational Note: See 110.11 for information on deteriorating agents that could cause physical damage.

(D) Not in Vicinity of Easily Ignitible Material.

Overcurrent protective devices shall not be located in the vicinity of easily ignitible material, such as in clothes closets.

(E) Not Located in Bathrooms.

Overcurrent protective devices, other than supplementary overcurrent protection, shall not be located in bathrooms, showering facilities, or locker rooms with showering facilities.

(F) Not Located over Steps.

Overcurrent protective devices shall not be located over steps of a stairway.

Submitter Information Verification

Committee: NEC-P10

Submittal Date: Mon Oct 25 16:20:41 EDT 2021

Committee Statement

Committee Statement: The text is revised to include proper terminology in 240.24,

Response Message: SR-8313-NFPA 70-2021

Public Comment No. 862-NFPA 70-2021 [Section No. 240.24(F)]

Second Revision No. 8323-NFPA 70-2021 [Section No. 240.67 [Excluding any Sub-Sections]]

Where fuses rated ~~1000~~ 1200 amperes or higher are installed, 240.67(A), (B), and (C) shall apply.

Submitter Information Verification

Committee: NEC-P10

Submittal Date: Mon Oct 25 16:59:55 EDT 2021

Committee Statement

Committee Statement: No technical substantiation was provided to reduce the threshold for the requirement for Arc Energy Reduction methods where fuses are installed from 1200 amps to 1000 amps.

The hazards posed by arc flashes are known. The panel is open to reconsidering the threshold for arc flash protection during the next code cycle based on scientific data in accordance with the NFPA Regs.

Response Message: SR-8323-NFPA 70-2021

Public Comment No. 1876-NFPA 70-2021 [Section No. 240.67]

Second Revision No. 8320-NFPA 70-2021 [Section No. 240.87 [Excluding any Sub-Sections]]

Where the highest continuous current trip setting for which the actual overcurrent device installed in a circuit breaker is rated or can be adjusted is ~~1000~~ 1200 amperes or higher, 240.87(A), (B), and (C) shall apply.

Submitter Information Verification

Committee: NEC-P10

Submittal Date: Mon Oct 25 16:52:17 EDT 2021

Committee Statement

Committee Statement: No technical substantiation was provided to reduce the threshold for the requirement for Arc Energy Reduction methods where fuses are installed from 1200 amps to 1000 amps.

The hazards posed by arc flashes are known. The panel is open to reconsidering the threshold for arc flash protection during the next code cycle based on scientific data in accordance with the NFPA Regs.

Response Message: SR-8320-NFPA 70-2021

Public Comment No. 1877-NFPA 70-2021 [Section No. 240.87]

Second Revision No. 8331-NFPA 70-2021 [Section No. 242.1]

242.1 Scope.

This article provides the general requirements, installation requirements, and connection requirements for overvoltage protection and overvoltage protective devices. Part II covers surge-protective devices (SPDs) permanently installed on premises wiring systems of not more than 1000 volts, nominal, while Part III covers surge arresters permanently installed on premises wiring systems over 1000 volts, nominal.

~~Informational Note: This article combines and replaces Articles 280 and 285 in *NFPA 70* -2017.~~

Submitter Information Verification

Committee: NEC-P10

Submittal Date: Mon Oct 25 17:22:21 EDT 2021

Committee Statement

Committee Statement: The informational note has been removed because it is no longer necessary.

Response Message: SR-8331-NFPA 70-2021

Public Comment No. 863-NFPA 70-2021 [Section No. 242.1]

Second Revision No. 8334-NFPA 70-2021 [Section No. 242.28]

242.28 Conductor Size.

~~Line~~ SPD line conductors and conductors to ground shall not be smaller than 14 AWG copper or 12 AWG aluminum.

Submitter Information Verification

Committee: NEC-P10
Submittal Date: Mon Oct 25 17:27:20 EDT 2021

Committee Statement

Committee Statement: Added “SPD” to clarify that this section applies to all types of SPDs.
Response Message: SR-8334-NFPA 70-2021

Public Comment No. 864-NFPA 70-2021 [Section No. 242.28]

Second Revision No. 8335-NFPA 70-2021 [Section No. 242.42]

242.42 Surge Arrester Rating.

The duty cycle rating of a surge arrester shall be not less than 125 percent of the maximum ~~system~~ continuous operating voltage available at the point of application.

For solidly grounded systems, the maximum continuous operating voltage shall be the phase-to-ground voltage of the system.

For impedance or ungrounded systems, the maximum continuous operating voltage shall be the phase-to-phase voltage of the system.

Informational Note No. 1: See IEEE C62.11-2020, *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*, for further information on surge arresters.

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.

Submitter Information Verification

Committee: NEC-P10

Submittal Date: Mon Oct 25 17:30:33 EDT 2021

Committee Statement

Committee Statement: The language is revised in the parent text for consistency and clarity.

Response Message: SR-8335-NFPA 70-2021

Public Comment No. 865-NFPA 70-2021 [Section No. 242.42]

Second Revision No. 8457-NFPA 70-2021 [Sections Part IX., 240.100, 240.101, 240.102]

Part IX. Overcurrent Protection over 1000 Volts, Nominal

240.100 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 240.100(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.

240.101 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.

240.102 Reconditioned Equipment.

~~**(A)** Medium-Voltage Fuseholders.~~

~~Medium-voltage fuseholders and medium-voltage nonrenewable fuses shall not be permitted to be reconditioned.~~

~~**(B)** Medium-Voltage Power Circuit Breakers.~~

~~Medium-voltage power circuit breakers shall be permitted to be reconditioned.~~

~~**(C)** High-Voltage Circuit Breakers.~~

~~High-voltage circuit breakers shall be permitted to be reconditioned.~~

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Committee Statement

Committee Statement: The requirements of Part IX of 240 are moved to Article 245.
Response Message: SR-8457-NFPA 70-2021

Public Comment No. 871-NFPA 70-2021 [Section No. 240.102]

Public Comment No. 1394-NFPA 70-2021 [Global Input]

Second Revision No. 8272-NFPA 70-2021 [Sections Part VIII., 230.200, 230.202, 230.204, 230.205, 23...]

Part VIII. Services Exceeding 1000 Volts, Nominal

230.200 General.

Service conductors and equipment used on circuits exceeding 1000 volts, nominal, shall comply with all the applicable preceding sections of this article and with the following sections that supplement or modify the preceding sections. In no case shall the provisions of Part VIII apply to equipment on the supply side of the service point.

Informational Note: See ANSI/IEEE C2-2017, *National Electrical Safety Code* , for clearances of conductors of over 1000 volts, nominal.

230.202 Service-Entrance Conductors.

Service-entrance conductors to buildings or enclosures shall be installed to conform to 230.202(A) and (B).

(A) Conductor Size.

Service-entrance conductors shall not be smaller than 6 AWG unless in multiconductor cable. Multiconductor cable shall not be smaller than 8 AWG.

(B) Wiring Methods.

Service-entrance conductors shall be installed by one of the wiring methods covered in 300.37 and 305.15 .

230.204 Isolating Switches.

(A) Where Required.

Where oil switches or air, oil, vacuum, or sulfur hexafluoride circuit breakers constitute the service disconnecting means, an isolating switch with visible break contacts shall be installed on the supply side of the disconnecting means and all associated service equipment.

Exception: An isolating switch shall not be required where the circuit breaker or switch is mounted on removable truck panels or switchgear units where both of the following conditions apply:

(0) Cannot be opened unless the circuit is disconnected

(0) Where all energized parts are automatically disconnected when the circuit breaker or switch is removed from the normal operating position

(B) Fuses as Isolating Switch.

Where fuses are of the type that can be operated as a disconnecting switch, a set of such fuses shall be permitted as the isolating switch.

(C) Accessible to Qualified Persons Only.

The isolating switch shall be accessible to qualified persons only.

(D) Connection to Ground.

Isolating switches shall be provided with a means for readily connecting the load side conductors to a grounding electrode system, equipment ground busbar, or grounded steel structure when disconnected from the source of supply.

A means for grounding the load side conductors to a grounding electrode system, equipment grounding busbar, or grounded structural steel shall not be required for any duplicate isolating switch installed and maintained by the electric supply company.

230.205 Disconnecting Means.

(A) Location.

The service disconnecting means shall be located in accordance with 230.70 .

For either overhead or underground primary distribution systems on private property, the service disconnect shall be permitted to be located in a location that is not readily accessible, if the disconnecting means can be operated by mechanical linkage from a readily accessible point, or electronically in accordance with 230.205(C) , where applicable.

(B) Type.

Each service disconnect shall simultaneously disconnect all ungrounded service conductors that it controls and shall have a fault-closing rating that is not less than the available fault current at its supply terminals.

Where fused switches or separately mounted fuses are installed, the fuse characteristics shall be permitted to contribute to the fault-closing rating of the disconnecting means.

(C) Remote Control.

For multibuilding, industrial installations under single management, the service disconnecting means shall be permitted to be located at a separate building or structure. In such cases, the service disconnecting means shall be permitted to be electrically operated by a readily accessible, remote-control device.

230.206 Overcurrent Devices as Disconnecting Means.

Where the circuit breaker or alternative for it, as specified in 230.208 for service overcurrent devices, meets the requirements specified in 230.205 , it shall constitute the service disconnecting means.

230.208 Protection Requirements.

A short-circuit protective device shall be provided on the load side of, or as an integral part of, the service disconnect, and shall protect all ungrounded conductors that it supplies. The protective device shall be capable of detecting and interrupting all values of current, in excess of its trip setting or melting point, that can occur at its location. A fuse rated in continuous amperes not to exceed three times the ampacity of the conductor, or a circuit breaker with a trip setting of not more than six times the ampacity of the conductors, shall be considered as providing the required short-circuit protection.

> Informational Note: See Table 315.60(C)(1) through Table 315.60(C)(20) for ampacities of conductors rated 2001 volts to 35,000 volts.

Overcurrent devices shall conform to 230.208(A) and (B).

(A) Equipment Type.

Equipment used to protect service-entrance conductors shall meet the requirements of Article 490, Part II.

(B) Enclosed Overcurrent Devices.

The restriction to 80 percent of the rating for an enclosed overcurrent device for continuous loads shall not apply to overcurrent devices installed in systems operating at over 1000 volts.

~~**230.209** Surge Arresters.~~

~~Surge arresters installed in accordance with the requirements of Parts II and III of Article 242 shall be permitted on each ungrounded overhead service conductor.~~

~~Informational Note: Surge arresters may be referred to as lightning arresters in older documents.~~

~~**230.210** Service Equipment — General.~~

~~Service equipment, including instrument transformers, shall conform to Part I of Article 490 .~~

~~**230.211** Switchgear.~~

~~Switchgear shall consist of a substantial metal structure and a sheet metal enclosure. Where installed over a combustible floor, suitable protection thereto shall be provided.~~

~~**230.212** Over 35,000 Volts.~~

~~Where the voltage exceeds 35,000 volts between conductors that enter a building, they shall terminate in a switchgear compartment or a vault conforming to the requirements of 450.41 through 450.48 .~~

Submitter Information Verification

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Committee Statement

Committee Statement: New Article 231 is deleted in support of the revision provided in PC 1098. The provision of Article 231 will be redundant if PC 1098 is accepted.

PC-321 & 325: These public comments were resolved by the deletion of Article 231.

Response Message: SR-8272-NFPA 70-2021

Public Comment No. 278-NFPA 70-2021 [Article 231]

Public Comment No. 1244-NFPA 70-2021 [Article 231]

Public Comment No. 321-NFPA 70-2021 [Section No. 231.11(E)(3)]

Public Comment No. 1416-NFPA 70-2021 [Article 231]

Public Comment No. 916-NFPA 70-2021 [Article 231]

Public Comment No. 374-NFPA 70-2021 [Article 231]

Public Comment No. 32-NFPA 70-2021 [Article 231]

Public Comment No. 1473-NFPA 70-2021 [Article 231]

Public Comment No. 699-NFPA 70-2021 [Article 231]

Public Comment No. 2116-NFPA 70-2021 [Article 231]

Public Comment No. 877-NFPA 70-2021 [Global Input]

Public Comment No. 325-NFPA 70-2021 [Section No. 231.65]